



BANGLADESH TECHNICAL EDUCATION BOARD

Agargaon, Sher-E-Bangla Nagar

Dhaka-1207.

**04-YEAR DIPLOMA IN ENGINEERING CURRICULUM
COURSE STRUCTURE & SYLLABUS
(PROBIDHAN-2022)**

ELECTRONICS TECHNOLOGY

TECHNOLOGY CODE: 68

4TH SEMESTER

(Effective from 2022-2023 Academic Sessions)

COURSE STRUCTURE

(PROBIDHAN-2022)

TECHNOLOGY NAME: ELECTRONICS TECHNOLOGY (68

(4TH SEMESTER)

Sl. No.	Subject Code & Name		Period Per Week		Credit	Marks Distribution						
						Theory Assessment			Practical Assessment			Grand Total
	Code	Name	Theory	Practical		Continuous	Final	Total	Continuous	Final	Total	
1	25841	Accounting	2	-	2	40	60	100	-	-	-	100
2	26741	Electrical Installation, Planning and Estimating	3	3	4	60	90	150	25	25	50	200
3	26742	DC Machine	3	3	4	60	90	150	25	25	50	200
4	26841	Digital Electronics -II	2	3	3	40	60	100	25	25	50	150
5	26842	Communication Engineering	2	3	3	40	60	100	25	25	50	150
6	26843	Networks, Filters and Transmission lines	2	3	3	40	60	100	25	25	50	150
7	26844	Electronic servicing	-	3	1	40	-	40	25	25	50	90
Total			14	18	20	320	420	740	150	150	300	1040
Total Period			32									
Theory: Practical (%)			43.8%	56.3%								

Subject code	Subject Name	Period per week		Credit
25841	Accounting	T	P	C
		2	0	2

Rationale	All diploma graduate will work in any institution or organization or will be an employer this subject knowledgeable skill and attitude will health the studies to make appropriate decision for their professional life. This subject will cover the topics like information technology, Evaluation of an organization, journal entry system, cash book analysis and Income Tax.
Learning Outcome (Theoretical)	<p>After undergoing the subject, student will be able to:</p> <ul style="list-style-type: none"> ▪ Describe accounting concept ▪ Describe transaction analysis ▪ Describe accounting entry system. ▪ Explain the accounts of debit and credit ▪ Interpret the journal entry system. ▪ Evaluate the balance of ledger. ▪ Describe the cash book analysis. ▪ Evaluate of trial balance ▪ Explain the financial statement ▪ Describe income tax assessment.

Detailed Syllabus (Theory)

Unit	Topics with contents	Class (1 Period)	Final Marks
1.	CONCEPT OF ACCOUNTING 1.1 Define accounting. 1.2 State the objectives of accounting. 1.3 State the advantages of accounting. 1.4 State the necessity and scope of accounting.	2	3
2.	TRANSACTION ANALYSIS 2.1 Define transaction. 2.2 Define business transaction. 2.3 Describe the Characteristics of Transaction. 2.4 Discuss the different types of Transaction.	2	3
3.	ENTRY SYSTEM OF ACCOUNTING 3.1 Define single and double entry system. 3.2 Discuss the principles of double entry system. 3.3 Justify whether double entry system is an improvement over the single-entry system. 3.4 Distinguish between single entry and double entry system of accounting	1	3
4.	CONCEPT OF ACCOUNTS 4.1 Define accounts. 4.2 State the objectives of accounts. 4.3 Illustrate different type of accounts. 4.4 State the golden rules of accounting. 4.5 State the rules for debit and credit in each class of accounts. 4.6 Define accounting cycle.	2	3
5.	JOURNAL ENTRY SYSTEM 5.1 Define journal. 5.2 State the objective of journal. 5.3 Mention the various names of journal. 5.4 Prepare the form of journal entry system. 5.5 Solve the problem related journal entry system.	4	10
6.	LEDGER 6.1 Define ledger 6.2 Interpret the form of ledger 6.3 Distinguish between journal and ledger 6.4 Explain "ledger is called the king of all books of accounts" 6.5 Prepare ledger from given transaction	2	3
7.	CASH BOOK ANALYSIS 7.1 Define cash book. 7.2 Classify cash book. 7.3 Explain cash book as both journal and ledger. 7.4 Explain the different types of discount. 7.5 Prepare different types of cash books from given transactions showing balances.	4	10
8.	TRIAL BALANCE ANALYSIS 8.1 Define trial balance. 8.2 State the objective of a trial balance. 8.3 Mention the reason for non-agreement of trial balance. 8.4 Prepare trial balance from given balance.	3	3
9.	FINAL ACCOUNTS	10	20

	9.1 State the components of final accounts 9.2 Distinguish between trial balance and balance sheet 9.4 List the items to be posted in the trading account profit and loss account and the balance sheet 9.5 Prepare trading account profit and loss account and balance sheet from the given trial balance and other information		
10.	INCOME TAX 10.1 Define income tax. 10.2 State the objective of income tax. 10.3 Classify of assesses. 10.4 State the Taxable income of assesses. 10.5 Describe the Tax rebate. 10.6 Describe ther Income tax year, assessment year and National Board of Revenue (NBR).	2	2
	Total	32	60

REFERENCE BOOKS

SL	Book Name	Writer Name
1.	Book-Keeping & Accounting	Prof. Gazi Abdus Salam
2.	Principles of Accounting	Hafiz uddin
3.	Cost Accounting	Prof. Asimuddin Mondol
4.	হিসাবরক্ষন ও হিসাববিজ্ঞান	পারেশ মন্ডল
5.	উচ্চ মাধ্যমিক হিসাববিজ্ঞান	হক ও হোসাইন
6.	আয়কর	ওয়ালীউল্লাহ

Subject Code	Subject Name	Period per Week		Credit
26741	ELECTRICAL INSTALLATION, PLANNING AND ESTIMATING	T	P	C
		2	6	4
Rationale	<p>Diploma in Engineering Level students are required to acquire the knowledge and skill on the area of Electrical Installation, Planning and Estimating with special emphasis on factors and types of planning and estimating, measurement books, illumination and lighting scheme, types of electrical load, load calculation, current carrying capacity, size of conductor, Internal electrical wiring, service connection, estimate of earthing, motor connections, estimate of LT distribution line, electricity Acts and Rules and utility of electrical codes. Electrical Installation, planning and estimating is a subject where a student will deal various type of estimating which are employed in Industries, Domestic and commercial installations, different types of departments related in electrical work. As such the knowledge of the pre-requisite for these fields for effective discharge of their duties. These necessities the introduction of Electrical Engineering subject in the curriculum of Diploma in Engineering level by the completion of this course student will be able to perform measuring lumen, load calculation, find the conductor size, different types of electrical house wiring, estimate the electrical installation of building, service connection & its estimate, motor connection and estimate of electrification of workshop, estimate of rewinding of motor, earthing, indoor substation, LT distribution line and different types of testing. Have been given more emphasis on practical aspect rather than theory in teaching learning approach.</p>			
Learning Outcome (Theoretical)	<p>After Completing the subject, students will be able to:</p> <ul style="list-style-type: none"> ▪ Concept of electrical Installation, planning and estimating ▪ Perceive Measurement books and its utility ▪ Recognize Illumination and Lighting scheme ▪ Generalize Load calculation and conductor size ▪ Interpret Internal electrical wiring ▪ Estimate the electrical installation of buildings ▪ Point out Service connections ▪ Illustrate Motor connection and estimate of electrification of workshop ▪ Estimate of earthing, Indoor substation and LT Distribution line ▪ Conclude Acts, Rules and Electrical code 			
Learning Outcome (Practical)	<p>After undergoing the subject, students will be able to:</p> <ul style="list-style-type: none"> ▪ Measure lumen ▪ Calculate load ▪ Find the conductor size ▪ Perform different types of electrical house wiring ▪ Estimate the electrical installation of building ▪ Perform service connection and its estimate ▪ Perform Motor connection and estimate of electrification of workshop ▪ Estimate of rewinding of motor, earthing, indoor substation and LT distribution line ▪ Perform different types of testing 			

Detailed Syllabus (Theory)

Unit	Topics with contents	Period	Marks
1.	ELECTRICAL INSTALLATION ITS PLANNING AND ESTIMATING 1.1 Explain electrical installation and types of electrical installation. 1.2 Define indoor and outdoor electrical installation. 1.3 Distinguish between indoor and outdoor electrical installation. 1.4 Describe Planning and the necessity of planning of an electrical installation. 1.5 List the main categories of planning of an electrical installation. 1.6 Mention the considering factors for proper planning. 1.7 Explain Estimating and the necessity of estimating. 1.8 List the important steps for costing of an installation. 1.9 Mention the considering steps for preparing an estimate.	2	4
2.	MEASUREMENT BOOKS, PRICE SHEET AND SCHEDULE OF LABOR RATES 2.1 Describe Measurement Books. 2.2 Explain the necessity of MB. 2.3 Interpret the styles of maintaining an MB. 2.4 Mention proper specifications for the required materials form catalogue. 2.5 Describe price sheet and schedule of labor rates. 2.6 Explain the necessity of price sheet and labor rates for an estimate. 2.7 Prepare a price sheet and a labor rate schedule.	2	4
3.	ILLUMINATION AND LIGHTING SCHEME 3.1 Define illumination. 3.2 Define Solid angle, Candela, Luminous flux, Luminous intensity, MSCP and MHSCP with different related factors 3.3 Explain the laws of illumination. 3.4 Calculate illumination required for different purposes. 3.5 Prepare a chart of illumination for different lamp system (including CFL, Incandescent and Florescent) 3.6 Discuss direct lighting, indirect lighting, semi-direct and semi-indirect lighting. 3.7 Describe the level of illumination required for different purposes. 3.8 Explain the considering factors for designing a lighting scheme. 3.9 Design a lighting scheme. 3.10 Solve problems related to illumination and Lighting Scheme.	4	8

4.	ELECTRICAL LOAD, CURRENT CARRYING CAPACITY AND SIZE OF CONDUCTOR 4.1 Define electrical load. 4.2 Mention the types of electrical load. 4.3 Calculate the electrical load of residential building, Academic building, Student hostel, An office building, load of different types of lift and 20 stored building. 4.4 Describe the considering factors for determining the conductor size. 4.5 Calculate the current carrying capacity of a given circuit and sub circuits. 4.6 Calculate Voltage and Voltage drop of conductor 4.7 Explain the meaning and utility of RM, RE, SE, SM and SWG. 4.8 Find the conductor size from the table.	3	6
5.	INTERNAL ELECTRICAL WIRING. 5.1 Explain internal electrical wiring installation. 5.2 Describe the main types of internal wiring. 5.3 Sketch the layout plan for channel, surface conduit, and concealed conduit of small building. 5.4 Prepare schedule of materials for channel, surface conduit, and concealed conduit wiring. 5.5 Calculate the load of main circuit and sub circuits. 5.6 Select the sizes of wire, main switch, sub-main switches and switches. 5.7 Prepare a detail estimate of necessary materials and labor for installation of internal wiring. 5.8 Describe the tests to be carried out after completion of wiring of a building.	5	8
6.	SERVICE CONNECTIONS 6.1 Explain service main. 6.2 Sketch the layout of 1-phase service connection required energy meter, DB & SDB. 6.3 Prepare a schedule of materials for single phase service main. 6.4 Generate a detail estimate of materials & Labor for 1-phase service connection. 6.5 Sketch the layout of 3-phase service connection required energy meter, DB & SDB. 6.6 Prepare a schedule of materials for 3-phase service connection. 6.7 Produce a detail estimate for materials & Labor of 3-phase service connection.	3	6
7.	ESTIMATE OF EARTHING 7.1 Prepare a schedule of necessary materials for Pipe earthing,	5	8

	Plate earthing, Rod earthing, and Sheet earthing. 7.2 Produce an Estimate for each type of Earthing. 7.3 Produce an Estimate for earthing for 5-storied building. 7.4 Prepare an Estimate for earthing for 10-storied building. 7.5 Generate an estimate for earthing for 20-storied building 7.6 Explain the method of testing of an earthing installation. 7.7 List the desired value of earth resistance for different installations.		
8.	ESTIMATE OF INDUSTRIAL ELECTRICAL INSTALLATION 8.1 Sketch the layout plan and single line wiring diagram of a motor connection 8.2 Mention the position and calculate the distance of motor, main switch, starter and accessories in the diagram 8.3 Find out the sizes of wire, main switch and starter for the installation. 8.4 Prepare an estimate for a motor connection 8.5 Sketch the layout plan for casing wiring of a small workshop showing lighting loads and power loads 8.6 Sketch the layout plan for surface conduit wiring of a small workshop showing lighting loads and power loads 8.7 Calculate power loads and lighting loads respective sub-circuits and main circuit 8.8 Select the sizes of wires, switches, sub-main switches, main switch and distribution boards to lighting and power line respectively. 8.9 Prepare an estimate for the required materials and labor from the schedule.	4	6
9.	ESTIMATE OF LT OVERHEAD DISTRIBUTION LINE. 9.1 Sketch the layout plan of a 400V, 3-phase 4-wire overhead distribution line with street poles, conductors, insulators and other accessories. 9.2 Sketch the layout plan of a 400V, 3-phase 4-wire overhead distribution line with street poles, conductors, insulators and other accessories by E-CAD. 9.3 Prepare a schedule of materials required for overhead line. 9.4 Generate an estimate for required materials for one-kilometer-long overhead LT distribution line with the 5th wire for street lighting. 9.5 Prepare a schedule of labor for overhead LT distribution line. 9.6 Make an estimate for overhead LT distribution line.	2	6
10.	ELECTRICITY ACT, RULES AND UTILITY OF ELECTRICAL CODES. 10.1 List the main electricity rules of Bangladesh Electricity Act. 10.2 Describe the importance of electricity Act and Rules. 10.3 Explain the need for maintaining safety procedure against electrical	2	4

	hazards.		
10.4	Describe the safety measures.		
10.5	List the electrical codes of Bangladesh National Building Code and (BNBC) and International Building code.		
10.6	Explain different electrical codes of National Building Code and International Building code		
10.7	State the advantages of using the electrical codes.		
	Total	32	60

Detailed Syllabus (Practical)

Sl.	Experiment name with procedure	Class (3 Period)	Continuous Marks
1	MEASURE THE ILLUMINATION LEVEL OF A SURFACE. 1.1 Collect necessary tools, equipment and materials. 1.2 Prepare a job for measuring Illumination. 1.3 Operate the lumen meter. 1.4 Measure the illumination level in your wiring lab/ class room. 1.5 Compare the obtained reading with the calculated value. 1.6 Maintain the record of performed task.	1	2
2	PLAN AND ESTIMATE FOR ELECTRIFICATION OF A CLASS ROOM. 2.1 Sketch the layout plan and single line wiring diagram of a class room. 2.2 Draw the wiring and circuit diagram. 2.3 Sketch the wiring and circuit diagram by E-CAD. 2.4 Indicate the positions of electrical fittings in the plan. 2.5 Select wires and main switch from the calculated load of main circuit and sub-circuits. 2.6 Measure the distances of fittings from the main board & SDB and find out the length of the wire. 2.7 List the materials in the schedule and find out the cost. 2.8 Add labor charges from the schedule with material cost for the summary of estimate. 2.9 Maintain the record of performed task.	1	2
3	DETERMINE CABLE SIZE FROM CABLE CATALOGUE. 3.1 Collect necessary tools, equipment and materials. 3.2 Calculate the load of main circuits and sub-circuits of different installations. 3.3 Find out the corresponding suitable cable size from the catalogue allowing safety factor.	1	2

	3.4 Check the size of the cables by using SWG. 3.5 Find out the size of the cables in respect of RM & RE. 3.6 Maintain the record of performed task.		
4	PERFORM CHANNEL WIRING. 4.1 Sketch the layout plan mentioning positions of fittings. 4.2 Draw the wiring and circuit diagrams. 4.3 Select the necessary size of wires, main switch, fuse/MCB. 4.4 Measure the distance of the fittings from the main switch. 4.5 Mark the position of the fittings. 4.6 Fix up the rowel plugs, boards and casing on the wall. 4.7 Set wires, switches and outlets. 4.8 Install energy meter, cut-out/MCB and main switch. 4.9 Prepare estimate of Channel wiring. 4.10 Maintain the record of performed task.	3	4
5	PERFORM SURFACE CONDUIT WIRING. 5.1 Sketch the layout plan mentioning positions of fittings. 5.2 Sketch the wiring and circuit diagrams. 5.3 Select wires, main switch, fuse/MCB. 5.4 Measure the distance of the fittings from the main switch. 5.5 Mark the position of the fittings. 5.6 Fix up the rowel plugs, boards and casing on the wall. 5.7 Set wires, switches and outlets. 5.8 Install energy meter, cut-out MCB and main switch. 5.9 Prepare estimate of surface conduit wiring. 5.10 Maintain the record of performed task.	3	4
6	PERFORM CONCEALED CONDUIT WIRING. 6.1 Sketch the layout plan mentioning positions of fittings. 6.2 Draw the wiring and circuit diagrams. 6.3 Select wires, main switch, fuse/MCB. 6.4 Measure the distance of the fittings from the main switch. 6.5 Mark the position of the fittings. 6.6 Insert conduit into the wall channel and draw wires. 6.7 Set wires, switches and outlets. 6.8 Install energy meter, cut-out MCB and main switch. 6.9 Prepare estimate of concealed conduit wiring. 6.10 Maintain the record of performed task.	3	4
7	PLAN AND ESTIMATE FOR ELECTRIFICATION OF A SINGLE STORIED RESIDENTIAL BUILDING. 7.1 Sketch the layout plan of a single storied residential building of about 1250 square feet plinth area in a five decimal land with	2	3

	<p>boundary wall and gate showing the position of electric pole for service connection.</p> <p>7.2 Draw the wiring and circuit diagrams and show the service connection.</p> <p>7.3 Sketch the wiring and circuit diagrams and show the service connection by E-CAD.</p> <p>7.4 Show the positions of electrical fittings in the plan.</p> <p>7.5 Select wire, main switch, SDB, fuse or MCB from the calculated load of circuit and sub circuit.</p> <p>7.6 Measure the distance of the fittings from the board to find out the length of wires.</p> <p>7.7 Prepare the estimate for electrification of the building.</p> <p>7.8 Maintain the record of performed task.</p>		
8	<p>PLAN AND ESTIMATE FOR ELECTRIFICATION OF A MULTISTORIED BUILDING.</p> <p>8.1 Sketch the elevation and floor plan of the building.</p> <p>8.2 Draw the wiring and circuit diagrams of a flat.</p> <p>8.3 Show the positions of the fittings in a flat.</p> <p>8.4 Sketch the wiring and circuit diagrams of a flat by E_CAD.</p> <p>8.5 Select wires, main switch, fuse or MCB.</p> <p>8.6 Measure the distance of the fittings from the board to find out the length of wire.</p> <p>8.7 Identify the rising main and power distribution system.</p> <p>8.8 Prepare the estimate for electrification of the building.</p> <p>8.9 Maintain the record of performed task.</p>	2	2
9	<p>INSTALL A SINGLE-PHASE SERVICE CONNECTION.</p> <p>9.1 Sketch the layout plan showing single line service connection from the nearest pole to the service entrance of the building.</p> <p>9.2 Determine the total electrical load of the installation.</p> <p>9.3 Measure the distance from the meter at premises to the nearest electric pole.</p> <p>9.4 Prepare the estimate of material cost, labor cost and contingencies.</p> <p>9.5 Fix up brackets, service pipe and insulators.</p> <p>9.6 Lay two GI guard wires with carlings (use draw vice).</p> <p>9.7 Draw the single core PVC wires through the pipe up to the meter inside the premises.</p> <p>9.8 Connect one aerial fuse with the phase.</p> <p>9.9 Maintain the record of performed task.</p>	1	2
10	<p>INSTALL A THREE-PHASE SERVICE CONNECTION.</p> <p>10.1 Sketch the layout plan showing single line service</p>	1	2

	<p>connection from the nearest pole to the service entrance of the building.</p> <p>10.2 Calculate the total electrical load of the installation.</p> <p>10.3 Measure the distance from the meter at premises to the nearest electric pole.</p> <p>10.4 Prepare the estimate of material, labor cost and contingencies.</p> <p>10.5 Fix up brackets, service pipe and insulators.</p> <p>10.6 Lay two GI guard wires with carlings (use draw vice).</p> <p>10.7 Draw the single core PVC wires through the pipe up to the meter inside the premises.</p> <p>10.8 Connect one aerial fuse with the phase.</p> <p>10.9 Maintain the record of performed task.</p>		
11	<p>PERFORM THE THREE PHASE MOTOR CONNECTION.</p> <p>11.1 Sketch the layout plan and single line wiring diagram of the motor connection.</p> <p>11.2 Sketch the wiring and circuit diagrams by E-CAD.</p> <p>11.3 Indicate the position of the motor, main switch and starter.</p> <p>11.4 Measure the distance of the motor, starter and main switch from the supply main.</p> <p>11.5 Select sizes of wires, main switch and starter.</p> <p>11.6 Prepare Estimate for motor connection considering material cost, labor charges and contingencies.</p> <p>11.7 Following electricity rules connect the supply mains and operate the motor.</p> <p>11.8 Maintain the record of performed task.</p>	1	2
12	<p>PLAN AND ESTIMATE FOR ELECTRIFICATION OF AN ELECTRICAL MACHINE SHOP.</p> <p>12.1 Sketch the layout plan and single line wiring diagram of the shop.</p> <p>12.2 Draw the wiring and circuit diagrams.</p> <p>12.3 Sketch the wiring and circuit diagrams by E-CAD.</p> <p>12.4 Indicate the positions of the fittings in the plan.</p> <p>12.5 Select wires, main switch, fuse or MCB.</p> <p>12.6 Measure the distance of the fittings from the board to find out the length of wire.</p> <p>12.7 List the materials in the schedule of materials and find out the cost.</p> <p>12.8 Add labor charge with the cost of material for the summary of estimate.</p> <p>12.9 Maintain the record of performed task.</p>	2	2

13	PREPARE AN ESTIMATE FOR RE-WIND OF A SINGLE-PHASE INDUCTION MOTOR 13.1 Calculate the size of conductor, number of coils and number of turns in a coil. 13.2 Sketch winding diagram of the induction motor. 13.3 Make necessary grouping on the basis of the layout plan for winding. 13.4 Find out the types and sizes of wire required for the winding. 13.5 Determine the number of turns required on the basis of the coil grouping per phase and layer of winding. 13.6 Estimate the cost involved to rewind the motor. 13.7 Maintain the record of performed task.	1	2
14	PREPARE AN ESTIMATE FOR RE-WIND OF A THREE-PHASE INDUCTION MOTOR 14.1 Calculate the size of conductor, number of coils and number of turns in a coil. 14.2 Sketch winding diagram of the induction motor. 14.3 Make necessary grouping on the basis of the layout plan for winding. 14.4 Select wires required for the winding. 14.5 Determine the number of turns required on the basis of the coil grouping per phase and layer of winding. 14.6 Estimate the cost involved to rewind the motor. 14.7 Maintain the record of performed task.	1	2
15	PERFORM INSTALLATION OF PLATE EARTHLING. 15.1 Select earth electrode, earth continuity conductor & other necessary materials. 15.2 Draw the layout diagram of Plate earthing. 15.3 Sketch the layout diagram of Plate earthing by E-CAD. 15.4 Place the earth electrode into the ground after digging hole. 15.5 Put charcoal & salt into the hole. 15.6 Pull the continuity conductor from the earth electrode. 15.7 Measure the earth resistance. 15.8 Maintain the record of performed task.	2	3
16	PERFORM INSTALLATION OF PIPE EARTHLING. 16.1 Select earth electrode, earth continuity conductor & other necessary materials. 16.2 Draw the layout diagram of Plate earthing. 16.3 Sketch the layout diagram of Plate earthing by E-CAD. 16.4 Place the earth electrode into the ground after digging hole. 16.5 Put charcoal & salt into the hole.	2	3

	16.6 Pull the continuity conductor from the earth electrode. 16.7 Measure the earth resistance. 16.8 Maintain the record of performed task.		
17	PERFORM INSTALLATION OF SHEET EARTHLING. 17.1 Select earth electrode, earth continuity conductor & other necessary materials. 17.2 Draw the layout diagram of Plate earthing. 17.3 Sketch the layout diagram of Plate earthing by E-CAD. 17.4 Place the earth electrode into the ground after digging hole. 17.5 Put charcoal & salt into the hole. 17.6 Pull the continuity conductor from the earth electrode. 17.7 Measure the earth resistance. 17.8 Maintain the record of performed task.	2	3
18	PREPARE AN ESTIMATE FOR INDOOR SUBSTATION 18.1 Identify the equipment, measuring instrument, controlling devices and protective devices of indoor substation. 18.2 Draw the layout diagram of an indoor substation. 18.3 Sketch the layout diagram of an indoor substation by E-CAD. 18.4 Prepare an estimate of an indoor substation. 18.5 Maintain the record of performed task.	1	2
19	TEST AN ELECTRICAL INSTALLATION (MACHINE / EQUIPMENT) BEFORE COMMISSIONING. 19.1 Select the machine/equipment to be tested. 19.2 Test continuity of the winding of the machine/equipment by AVO meter. 19.3 Test the insulation resistance within the coils by Megger. 19.4 Test the insulation resistance with the coils and body of the machine/equipment by Megger. 19.5 Measure the resistance of the earth point which will be connected to the body of the machine/equipment. 19.6 Maintain the record of performed task.	1	2
20	PREPARE PLAN AND ESTIMATE OF A SHORT DISTRIBUTION LINE. 20.1 Take the measurements of the route of the proposed distribution line. 20.2 Sketch the route showing substation, pole and consumer. 20.3 Sketch the route showing substation, pole and consumer by E-CAD. 20.4 Prepare estimate of a short distribution line. 20.5 Maintain the record of performed task.	1	2
	Total	32	50

Necessary Resources (Tools, equipment's and Machinery):

SI	Item Name	Quantity
01	Screw drivers, Neon tester, Pliers, Chisels, Hammer, Mallet, Hack saw, Hand saw, Soldering Iron, Electrician Knife, Wire strippers, Poker, Plumb bob, Hand drill machine, measuring tape	Each item 25 no's
02	Lux meter, SWG, Ohm meter, AVO meter, Energy meter, Tacko meter and Megger	Each item 15 no's
03	Rowel plug, Clump, Steel nail, wall hook, Earth plate, GI pipe, Earth continuity conductor, Earth sheet, Charcoal, Salt,	Each item 50 no's
04	Different types of Wires and Cables (1.0 to 3.5mm)	5 coils of different sizes
05	Switches (SPST, SPDT, SPTT, DPST, DPDT, DPTS, TPST, TPDT, TPTT, Tumbler switch, Push bottom switch, Piano switch, Gang switch, two pin socket, three pin socket, Combined switch and socket, two pin plug, Tree pin Plug, Adaptor,	Each item 10 no's
06	Incandescent Lamp, Fluorescent lamp, Mercury lamp, Vapor lamp, LED, LCD, LED tube light,	Each item 25 no's
07	Channel of different dimension, Conduit of different dimension, Shackle, Bend, Calling bell, Choke coil, Starter	Each item 25 no's
08	Batten holder, Pendent holder, Bracket holder, Tube light holder set	Each item 25 no's

Recommended Books:

SI	Book Name	Writer Name	Publisher Name & Edition
01	A course in Electrical Installation, Estimating and costing	J B Gupta	S.Chand, 2021
02	Electrical Installation, planning and costing	Uppal	S.Chand2020
03	Electrical Estimating	Michael Halt	McGrawhill, 2019
04	PDB, PGCB,PWD Rate schedule	PWD, BD	Dhaka, 2018
05	National Building Code	BNBC	BNBC 2015

Website References:

SI	Web Link	Remarks
01	http://www.electricalengineering.org	
02	http://www.electrical-installation.org	
03	http://www.eetiimes.eu	
04	http://www.interestingengineering.com	
05	http://www.electrical-engineering-portal.com	
06	http://www.electrical4u.com	

Subject Code	Subject Name	Period per Week		Credit
26742	DC Machine	T	P	C
		3	3	4

Rationale	<p>Diploma in Engineering Level students are required to acquire the knowledge and skill on the area of DC Machines with special emphasis of basic concept of Cell & Battery, Fuel cell, procedure of Battery charging and testing, DC generator and its characteristics, Losses and Efficiency of DC generator, DC motor, Speed control and voltage regulation of DC motor, Industrial Application of DC motor, electric traction. Electrical machines is a subject where a student will deal with various types of electrical machines which are employed in industries, power stations, domestic and commercial appliances etc. As such the knowledge of DC Machine the pre-requisite for these fields for effective discharge of their duties. These necessities of electrical engineering subjects in the curriculum of Diploma in engineering. After completion of this course student will be able to construct Cell & Battery, Perform Battery charging and testing, assemble and re-assemble of DC Generator, Operate DC generator and motor, develop lap and wave winding and speed control of DC motor. Have been given more emphasis on practical aspect rather than theory in teaching learning approach.</p>
Learning Outcome (Theoretical)	<p>After Completing the subject, students will be able to:</p> <ul style="list-style-type: none"> ▪ Define cell, fuel cell and battery. ▪ Illustrate procedure of Battery charging and testing. ▪ Outline DC generator and its characteristics. ▪ Calculate Losses and Efficiency of DC generator. ▪ Describe DC motor. ▪ Enumerate Speed control and Regulation of DC motor ▪ Explain Industrial Application of DC motor. ▪ Mention electric traction.
Learning Outcome (Practical)	<p>After undergoing the subject, students will be able to:</p> <ul style="list-style-type: none"> ▪ Construct cell, fuel cell and battery. ▪ Perform Battery charging and testing. ▪ Assemble and de-assemble of varies parts of D.C. Generator ▪ Operate DC shunt, series and compound motors ▪ Develop Lap and wave winding. ▪ Execute speed control on DC Motors. ▪ Demonstrate Industrial Application of DC motor.

Detailed Syllabus (Theory)

Unit	Topics with contents	Class (1 Period)	Final Marks
1.	CELL AND BATTERY 1.1 Define cell, Primary cell and Secondary cell. 1.2 Classify cell and Primary cell. 1.3 Explain Series, Parallel and combined cell connection 1.4 Describe the construction and principle of a simple voltaic cell. 1.5 List the defects of a simple voltaic cell. 1.6 Illustrate the causes and methods of removing of defects of a Simple voltaic cell. 1.7 Mention the construction of Dry cell and its chemical reaction. 1.8 Solve problem related cell combination/connection. 1.9 Illustrate the construction of alkaline batteries. 1.10 Describe the construction of lead acid battery and its chemical reaction	4	8
2	FUEL CELLS 2.1 Discuss the concept of Fuel cell. 2.2 Mention the types of Fuel cell. 2.3 Describe the proton exchange membrane fuel cell (PEMFC) and phosphoric acid fuel cell (PAFC). 2.4 Explain the solid acid fuel cell (SAFC) and alkaline fuel cell (AFC). 2.5 Illustrate the High Temperature Fuel Cell of Solid Oxide Fuel Cell (SOFC), Molten carbonate fuel cells (MCFC). 2.6 Mention the uses of PEMFC, PAFC, SAFC, SOFC, MCFC and AFC.	3	6
3	BATTERY CHARGING 3.1 List the types of battery charging system. 3.2 Describe the procedure of slow charging of battery by 220-230VAC source. 3.3 Describe the procedure of quick charging of battery by 220-230VAC source. 3.4 Illustrate the procedure of preparing electrolyte. 3.5 Outline the construction of dry charged battery. 3.6 Explain the charging procedure of sulfated battery. 3.7 Describe the process of charging more than one battery at a time.	3	6
4	EFFICIENCY AND TESTING OF BATTERIES 4.1 Describe the internal resistance and efficiency of a battery. 4.2 Explain Ampere – Hour (A - H) rating of battery. 4.3 Solve problems related with internal resistance affecting terminal voltage. 4.4 List the factors on which the capacity of a battery depends. 4.5 Illustrate the procedures of testing a storage battery by	4	6

	hydrometer, voltmeter and ammeter. 4.6 State the maintenance and routine inspection procedure of a battery.		
5	ELECTROPLATING 5.1 Explain fundamental principles of electroplating. 5.2 State Faraday's laws of electrolysis. 5.3 Describe the process of extraction and refining of metals. 5.4 Mention a simple method of producing copper plating upon a carbon brush. 5.5 Illustrate electro-deposition process. 5.6 Mention power supply for electrolytic process adopted in electroplating.	3	6
6	DC GENERATOR 6.1 State generator principle. 6.2 Mention the conditions for generation of emf in a single coil generator. 6.3 Describe the constructional details of a DC generator. 6.4 Derive the EMF equation of a DC generator. 6.5 Solve problems relating to DC generator. 6.6 Describe the excitation of DC generator. 6.7 Explain the necessity of excitation. 6.8 Self-excited and separately excited generator. 6.9 State the condition for excitation.	4	7
7	WINDING OF DC GENERATOR 7.1 Define pole pitch, coil pitch, front pitch, back pitch, average pitch and commutation pitch. 7.2 Describe lap and wave winding. 7.3 Sketch the developed diagram of simplex and duplex (lap and wave) winding. 7.4 Differentiate between the lap and wave windings.	3	6
8	ARMATURE REACTION AND COMMUTATION OF DC GENERATOR 8.1 Explain armature reaction. 8.2 Describe the effect of armature reaction. 8.3 State de-magnetizing and cross magnetizing. 8.4 Define the action of commutation. 8.5 Mention the methods of improving commutation. 8.6 Explain the necessity of interpoles and compensating winding. 8.7 State the need for equalizing bar and rings.	3	6
9	CHARACTERISTICS OF DC GENERATOR 9.1 Explain the process of building up voltage of shunt generator. 9.2 State the critical resistance and critical speed for shunt generator. 9.3 Plot the terminal voltage Vs load current characteristic curve of shunt generator. 9.4 Describe the reasons for decreasing terminal voltage with increasing load.	3	6

	9.5 Plot the internal and external characteristic curve of DC shunt, series and compound generator. 9.6 Solve the problems related to shunt generator.		
10	VOLTAGE REGULATION AND EFFICIENCY OF A DC GENERATOR 10.1 List the various losses in a DC generator. 10.2 Explain power stages of a DC generator. 10.3 Calculate the condition for maximum efficiency. 10.4 Derive the formula for voltage regulation of a DC generator. 10.5 Discuss the importance of voltage regulation of DC generator. 10.6 Solve problems relating to voltage regulation of DC Generator. 10.7 Express the formula for efficiency of a DC generator. 10.8 Solve problems relating to efficiency of a DC generator.	3	6
11	PARALLEL OPERATION OF DC GENERATOR 11.1 State the need for parallel operation of DC generator (shunt, series and compound) 11.2 List the conditions for parallel operation of DC generator. 11.3 Discuss the condition of sharing loads in DC generators operating in parallel. 11.4 Draw the circuit diagram of two long shunt compound generators connected in parallel. 11.5 Calculate the load shared by individual machine at the time of parallel operation.	4	6
12	WORKING PRINCIPLE OF DC MOTOR 12.1 Explain the working principle of DC motor. 12.2 List the types of DC motor 12.3 Describe generator action of DC motor. 12.4 Discuss the significance of the back emf. 12.5 Derive the voltage equation of DC motor. 12.6 Define torque, running torque and break down torque with unit. 12.7 State different torque and force. 12.8 Plot the torque/speed curve of series, shunt and compound motors.	3	5
13	LOSSES AND EFFICIENCY OF DC MOTOR 13.1 State the losses in DC motor. 13.2 Calculate the efficiency of DC motor from a given data. 13.3 Explain the power stages of DC motor. 13.4 Solved problem related to efficiency of DC motor.	2	6
14	STARTING METHODS AND SPEED CONTROL OF DC MOTOR 14.1 Describe the factors controlling the speed of DC motor. 14.2 Discuss the general methods of speed control of DC motor. 14.3 Explain speed control of shunt, series and compound motor. 14.4 Describe Ward-Leonard System for DC motor speed control. 14.5 Express Solid-State speed controller for DC motor (SCR based) 14.6 Describe electric braking of shunt and series motor.	3	5

	14.7 Explain the necessity of a starter for DC motor. 14.8 Describe three point and four-point starter used in DC motor. 14.9 Explain the heating and cooling of DC machine. 14.10 Explain brake test and no-load test of DC motor.		
15	ELECTRIC TRACTION SYSTEM 15.1 State electric traction. 15.2 List the characteristics of an ideal traction system. 15.3 Describe the feeding and distribution system for tram ways and trolley buses. 15.4 Explain the diesel electric drive, battery electric drive and electric drive of locomotives. 15.5 Explain the working principle of tram ways and trolley buses. 15.6 Describe the DC system used in traction. 15.7 Explain the reasons for using DC series motor for traction purpose. 15.8 Discuss different methods of speed control of DC traction motors. 15.9 Explain starting method of 3-phase induction motor used in traction. 15.10 Describe the systems of supplying power in electric traction.	3	5
	TOTAL	48	90

Detailed Syllabus (Practical)

Sl.	Experiment name with procedure	Class (3 Period)	Continuous Marks
1	MAKE A VOLTAIC CELL 1.1 Collect tools and necessary materials for making a voltaic cell. 1.2 Sketch the connection diagram. 1.3 Connect all components according to diagram. 1.4 Observe the chemical reaction. 1.5 Measure the output voltage. 1.6 Maintain the record of performed task.	1	2
2	PERFORM CHARGE A LEAD ACID BATTERY. 2.1 Sketch the connection diagram for constant potential/Constant current method of charging. 2.2 Identify the equipment and materials for charging a lead acid battery. 2.3 Record the readings by measuring the terminal voltage of the discharged battery and specific gravity of electrolytes. 2.4 Connect the positive and negative terminal of the battery to the positive and negative terminals of the charger respectively. 2.5 Set the charging voltage and switch on the charger.	1	3

	<p>2.6 Record the readings by measuring the specific gravity of electrolyte and the terminal voltage of the battery.</p> <p>2.7 Maintain the record of performed task.</p>		
3	<p>MEASURE THE INTERNAL RESISTANCE OF A BATTERY.</p> <p>3.1 Sketch necessary circuit diagram.</p> <p>3.2 Connect a resistance (known value) with the battery.</p> <p>3.3 Record the readings by measuring the voltage and current of the battery.</p> <p>3.4 Calculate the internal resistance of a battery</p> <p>3.5 Maintain the record of performed task.</p>	1	3
4	<p>DE-ASSEMBLE AND RE-ASSEMBLE THE PARTS OF A DC GENERATOR/ DC MOTOR.</p> <p>4.1 Select the necessary tools required for de-assembling and re-assembling the parts of DC generator/ DC motor.</p> <p>4.2 Identify at least ten main parts of the generator/motor.</p> <p>4.3 Sketch at least ten main parts of the generator/motor.</p> <p>4.4 Re-assemble the parts of the generator/motor.</p> <p>4.5 Connect the generator/motor to the proper power source.</p> <p>4.6 Start the generator/motor.</p> <p>4.7 Maintain the record of performed task.</p>	2	3
5	<p>DEVELOP 4 POLES, 24 SLOTS; DOUBLE LAYER LAP WINDING (SIMPLEX & DUPLEX) OF A DC GENERATOR.</p> <p>5.1 Select pole pitch, back pitch, front pitch and commutator pitch for the generator.</p> <p>5.2 Sketch the developed winding diagram (simplex and duplex) showing the position of carbon brushes.</p> <p>5.3 Select the coil turns, coil number and coil grouping for the winding.</p> <p>5.4 Select the sizes and types of wires required for the winding.</p> <p>5.5 Construct required number of coils.</p> <p>5.6 Insert the coils into the slot using the proper insulation.</p> <p>5.7 Connect the coils in proper way.</p> <p>5.8 Test the winding step by step.</p> <p>5.9 Maintain the record of performed task.</p>	2	3
6	<p>DEVELOP A 4 POLES, 16 SLOTS, DOUBLE LAYER WAVE WINDING (SIMPLEX & DUPLEX) OF A DC GENERATOR.</p> <p>6.1 Identify pole pitch, back pitch, front pitch, commutator pitch.</p> <p>6.2 Sketch the developed winding diagram (simplex & duplex) showing the position of carbon brushes.</p> <p>6.3 Determine the number of turns required on the basis of coil grouping and layer of winding.</p> <p>6.4 Determine the size and type of wires required for the winding.</p>	1	3

	6.5 Perform winding. 6.6 Maintain the record of performed task.		
7	DETERMINE GENERATED EMF OF A DC SHUNT GENERATOR. 7.1 Sketch the required diagram of the shunt generator. 7.2 Set the experiment as per diagram. 7.3 Start the generating set and build up the voltage. 7.4 Measure the developed emf by starting the generator. 7.5 Record the required data. 7.6 Plot the I_f versus V_g curve from the data. 7.7 Maintain the record of performed task.	1	2
8	PLOT THE V_L- I_L CHARACTERISTIC CURVES OF A SHUNT GENERATOR. 8.1 Sketch the required diagram for the experiment. 8.2 Collect the materials, meters and equipment required for the experiment. 8.3 Connect all the meters and equipment as per diagram. 8.4 Record the necessary readings from the meters. 8.5 Plot the V_L - I_L curve from the data. 8.6 Maintain the record of performed task.	2	2
9	PLOT THE V_L - I_L CHARACTERISTIC CURVE OF A SERIES GENERATOR. 9.1 Sketch the required diagram for the experiment. 9.2 Collect the required instruments & materials. 9.3 Connect all the meters and equipment as per diagram. 9.4 Record the necessary readings from the meters. 9.5 Plot the V_L - I_L curve from the data. 9.6 Maintain the record of performed task.	2	2
10	PLOT THE V_L- I_L CHARACTERISTIC CURVE OF A COMPOUND GENERATOR. 10.1 Sketch the required diagram for the experiment. 10.2 Collect the required instruments & materials. 10.3 Connect all the meters and equipment as per diagram. 10.4 Record the necessary readings from the meters. 10.5 Plot the V_L - I_L curve from the data. 10.6 Maintain the record of performed task.	3	2
	Total	16	25

Necessary Resources (Tools, Materials, equipment's and Machineries):

Sl	Item Name	Quantity
01	Screw drivers, Neon tester, Standard Wire Gauge(SWG), Hammer, Mallat	Each item 25 no's
02	Ammeter, Voltmeter, Ohm meter, AVO meter, Wattmeter, Megger	Each item 10 no's
03	Voltaic cell, Fuel cell, Lead Acid Battery, Battery	Each item 08 no's

	charging Unit, Ampere Tube, Cotton tap, Leather wage paper, Insulation varnish	
04	DC motor & DC generator set ,3- Point and 4- point starter	5 no's
05	Two pin socket, Combined switch and socket, two pin plug	Each item 10 no's
06	Dc power supply unit, Voltage stabilizer	Each item 10 no's
07	Dry cells (1.5v, 2.2v, 3.0v, 6.0v, 9.0v), Graph papers	Each item 10 no's
08	Super enamel copper wire	As per required

Sl	Book Name	Writer Name	Publisher Name & Edition
01	A Text Book of Electrical Technology	B. L. Theraja	S.Chand, Millenium Edition
02	Electrical Machines	Charles Siskind	2nd edition
03	DC Machines	Samadder & Gongopadhya	2021` edition
04	A course in Electrical Power	J. B. Gupta	Katson books
05	Electric Machinery fundamentals	Stephen J. Chapman	Mc Grew Hill international, Fourth Edition.

Website References:

Sl	Web Link	Remarks
01	http://www.electricalengineering.org	
02	http://www.eetiimes.eu	
03	http://www.interestingengineering.com	

Subject Code	Subject Name	Period/Week		Credit
26841	Digital Electronics – II	T	P	C
		2	3	3

Rationale	Diploma in Engineering Level students are required to acquire the knowledge and skill on concept of Digital counters , shift registers, memory, ADC, DAC, PLD, PLA , PAL, GAL, SAP-1 and 8085 microprocessor which are used in about all digital system and the foundation of advanced microprocessor, microcontroller and PLC.
Learning Outcome (Theoretical)	<p>After Completing the subject, students will be able to:</p> <ul style="list-style-type: none"> • Explain register and counter • Use Memory • Describe ADC and DAC • State programmable logic Devices • Describe simple computer • Explain Program 8085 microprocessor
Learning Outcome (Practical)	<p>After undergoing the subject, students will be able to:</p> <ul style="list-style-type: none"> • Verify the operation of shift register. • Verify the operation of binary counter. • Verify the operation of ring and Johnson counter. • Perform read & write operation of an EPROM. • Verify the operation of DAC. • Verify the operation of ADC. • Observe the operation of programmable logic device (PLD). • Test program to add two 8-bit numbers using 8085 microprocessor. • Test program to subtract two 8-bit numbers using 8085 microprocessor. • Test program to multiply two 8-bit numbers using 8085 microprocessor.

Detailed Syllabus (Theory)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1	REGISTER 1.1 Define register and shift register. 1.2 Mention types of shift registers. 1.3 Describe the operation of buffer register. 1.4 Explain the operation of SISO, SIPO, PISO and PIPO shift register with logic diagram. 1.5 Describe the operation of left shift, right shift and universal shift register with logic diagram. 1.6 List the different types of common shift register IC chips. 1.7 Mention the uses of shift registers.	3	6
2	COUNTER 2.1 Define binary counter, modulus of counter and divided by N counter. 2.2 Classify counter. 2.3 Differentiate between asynchronous and synchronous counter. 2.4 Describe the operation of 4-bit binary up, binary down, and binary Up-Down counter with timing diagram. 2.5 Describe the operation of MOD-10 counter. 2.6 Explain the operation of ring & Johnson counter with logic circuit and timing diagram. 2.7 Describe the operation of digital clock.	3	8
3	MEMORY 3..1 Define memory. 3..2 Classify memory. 3..3 Describe ROM, PROM, EPROM and EEPROM. 3..4 Describe the logic circuit of RAM and Flash RAM. 3..5 Explain the architecture of static RAM (SRAM) and dynamic RAM (DRAM). 3..6 Describe the read and write operation of memory. 3..7 Differentiate between RAM and ROM. 3..8 Distinguish between SRAM and DRAM.	3	6
4	ANALOG TO DIGITAL CONVERTER (ADC) AND DIGITAL TO ANALOG CONVERTER (DAC) 4.1 Define ADC and DAC. 4.2 Mention the steps to convert analog signal to digital signal. 4.3 Describe the operation of sample and hold circuit. 4.4 Mention the types of ADC and DAC. 4.5 Explain the conversion process of 3-bit parallel ADC. 4.6 Describe the operation of successive approximation and dual slope ADC. 4.7 Discuss the operation of a binary weighted and R-2R ladder DAC. 4.8 State resolution, percentage of resolution, accuracy of ADC and DAC. 4.9 List the ICs used as ADC and DAC.	3	8
5	PROGRAMMABLE LOGIC DEVICES (PLDs) 5.1 Defines PLD, AND array and OR Array.	4	5

	5.2 Mention the advantages of PLD. 5.3 Classify PLD. 5.4 Describe the logic structure of PLA, PAL and GAL. 5.5 Interpret standard PAL and GAL numbering. 5.6 Describe the programming process of SPLD. 5.7 Discuss the block diagram of CPLD. 5.8 Discuss the block diagram of FPGA. 5.9 List the Application of PLDs, CPLD and FPGA.		
6	SIMPLE AS POSSIBLE (SAP)-1 COMPUTER 5.1 State the meaning of SAP. 5.2 Describe the function of each stage of SAP-1 with block diagram. 5.3 State the function of control signals. 5.4 Explain each instruction of SAP-1 with binary code. 5.5 Write simple program using SAP-1 Instruction and show the instruction in memory with mentioning memory address. 5.6 State the concept of machine cycle, fetch cycle, execution cycle and Instruction cycle. 5.7 Describe the timing diagram of LDA, ADD and SUB Instructions. 5.8 Describe the methods of micro programming.	4	8
7	FEATURES OF MICROPROCESSOR 7.1. Define Microprocessor and microcomputer. 7.2. List 8-bit, 16-bit, 32 bit and 64-bit Microprocessors. 7.3. Describe the architecture of 8085 microprocessor. 7.4. Describe the pin diagram and function of each pin of Intel 8085 microprocessors. 7.5. Describe the software model of Intel 8085 microprocessors.	4	8
8	PROGRAMMING OF 8085 MICROPROCESSORS 8.1. Define assembly language and assembler. 8.2. Describe the fields of assembly language program. 8.3. Define instruction and instruction set. 8.4. Describe the instruction set of 8085 microprocessors. 8.5. Explain the addressing modes of Intel 8085 microprocessors. 8.6. Write programs using 8085 instructions.	4	7
9	8085 MICROPROCESSOR BASED SYSTEM 9.1 Define microprocessor based system. 9.2 Describe the block diagram of a microprocessor based system. 9.3 Define Bus multiplexing. 9.4 Explain the process of multiplexing bus using latch. 9.5 Describe the technique of generate control signals. 9.6 Differentiate between memories mapped I/O and standard I/O. 9.7 Describe the block diagram of 8255 programmable peripheral Interface (PPI). 9.8 Discuss the function of Programmable Interval Timer.	4	4
	Total	32	60

Detailed Syllabus (Practical)

Unit	Experiment name with procedure	Class (1 Period)	Continuous Marks
1	VERIFY THE OPERATION OF SHIFT REGISTER. 1.1 Select a SIPO & PISO shift register IC.	2	3

	1.2 Construct the SIPO & PISO shift register circuits diagram on Trainer Board. 1.3 Apply clock input pulse to the circuit and observe the operation. 1.4 Connect the PISO shift register according to circuits diagram on Trainer Board. 1.5 Apply clock input pulse to the circuit and observe the operation. 1.6 Maintain the record of performed task.		
2	VERIFY THE OPERATION OF BINARY COUNTER. 2.1 Select 4-Bit ripple counter IC. 2.2 Connect the Up /Down ripple counter circuit on Digital Trainer Board. 2.3 Apply clock input pulse to the circuit and observe the operation of up-counting and down counting. 2.4 Select MOD-10 counter IC. 2.5 Connect the Decade counter circuit on Digital Trainer Board. 2.6 Apply clock input pulse to the circuit and observe the Decade operation. 2.7 Maintain the record of performed task.	2	3
3	VERIFY THE OPERATION OF RING AND JOHNSON COUNTER. 3.1 Select ring counter IC. 3.2 Construct the Ring counter circuit on Digital Trainer Board. 3.3 Apply clock input pulse to the circuit and observe the operation of up-counting and down counting. 3.4 Select Johnson counter IC. 3.5 Construct the Decade counter circuit on Digital Trainer Board. 3.6 Apply clock input pulse to the circuit and observe the Decade operation. 3.7 Maintain the record of performed task.	2	2
4	PERFORM READ & WRITE OPERATION OF AN EPROM. 4.1 Select an EPROM IC. 4.2 Connect EPROM Chip with programmer. 4.3 Write/Burn data to the EPROM Chip. 4.4 Observe the written data from EPROM . 4.5 Maintain the record of performed task.	2	2
5	VERIFY THE OPERATION OF DAC. 5.1 Select a DAC IC. 5.2 Construct DAC IC circuit on Digital Trainer Board. 5.3 Apply input data and clock pulses to the different input of the circuit. 5.4 Observe the operation of the circuit and detect the output result of DAC. 5.5 Maintain the record of performed task.	1	3
6	VERIFY THE OPERATION OF ADC. 6.1 Select an A/D converter IC. 6.2 Connect an A/D converter IC according to circuit on Digital Trainer Board. 6.3 Apply input data and clock pulses to the different input of the circuit. 6.4 Observe the operation of the circuit and detect the output result of A/D converter. 6.5 Maintain the record of performed task.	1	2
7	PERFORM THE WRITE OPERATION OF PLD 7.1 Select appropriate PLD IC. 7.2 Select a logic equation. 7.3 Write the equation by a EPROM programmer. 7.4 Construct the circuit on Digital Trainer Board.	1	3

	7.5 Apply input data and clock pulses to the different input of the circuit. 7.6 Observe the operation of the circuit and detect the output result PLD. 7.7 Maintain the record of performed task.		
8	TEST PROGRAM TO PERFORM 8-BIT ARITHMETIC OPERATION OF 8085 MICROPROCESSOR. 8.1 Select 8085 microprocessor trainer board/Simulator. 8.2 Write assembly language program. 8.3 Run the program. 8.4 Observe the result. 8.5 Maintain the record of performed task.	1	3
9	TEST PROGRAM TO PERFORM SELECTION/BRINCHING OPERATION OF 8085 MICROPROCESSOR. 9.1 Select 8085 microprocessor trainer board/Simulator. 9.2 Write assembly language program. 9.3 Run the program. 9.4 Observe the result. 9.5 Maintain the record of performed task.	2	2
10	TEST PROGRAM TO PERFORM REPEATION/LOOPING OF 8085 MICROPROCESSOR. 10.1 Select 8085 microprocessor trainer board/Simulator. 10.2 Write assembly language program. 10.3 Run the program. 10.4 Observe the result. 10.5 Maintain the record of performed task.	2	2
	Total	16	25

Necessary Resources (Tools, Equipment and Machinery):

Sl. No.	Item Name	Quantity
1	DC power Supply	10 Nos
2	Function generator	10 Nos
3	Oscilloscope	10 Nos
4	Digital Electronics Trainer	10 Nos
5	Power project board/ bread board,	20 Nos
6	8085 Microprocessor Trainar.	10 Nos
7	8085 Simulatore program.	
8	IC No: 74164, 74165, 7494, 7495, 7490, 7493, 74181, 74191, ADC0804, DAC0800, 74189, 2732.	10 Nos each
9	7-segment Display Module, 555IC	10 Nos each
10	Soldering Iron	20 Nos
11	Resin, Soldering lead, Soldering trip, Fixable wire, Wire Brush,	As required

Recommended Books:

Sl No.	Book Name	Writer Name	Publisher Name & Edition
1	A Text Book of Digital Electronics	R. S. Sedha	Chand Publication
2	Digital Computer Electronics	Albert P. Malvino	McGraw-Hill
3	Digital Fundamentals	Thomas L. Floyd	Prentice Hall
4	Digital Electronics	D. R. Kaushik	Dhanpat Rai Publication Company

Website References:

Sl. No.	Web Link	Remarks
1	https://www.tutorialspoint.com/	Search the

2	https://www.electronics-tutorials.ws/	links
3	https://www.youtube.com/channel/	
4	https://youtu.be/qsWkA-5grogo	
5	https://youtu.be/eXyGIPrD5Qk	
6	https://you.be/f-WiulYIrow	

SUBJECT CODE	SUBJECT NAME	PERIOD PER WEEK		CREDIT
26842	COMMUNICATION ENGINEERING	T	P	C
		2	3	3

Rationale	<p>Communication Engineering deals with the mechanism of communication and Telecommunication. It works with various fields of Telecommunication such as Signals And Noise, Modulation, De-modulation, Modulator and Demodulator, Radio Transmitter, Radio Receiver, Multiplexing and Multiple Access Techniques, Digital Communication, Optical Fiber Communication, Satellite and Mobile Communications.</p> <p>The students should have requisite knowledge regarding characteristics, uses and availability of various Electrical and Electronic circuits for various communication purposes. In addition, specifications, rules and regulations of various materials should also be authorized by BTRC for effective quality control.</p>
Learning Outcome (Theoretical)	<p>After undergoing the subject, students will be able to</p> <ul style="list-style-type: none"> • Explain Basics of Communication. • Illustrate Signals and Noise in Telecommunication. • Describe Modulation. • Discuss Modulator And Demodulator. • Explain Radio Transmitter. • Describe Radio Receiver. • Describe Multiplexing and Multiple Access Techniques. • Explain Digital Communication. • Describe Optical Fiber Communication. • Explain Satellite and Mobile Communication.
Learning Outcome (Practical)	<p>After undergoing the subject, students will be able to</p> <ul style="list-style-type: none"> • Identify the analog and digital signals and measure frequency. • Show the AM wave forms. • Measure the modulation index for AM wave forms. • Demonstrate the working of SSB and DSB modulation. • Demonstrate the working of frequency modulation (FM). • Demonstrate the operation of radio transmitter (AM/FM). • Demonstrate the operation of radio receiver (AM/FM). • Demonstrate the working of Pulse Code Modulation (PCM). • Demonstrate the working of ASK/FSK/PSK. • Demonstrate the operation of optical fiber communication system. • Perform the optical fiber splicing. • Demonstrate the satellite home receiving system.

DETAILED SYLLABUS (THEORY)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1.	BASICS OF COMMUNICATION 1.1 Define communication and Telecommunication. 1.2 Describe the historical development of telecommunication. 1.3 Mention the different types of communication. 1.4 Describe the basic block diagram of communication system. 1.5 Describe the functions of BTRC. 1.6 Describe the IEEE-802 project group. 1.7 Describe the organization and functions of the ITU.	02	04
2	SIGNALS AND NOISE IN TELECOMMUNICATION SYSTEM 2.1 Define Signal, noise and Signal-to-Noise ratio (S/N). 2.2 Explain the nature and frequency ranges of different signals. 2.3 Mention the types and sources of noise. 2.4 Describe the noise figure. 2.5 Define baud. 2.6 Describe bandwidth and channel capacity. 2.7 Describe the affecting factors of the channel capacity. 2.8 Describe the Nyquist's theorem. 2.9 Solve the related problems.	02	04
3	MODULATION 3.1 Define Modulation. 3.2 Mention the necessity of modulation. 3.3 Describe the types of modulation. 3.4 Explain the amplitude modulated (AM) wave and derive the equation. 3.5 State Modulation index, depth of modulation, SSB, SSB-SC, DSB, DSB-SC and VSB modulation. 3.6 Explain the frequency modulated (FM) wave and derive the equation. 3.7 State Modulation index, Maximum frequency deviation and Deviation ratio for FM wave. 3.8 Explain the PAM, PPM, PDM and PWM signals 3.9 Describe the application of PAM, PPM, PDM and PWM signals.	03	06
4	MODULATOR AND DEMODULATOR 4.1 Define Modulator, Demodulation/detection and Demodulator/detector. 4.2 Mention the types of modulator. 4.3 Explain the basic operation of collector modulator, base modulator, balanced modulator and SSB-SC generation for AM. 4.4 Explain the principle of operation of varactor diode modulator. 4.5 Explain the principle of operation of Transistor Reactance type FM modulator. 4.6 Mention the methods of AM detection and FM demodulation. 4.7 Explain the principle of operation of linear diode detector. 4.8 Describe the operation of Envelope detector and ratio detector. 4.9 Explain the basic principle of PLL FM Demodulator with block diagram.	06	12
5	RADIO TRANSMITTER 5.1 Mention the classification of radio transmitters based on power, frequency, modulation and service. 5.2 Explain the block diagram of AM transmitter. 5.3 Describe high level and low level modulation. 5.4 Explain the operation of SSB transmitter with block diagram. 5.5 Describe the working principle of QAM. 5.6 Explain the block diagram of stereo FM transmitter with resulting	03	06

	spectrum. 5.7 Explain the block diagram of Armstrong system FM transmitter.		
6	RADIO RECEIVER 6.1 Mention the classification of radio receiver. 6.2 Explain the block diagram of super heterodyne radio receiver with wave forms. 6.3 Explain the typical circuit of each block of super heterodyne radio receiver. 6.4 Describe the operation of crystal, Tuned radio-frequency radio receiver. 6.5 Explain a typical IC based AM and FM radio receiver circuit. 6.6 Explain the sensitivity, selectivity and fidelity.	03	06
7	MULTIPLEXING AND MULTIPLE ACCESS TECHNIQUES 7.1 Define multiplexing, de-multiplexing and multiple access technique. 7.2 Mention the types of multiplexing and de- multiplexing. 7.3 Explain TDM, FDM and WDM with block diagram. 7.4 Mention the types of multiple access techniques. 7.5 Explain TDMA, FDMA and CDMA with block diagram.	03	05
8	DIGITAL COMMUNICATION 8.1 Define sampling and quantization. 8.2 Describe the sampling theorem. 8.3 Describe the coding principle of PCM. 8.4 State modulation of binary data. 8.5 Describe ASK, FSK and PSK. 8.6 List the application of ASK, FSK and PSK techniques. 8.7 Solve the related problems.	03	05
9	OPTICAL FIBER COMMUNICATION 9.1 Define Optical Fiber. 9.2 Describe the Basic block diagram of Optical Fiber communication system. 9.3 Mention the types of optical fiber. 9.4 Describe the construction of optical fiber. 9.5 Describe the basic construction of optical fiber cable. 9.6 Mention the advantages and disadvantages of optical fiber. 9.7 Mention different types of optical sources and detectors. 9.8 Describe the splicing of optical fiber.	03	06
10	SATELLITE AND MOBILE COMMUNICATION 10.1 Discuss the principles of satellite communication. 10.2 Describe satellite earth station with block diagram. 10.3 Explain the working principle of VSAT. 10.4 Describe the status and features of Bangabandhu Satellite-I. 10.5 State the mobile communication systems. 10.6 Describe the function of GSM system with block diagram. 10.7 State Bluetooth, Wi-Fi and WIMAX communication. 10.8 Describe 2G, 3G, 4G, LTE and 5G.	04	06
	Total	32	60

DETAILED SYLLABUS (PRACTICAL)

Sl.	Experiment Name	Class (3 Period)	Marks (Continuous)
1	IDENTIFY ANALOG AND DIGITAL SIGNALS AND MEASURE FREQUENCY 1.1 Select required equipment, tools and materials. 1.2 Set up the equipment to observe the audio frequency signal 1.3 Observe wave shape, amplitude, frequency. 1.4 Observe low frequency sine waves/square waves /triangular waves at different frequencies. 1.5 Maintain the record of performed task.	1	2
2	OBSERVE THE AM WAVE FORMS WITH DIFFERENT COMBINATION OF MODULATING AND CARRIER SIGNALS 2.1 Select required circuit board, equipment, tools and materials. 2.2 Connect the circuit and equipment. 2.3 Input different modulating and carrier signals. 2.4 Make proper adjustments. 2.5 Observe the AM wave forms. 2.6 Maintain the record of performed task.	1	2
3	MEASURE THE MODULATION INDEX FOR AM WAVE FORMS WITH DIFFERENT COMBINATION OF MODULATING AND CARRIER SIGNALS 3.1 Select required circuit board, equipment, tools and materials. 3.2 Connect the circuit and equipment. 3.3 Input different modulating and carrier signals. 3.4 Make proper adjustments. 3.5 Calculate modulation index for each set of data. 3.6 Maintain the record of performed task.	2	3
4	DEMONSTRATE THE WORKING OF SSB AND DSB MODULATION 4.1 Select required circuit board, equipment, tools and materials. 4.2 Setup the equipment for above conditions. 4.3 Observe the operation. 4.4 Maintain the record of performed task.	2	2
5	DEMONSTRATE THE WORKING OF FREQUENCY MODULATION (FM) 5.1 Select required circuit board, equipment, tools and materials. 5.2 Set up circuit board and equipment. 5.3 Input proper signals. 5.4 Make proper adjustments. 5.5 Observe FM wave. 5.6 Maintain the record of performed task.	1	2
6	DEMONSTRATE THE OPERATION OF RADIO TRANSMITTER (AM/FM) 6.1 Select the required equipment, tools and materials. 6.2 Setup the circuit board and the equipment. 6.3 Input the proper signals. 6.4 Make the proper adjustment. . 6.5 Maintain the record of performed task.	2	2

7	DEMONSTRATE THE OPERATION OF RADIO RECEIVER(AM/FM) 7.1 Select the required equipment, tools and materials. 7.2 Setup the circuit board and the equipment. 7.3 Input the proper signals. 7.4 Make the proper adjustment. . 7.5 Maintain the record of performed task.	2	2
8	DEMONSTRATE THE WORKING OF PULSE CODE MODULATION (PCM). 8.1 Select required circuit board, equipment, tools and materials. 8.2 Setup the equipment. 8.3 Observe the operation. 8.4 Maintain the record of performed task.	1	2
9	DEMONSTRATE THE WORKING OF ASK/FSK/PSK. 9.1 Select required circuit board, equipment, tools and materials. 9.2 Setup the equipment. 9.3 Observe the operation. 9.4 Maintain the record of performed task.	1	2
10	DEMONSTRATE THE OPERATION OF OPTICAL FIBER COMMUNICATION SYSTEM. 10.1 Select the required equipment, tools and materials. 10.2 Identify the transmitting and receiving section. 10.3 Connect the circuit and equipment. 10.4 Input the proper signals. 10.5 Observe the output. 10.6 Maintain the record of performed task.	1	2
11	PERFORM THE OPTICAL FIBER SPLICING. 11.1 Select the required equipment, tools and materials. 11.2 Make Optical Fiber joints. 11.3 Test the joint. 11.4 Maintain the record of performed task	1	2
12	DEMONSTRATE THE SATELLITE HOME RECEIVING SYSTEM 12.1 Select required tools & materials. 12.2 Connect the satellite receiver with antenna and TV receiver. 12.3 Adjust the channel frequency. 12.4 Observe different channels.	1	2
	Total	16	25

NECESSARY RESOURCES (TOOLS, EQUIPMENT'S AND MACHINERY):

SI	Item Name	Quantity
01	Oscilloscope	10 nos
02	Signal Function Generator	10 nos
03	AM Trainer (Tx and Rx)	05 Set
04	FM Trainer (Tx and Rx)	05 Set
05	SSB MODULATION Trainer (Tx and Rx)	05 Set
06	DSB MODULATION Trainer (Tx and Rx)	05 Set
07	PCM Trainer	05 Set

08	ASK Trainer	05 Set
09	FSK Trainer	05 Set
10	PSK Trainer	05 Set
11	Optical Fiber Communication Trainer	05 Set
12	Optical Fiber Splicing Machine	05 Set
13	Satellite Home Receiving System Trainer	05 Set
14	Electronic Tool Box	05 Set

RECOMMENDED BOOKS:

SI	Book Name	Writer Name	Publisher Name & Edition
01	Principles Of Communication Engineering	- Anokh Singh	Chand (S.) & Co Ltd
02	Electronic communication	- Anokh Singh	Chand (S.) & Co Ltd
03	Electronic communication systems	– Kenedy, Devis	McGraw-Hill
04	Radio Engineering	– G.K Mithal	Chand (S.) & Co Ltd

WEBSITE REFERENCES:

SI	Web Link	Remarks
01	https://en.wikipedia.org/wiki/Modulation	
02	www.youtube.com	Search here with topics
03	www.google.com	Search here with topics

SUBJECT CODE	SUBJECT NAME	PERIOD PER WEEK		CREDIT
26843	NETWORKS, FILTERS AND TRANSMISSION LINES	T	P	C
		2	3	3

Rationale	<p>The study of network, filters and transmission lines leads to understand line communication, audio, video and microwave communication. Particularly the study of network from principles of AC theory, introduces the students to parameters and characteristics of various networks, including filters. Also the study of transmission lines becomes important as its analogy is used in study of transmission of plane electromagnetic waves in bounded media.</p> <p>Networks, Filters and Transmission Lines deals with the four terminal networks, half section network, attenuators and filters, Transmission line, Line Constant and impedance matching, Antenna, Propagation of radio wave, Effect of earth curvature and ionosphere on wave propagation.</p>
Learning Outcome (Theoretical)	<p>After undergoing the subject, students will be able to</p> <ol style="list-style-type: none"> 1. State four terminal networks. 2. State half section network. 3. Describe attenuators and filters. 4. Define transmission line. 5. Describe Line Constant and impedance matching. 6. State Antenna. 7. State Propagation of radio wave.
Learning Outcome (Practical)	<p>After undergoing the subject, students will be able to</p> <ol style="list-style-type: none"> 1. Measure the characteristic impedance of a symmetrical "T" and Π network. 2. Measure the image impedance of a given asymmetrical "T" and Π network. 3. Measure the attenuation of symmetrical "T" Type attenuator. 4. Determine the impedance characteristics of prototype Low pass filter. 5. Determine the impedance characteristics of prototype high pass filter. 6. Measure the velocity of propagation through a parallel wire transmission line. 7. Measure the characteristics impedance of a transmission line. . 8. Design the impedance matching of transmission line. 9. Determine the radiation pattern of dipole antenna. 10. Construct a Yagi antenna.

DETAILED SYLLABUS (THEORY)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1.	Four terminal networks 1.1 Define network. 1.2 Define Active element, passive element, linear & nonlinear element and Unilateral & Bilateral elements. 1.3 State the classification of networks. 1.4 Define symmetrical and asymmetrical networks. 1.5 Illustrate the characteristic impedance, propagation constant, attenuation constant and phase constant of general four terminal symmetrical networks connected in services. 1.6 Explain iterative impedance, image impedance, image transfer constant and insertion loss of general four terminal asymmetrical networks connected in series. 1.7 Mention the parameters of four terminal networks.	03	05
2	Special network 2.1 Define Special Network. 2.2 Distinguish between the unbalanced and balanced structure ladder network. 2.3 State the meaning of lattice network and Bridge T-network. 2.4 Draw unbalanced and balanced ladder network as series of T, π and L sections. 2.5 Explain the equivalence between balanced and unbalanced sections.	02	03
3	T, π, L and half section networks 3.1 Express the deduction of the characteristic impedance (Z_0) in terms of lumped impedance (Z_1, Z_2) of symmetrical T section and π section networks. 3.2 Explicit the deduction of the Z_0 in terms of Z_{oc} and Z_{sc} for T and π section. 3.3 Express the deduction of the propagation constants in terms of Z_1 and Z_2 for T & π section. 3.4 Draw the symmetrical T and π section into half section network. 3.5 Derive the iterative, image, open and short circuit impedance of half section networks. 3.6 Draw the unbalanced and balanced forms of L sections. 3.7 Express the deduction of the iterative and image impedance of L section network. 3.8 Draw the T as star and π as a mesh network.	03	08
4	Attenuators 4.1 Define attenuator. 4.2 Express attenuation in decibel and neper unit. 4.3 Mention the general characteristics of attenuating network.	03	03

	<p>4.4 Show mathematically the attenuators involving symmetrical, asymmetrical, L and π type network.</p> <p>4.5 Explain the variable and ladders attenuator.</p>		
5	<p>Filter</p> <p>5.1 Define electronic filter and mention the types of filters.</p> <p>5.2 Define resonance circuit and mention the types of resonance circuit.</p> <p>5.3 Analyze series and parallel resonance circuit.</p> <p>5.4 Mention the general properties of low pass, high pass, band pass, band stop filters.</p> <p>5.5 Mention the application of low pass, high pass, band pass, band stop filters.</p> <p>5.6 Represent the low pass filter in symmetrical unbalanced and balanced T-section and symmetrical unbalanced and balanced π section forms.</p> <p>5.7 State the theorem connecting α (alpha) and Z_o.</p>	03	03
6	<p>Special filter</p> <p>6.1 State the cut off frequency of filter network.</p> <p>6.2 Mention the reactance frequency characteristics of T and π low pass and high pass filters.</p> <p>6.3 Draw the attenuation vs. frequency, phase shift vs. frequency and characteristic impedance vs. frequency curve.</p> <p>6.4 Mention the significance of T and π section low and high pass filters.</p> <p>6.5 Express the deduction of M-derived filters.</p> <p>6.6 Explain the operation of crystal filters.</p> <p>6.7 Describe the impedance matching of filters.</p> <p>6.8 Differentiate between active and passive filters.</p>	03	07
7	<p>Transmission line</p> <p>7.1 Define transmission line and mention the different types of transmission lines.</p> <p>7.2 Mention the implications and shape of different types of transmission lines (including 300 ohms' antenna feeder cable, 75 ohms' co-axial cable).</p> <p>7.3 List the application of transmission lines.</p> <p>7.4 Explain the velocity of propagation and characteristics impedance of transmission line.</p> <p>7.5 Define infinite line.</p> <p>7.6 Explain the short transmission line terminated in Z_o.</p> <p>7.7 Discuss the current and voltage wave along a transmission line.</p> <p>7.8 Mention the propagation, attenuation and phase constant of a transmission line.</p> <p>7.9 Describe the voltage, current and power reflection of transmission line.</p> <p>7.10 Interpret the conception of transmission lines at high frequencies.</p>	03	07
8	Line constant & impedance matching	03	07

	<p>8.1 State the meaning of primary and secondary line constants.</p> <p>8.2 Derive the expression of secondary line constant such as alpha, beta, gamma and Z_0 in terms of primary line Constants.</p> <p>8.3 Derive the condition of minimum attenuation, minimum distortion and distortion less Condition of transmission line.</p> <p>8.4 Describe the continuous loading and lumped loading.</p> <p>8.5 Describe the construction of loading coils.</p> <p>8.6 List the uses of continuous loading, lumped loading and loading coils.</p> <p>8.7 Define the input impedance of transmission line.</p> <p>8.8 Explain the impedance matching, single stub, double stub and quarter wave transformer.</p> <p>8.9 Mention the characteristics of the high frequency transmission line.</p> <p>8.10 Discuss the Concept of reflection and standing wave, definition of reflection co-efficient, SWR and VSWR and their relation.</p>		
9	<p>Construction & operation of antenna</p> <p>9.1 State the physical idea of radiation of electromagnetic energy from antenna.</p> <p>9.2 Define point source, power gain directivity, aperture, effective area, radiation pattern, beam angle, radiation angle, beam and radiation distance related to antenna.</p> <p>9.3 Describe the construction, operation and radiation pattern of dipole, folded dipole, Yagi, Marconi and whip antenna.</p> <p>9.4 Explain the construction of end-fire and broad-side array.</p> <p>9.5 Discuss the operation of end-fire and broad-side array.</p> <p>9.6 Mention the coupling and impedance matching procedure of antenna.</p> <p>9.7 Explain the construction and operation of the log periodic antenna.</p>	03	05
10	<p>The propagation of radio waves</p> <p>10.1 State the nature of electromagnetic waves.</p> <p>10.2 Mention the characteristics including polarization of electromagnetic waves.</p> <p>10.3 Describe the modes of radio wave propagation.</p> <p>10.4 Classify radio wave on the basis of frequency, distance and application.</p> <p>10.5 Mention the characteristics of ground, space and sky wave propagation.</p> <p>10.6 Explain the Summerfield equation and effect of terrain for ground wave propagation.</p> <p>10.7 State the environmental effect in propagation of waves.</p> <p>10.8 Describe the field strength and range of propagation in terms of antenna height for space wave propagation.</p>	03	07

11	The effect of earth curvature & ionosphere on wave propagation 11.1 Mention the effect of earth curvature and atmosphere on space wave propagation. 11.2 Explain the duct propagation, multi-hop propagation and tropo-scatter propagation. 11.3 Explain the of ionosphere. 11.4 Mention the layers of ionosphere. 11.5 List the basic properties of different layers of the ionosphere. 11.6 Explain the reflection and refraction through ionosphere. 11.7 Describe the ionosphere variation and effects of earth's magnetic fields. 11.8 Define skip distance, skip zone and M. U. F. 11.9 Explain the fading and noise in sky wave propagation.	03	05
	Total	32	60

DETAILED SYLLABUS (PRACTICAL)

Sl.	Experiment Name	Class (3 Period)	Marks (Continuous)
1	Determine the characteristic impedance of a symmetrical T and π network. 1.1 Select the required components, connecting board, meter and necessary materials. 1.2 Draw a diagram of symmetrical T network. 1.3 Set the components on the board as per diagram. 1.4 Check the connections. 1.5 Find the characteristic impedance. 1.6 1.6 Compare the observed result with theoretical value. 1.7 Maintain the Record of performed task.	2	2.5
2	Measure the image impedance of a given asymmetrical T and π network. 2.1 Select the required components. 2.2 Select the connecting board, meter and materials. 2.3 Select a circuit diagram. 2.4 Set the components on the board according to the circuit diagram. 2.5 Check the connections. 2.6 Record the characteristic impedance. 2.7 Compare the observed result with theoretical value. 2.8 Maintain the Record of performed task.	2	2.5
3	Measure the attenuation of symmetrical T type attenuator. 3.1 Select the attenuator circuit. 3.2 Select the components, meters, board and materials. 3.3 Connect the components of the board as per diagram. 3.4 Check the connections.	1	2.5

	3.5 Record the required data. 3.6 Calculate the attenuation. 3.7 Maintain the Record of performed task.		
4	Determine the impedance characteristics of prototype low pass filter. 4.1 Select a T or π low pass filter circuit. 4.2 Select the component board, tools and materials. 4.3 Connect the components according to the diagram. 4.4 Record the impedance for various frequencies. 4.5 Draw the reactance frequency curve from the data. 4.6 Show the pass band and attenuation band. 4.7 Maintain the Record of performed task.	2	2.5
5	Determine the impedance characteristics of a high pass filter. 5.1 Select a high filter circuit. 5.2 Select the components, board, meter and materials. 5.3 Connect the components and energize the circuit. 5.4 Record the impedance for various frequencies. 5.5 Draw the reactance frequency curve. 5.6 Show the pass band and attenuation band. 5.7 Maintain the Record of performed task.	2	2.5
6	Determine the attenuation characteristics of a filter. 6.1 Select a filter circuit. 6.2 Select the components, board, meter and materials. 6.3 Connect the components and energize the circuit. 6.4 Record the attenuation for various frequencies. 6.5 Draw the attenuation frequency curve. 6.6 Show the pass band and attenuation band. 6.7 Maintain the Record of performed task.	2	2.5
7	Measure the characteristic impedance of a transmission line. 7.1 Select a transmission line. 7.2 Select the required equipment, tools and materials. 7.3 Connect the meter to measure required line constant. 7.4 Calculate the characteristic impedance from line constants. 7.5 Maintain the Record of performed task.	2	2.5
8	Design and verify the impedance matching of transmission line with a quarter wave transformer. 8.1 Select a transmission line with given R_1 and Z_0 . 8.2 Select required equipment and tools for verification. 8.3 Design the quarter wave transformer using formula $Z_0 = \sqrt{Z_{in} Z_L}$ 8.4 Connect the quarter wave transformer between load and transmission line. 10.5 Observe the matching with the energy transmission.	01	2.5
9	Determine the radiation pattern of dipole antenna.	01	2.5

	9.1 Select a source (test antenna), receiver, indicator, power supply, mounting frame. 9.2 Select the required equipment and tools. 9.3 Connect the radiator dipole with the power supply and receiver to the indicator. 9.4 Place the source and radiator in the flexible mounting frame. 9.5 Energize the system. 9.6 Rotate the receiver at constant radius around the source. 9.7 Record the power received by the indicator. 9.8 Plot the output versus angular location curve. 9.9 Find the radiation pattern. 9.10 Maintain the Record of performed task.		
10	Construct a Yagi antenna. 10.1 Select the folded dipole, director and reflector of the antenna. 10.2 Select the required equipment, tools and materials. 10.3 Build up the antenna element with proper design data. 10.4 Connect the antenna with transmission line to the TV receiver. 10.5 Observe the receiver output. 10.6 Maintain the Record of performed task.	01	2.5
	Total	16	25

NECESSARY RESOURCES (TOOLS, EQUIPMENT'S AND MACHINERY):

Sl	Item Name	Quantity
01	Power supply	As Necessary
02	Oscilloscope	2nos
03	Signal Generator	2 nos
04	Digital Multi meter	2 nos
05	Function Generator	2 nos
06	Ammeter (AC/DC)	As Necessary
07	Voltmeter (AC/DC)	As Necessary
08	Resistor	As Necessary
09	Inductor	As Necessary
10	Capacitor	As Necessary
11	Antenna set	As Necessary
12	Project Board	As Necessary
13	Crocodile Clip	As Necessary
14	Wire/Cable	As Necessary

RECOMMENDED BOOKS:

SI	Book Name	Writer Name	Publisher Name & Edition
01	Handbook of Line Communication, Vol-1	The Royal Signals	Standard Publisher distributor .
02	Networks, Filters and Transmission lines	P.K Jain	Tata McGraw. 2001
03	Electronic and Radio Engineering.	M.L Gupta	Mcgraw Hill, 4 TH .
04	Networks, Filters and Transmission lines	A.K Chakarvorty	Dhanpat Rai and Co. New.
05	Network, Filters and Transmission lines	Satish Kumar and Shamshad Alam	S.K Kataria and Sons. 2010
06	Network Theory and Filter Design	Vasudev K.Aatre.	New Age International, Third

WEBSITE REFERENCES:

SI	Web Link	Remarks
01	https://www.electrical4u.com/	
02	https://www.allaboutcircuits.com/	

Subject Code	Subject Name	Period per Week		Credit
26844	Electronic Servicing	T	P	C
		0	3	1

Rationale	Electronic devices have become an important part of our day-by-day life. Now days it is difficult for us to live without electronic device. We live in a generation that uses electronics and smart technologies. Where robots and artificial intelligence is capable of doing human works in all technological equipment with more ease and efficiency. Operation of all machines, devices and equipment are controlled by electronic device and circuits. This subject covers only such topics which will enable the diploma engineers to identify and maintenance the electronics parts and able to proper fault finding.
Learning Outcome (Practical)	<ul style="list-style-type: none"> <input type="checkbox"/> Able to learn about safety Rules & Regulations related to servicing of electronic goods. <input type="checkbox"/> Able to select tools, measuring and testing instruments in servicing of electronic goods. <input type="checkbox"/> Able to trace layout diagram of faulty sections in PCB. <input type="checkbox"/> Able to test the active & passive faulty components. <input type="checkbox"/> Able to De-soldering of components/devices from PCB of a Radio Receiver and then solder. <input type="checkbox"/> Able to Find out the fault & Service of PSU/SMPS, Home appliance devices such as microwave oven, Induction cooker, Rice cooker, Air Fryer ,IPS, UPS, Mobile charger, Emergency Light, Power saving lamps, etc. <input type="checkbox"/> Able to Find out the fault & Service of office appliance such as Public Addressing system, FAX & Modem, etc. <input type="checkbox"/> Able to find out the fault & Service of Industrial appliance such as Digital balance/weight balance, Card reader, Infrared detector, etc.

Detailed Syllabus (Practical)

Unit	Experiment name with procedure	Class (3 Period)	Final Marks
1	Follow safety rules & Regulations and Select the tools, measuring & testing instruments for servicing 1.1 List the safety Rules. 1.2 List the workshop safety regulations. 1.3 Learn about Electrical & Electronics equipment safety policy. 1.4 Collect tools, testing & measuring Instruments. 1.5 Identify tools, testing & measuring Instruments for desire servicing. 1.6 Practice the use of above tools, testing & measuring Instruments.	1	4
2	Trace the Printed circuit board 2.1 Select a printed circuit board. 2.2 Locate the major components in PCB. 2.3 Trace out interconnection of among major components. 2.4 Draw the layout diagram. 2.5 Develop the schematic circuit diagram.	1	4
3	Identify the active and passive components (Diode, transistor, SCR, Diac , Triac , FET, Transformer, Resistor, Capacitor, Inductor, etc.) 3.1 Collect active and passive components. 3.2 Select the testing and measuring equipments. 3.3 Check the components. 3.4 Identify faulty components/devices.	1	4
4	Perform the De-soldering major components & than Soldering to the PCB 4.1 Extract the PCB/Mother board from a selected Circuit. 4.2 Identify the major components such as diode, power transformer, filter capacitor, Transistors, etc. 4.3 De-solder the components/devices from the PCB. 4.4 Re-solder the components to the PCB. 4.5 Set the PCB to the cabinet box.	1	4
5	Perform the Servicing of a Power supply Unit & SMPS 5.1 Apply a visual check. 5.2 Apply an off line check. 5.3 Identify the symptoms. 5.4 Apply a power check. 5.5 Identify the faulty components. 5.6 Replace the faulty components. 5.7 Test the power supply unit & SMPS.	1	4
6	Perform the Servicing of IPS & UPS 6.1 Apply an off line check. 6.2 Apply a power check 6.3 Observe and record the symptoms. 6.4 Write down the possible causes for the symptoms. 6.5 Locate the faulty section. 6.6 Measure and test the faulty components. 6.7 Replace the damage components. 6.8 Restart the IPS & UPS	1	5

7	Perform the Servicing of Emergency Light, Power saving lamps & Mobile charger 7.1 Apply an off line checks. 7.2 Apply a power check. 7.3 Identify the symptoms. 7.4 Write down the possible causes for the symptoms. 7.5 Identify the faulty components. 7.6 Measure and test the faulty components. 7.7 Replace the faulty components. 7.8 Test the selected device.	1	4
8	Perform the Servicing of Microwave oven, Induction cooker, Rice cooker, Air Fryer 8.1 Apply an off line check. 8.2 Apply a power check. 8.3 Observe and record the symptoms. 8.4 Write down the possible causes for the symptoms. 8.5 Locate the faulty section. 8.6 Check & test the possible causes one by one 8.7 Measure and test the faulty components. 8.8 Replace the damage components. 8.9 Restart the Device.	1	5
9	Perform the Servicing of a Public Addressing system 9.1 Apply an off line check. 9.2 Apply a power check. 9.3 Observe and record the symptoms. 9.4 Apply signal-tracing technique to identify the fault of a single circuit. 9.5 Identify the faulty components. 9.6 Replace the faulty components. 9.7 Test the Public Addressing system.	1	4
10	Perform the Servicing of a Multimedia Projector 10.1 Apply an off line check. 10.2 Apply a power check. 10.3 Observe and record the symptoms. 10.4 Check & test the possible causes one by one. 10.5 Apply signal-tracing technique to identify the fault of a single circuit. 10.6 Locate the faulty section. 10.7 Measure and test the faulty components. 10.8 Replace the damage components. 10.9 Restart the multimedia projector. 10.10 Observe the performance of the multimedia projector.	1	4
11	Perform the Servicing of Digital balance/weight scale 11.1 Apply an off line check. 11.2 Apply a power check. 11.3 Observe and record the symptoms. 11.4 Check and test the possible causes one by one. 11.5 Locate the faulty section. 11.6 Measure and test the faulty components. 11.7 Replace the damage components. 11.8 Observe the performance of Digital balance/weight scale	1	4
12	Perform the Servicing of Card reader & Infrared detector 12.1 Apply an off line check. 12.2 Apply a power check. 12.3 Observe and record the symptoms. 12.4 Locate the faulty section. 12.5 Check or test the possible causes one by one. 12.6 Measure and test the faulty components.	1	4

	12.7 Replace the damage components. 12.8 Observe the performance of Card reader & Infrared detector.		
	Total	16	25

Necessary Resources (Tools, Equipments and Machinery):

Sl. No.	Item Name	Quantity
1	Soldering Iron with Stand, De-soldering gun, Third Hand , Hot air gun, Iron Sponge, AVO Meter, Flat screw driver, Philips screw driver, Cutting pliers, Nose pliers, Automatic multifunction wire stripper. Tester, Knife, Power extension board.	30 Nos
2	DC power Supply, Function generator, Oscilloscope, Analog Electronics Trainer, Power project board/ bread board, Center tap Transformer (220/12V, 2A, 5A)	10 nos
3	Diode, Resistor, Potentiometer, Inductor, Capacitor, Transistor, LED, Zener diode, Photo diode, Tunnel diode, Varactor diode, Schottky diode, Step-Recovery diode, PIN diode, LCD and Solar cell.	50 nos
4	Resin, Soldering lead, Soldering tip, Fixable wire, Wire Brush	as required

Recommended Books:

Sl No.	Book Name	Writer Name	Publisher Name & Edition
1	How to be a successful Electronic Repair	By Jestine Yong.	
2	Electronic Repair guide.com	Floyd	
3	Repairing Guides	by Kent.	
4	Sumsung SMPS case History.		
5	A shorted Microwave Oven Repaired	Model Universal Uni-2040	

Website References:

Sl. No.	Web Link	Remarks
1	https://www.youtube.com/channel	
2	https://youtube/qsWkA-5grogo	