BANGLADESH TECHNICAL EDUCATION BOARD

4-YEAR DIPLOMA-IN-ENGINEERING PROGRAM

COMPUTER TECHNOLOGY

SYLLABUS

THIRD SEMESTER

COMPUTER TECHNOLOGY (66)
THIRD SEMESTER

Sl. No	Subject code	Name of the subject	T	P	C	MARKS				Total
						Theory		Practical		
						Cont. assess	Final exam.	Cont. assess	Final exam.	
1	6622	Programming Language-I	2	3	3	20	80	25	25	150
2	6632	Computer Application-II	0	6	2	-	-	50	50	100
3	6841	Digital Electronics-1	3	3	4	30	120	50	50	200
4	6832	Industrial Electronics	2	3	3	20	80	25	25	150
5	5931	Mathematics-III	3	3	4	30	120	50	-	200
6	5922	Physics-2	3	3	4	30	120	25	25	200
7	5811	Social Science-1	2	0	2	20	80	-	-	100
		Total	**15**	**21**	**22**					1100

6622	**Programming Language –1**	**T**	**P**	**C**
		2	**3**	**3**

OBJECTIVES
- To develop knowledge and skill to prepare programs in C.
- To develop knowledge and skill to create, compile, debug & execute C programs.

SHORT DESCRIPTION
Basics of C program; Data types; Variables; Operators; Expressions; Input-Output statements; Branching and Looping statements; Arrays; preprocessors, Functions, Pointers; Structures and Unions; File operations and Graphics.

DETAIL DESCRIPTION
Theory:

1   Understand fundamentals of C Programming
    1.1   Describe the historical development of C Programs.
    1.2   Describe the Basic structure of C program and programming style .
    1.3   State the difference of C with other high level languages.
    1.4   Explain the process of program planning.
    1.5   Describe algorithm and flow chart.
    1.6   Prepare algorithm and flow chart for simple problems.
    1.7   State the process of compiling C program.
    1.8   Write simple programs using basic structure of C program.

2   Understand data types, constants and variables.
    2.1   Describe the data types in C.
    2.2   Explain constants and variables in C.
    2.3   Describe the keywords and identifiers in C.
    2.4   Mention the use of qualifiers in data types.
    2.5   Declare variables and asign values to variables.
    2.6   State the type conversion and type defination in C.
    2.7   Write simple programs using constants and variables.

3   Understand Operators and Expressions.
    3.1   State C operators and their classification.
    3.2   Describe the arithmetic, relational, logical, assignment, increment, decrement and conditional operators.
    3.3   Explain the bitwise and special operators.
    3.4   Write arithmetic expression & its evaluation.
    3.5   Describe the precedence of arithmatic operators.
    3.6   Mention operator precedence and associativity.
    3.7   Write simple programs using operators and expressions.

4   Understand the input and output operations.
   a.   Describe the statement getting input from keyboard.
   b.   Describe the statements printing output on screen and by printer.
   c.   State the codes used for formatted I/O.Statements.
   d.   Mention the escape sequence in C.
   e.   Write programs using I/O statements.

5   Understand the Branching and Looping Statements.
   1.1   Describe the conditional an unconditional branching flow.
   1.2   State the statement for conditional and unconditional branching.
   1.3   Explain the format for branching statements.
   1.4   Describe the conditional an unconditional Looping flow.
   1.5   State the statement for conditional and unconditional Looping.
   1.6   Explain the format for looping statements
   1.7   Write programs using branching and looping statements.

6   Understand arrays
   1.1   Define arrays
   1.2   Describe the dimension of arrays.
   1.3   Initialize arrays.
   1.4   Write programs using arrays.

7   Understand preprocessor statements in C.
   7.1   Describe the preprocessor directives and their functions.
   7.2   Define header.
   7.3   Describe the process of including header in routine.
   7.4   Explain the use of macro.
   7.5   Describe the advantage of macros over functions in programs
   7.6   Write programs using preprocessor statements.

8   Understand pointer and its application.
   8.1   Define pointer.
   8.2   Describe the characteristics of pointer.
   8.3   Explain pointer expressions.
   8.4   Write programs using pointers.

9   Understand Function.
   9.1   Explain library function and user defined function.
   9.2   Describe the process of calling functions and returning values from functions in C.
   9.3   Describe arguments used in functions.
   9.4   Mention function prototype.
   9.5   Write programs using library function and user defined function..

10   Understand structure and union.
  10.1   Describe structure and union.
  10.2   Mention structure and union declaration.
  10.3   Distinguish between structure and union.
  10.4   Write simple programs using structure and union.

11   Understand file operations.
  11.1   Describe file operations.
  11.2   State the modes of opening files.
  11.3   Describe the functions that support character I/O.
  11.4   Explain the routines for performing formatted I/O to files
  11.5   Write programs for reading, writing and editing files.

12   Understand graphics and its application.
  12.1   Describe how graphics are created in computers.
  12.2   State resolution.
  12.3   Describe the graphic statements for creating point, line, circle, arc and polygon.
  12.4   Describe the statements required for selecting color and filling shapes by color.
  12.5   Describe the statements used to copy and move text and graphics.
  12.6   Write programs to create simple graphics..

Practical:
Perform skill to create, compile, debug & execute C programs to solve specific problems.
1.   Test simple programs using basic structure of C program
  1.1   Test a program for printing a message.
  1.2   Test a program for adding two integer numbers.

2.   Test simple programs using constants and variables
  2.1   Test a program to calculate the average of a set of N numbers..
  2.2   Test a program to convert the given temperature in fahrenheit to celcius and
          vice versa.
  2.3   Test a program to calculate the area of a circle.

3.   Test programs using operators and expressions.
  3.1   Test a program to convert days to months and days.
  3.2   Test a program to calculate the area of a traingle..
  3.3   Test a program to compare two integer numbers

4.   Test programs using I/O statements.
  4.1   Test a program for reading integer/real number.
  4.2   Test a program for summation of three floating point numbers from keyboard.
  4.3   Test a program to convert centimeter to inch using scanf () and Printf ()
          statements.

5.   Test programs using Branching Statements.
    5.1   Test a program to select and print the largest of the three numbers.
    5.2   Test a program to compute the roots of a quadratic equation.
    5.3   Test a program to count vowels from a string of ten characters using switch statement.

6   Test programs using Looping Statements
    6.1   Test a program to print odd or even numbers from 1 to 100..
    6.2   Test a program to find the maximum or minimum number from a set of numbers
    6.3   Test a program for searching prime numbers.

7   Test programs using arrays.
    7.1   Test a program to sort numbers in ascending or descending order using one dimensional array..
    7.2   Test a program to print numbers in two dimensional form.
    7.3   Test a program for matrix multiplication.

8.   Test programs using preprocessor statements.
    8.1   Test a program to determine hypotenuse of right angled triangle using macro.
    8.2   Test a program to determine the area of a triangle using nested macro.

9   Test programs using pointers.
    9.1   Test a program to illustrate the use of pointers in arithmatic operations.
    9.2   Test a program using pointers to compute the sum of all elements stored in an array.

10   Test programs using functions.
    10.1   Test a program to calculate the area of a triangle using function.
    10.2   Test a program that uses a function. to sort an array of integers.
    10.3   Test a program calculate factorial of any integer using recursive function.

11   Test programs using using structure and union..
    11.1   Test a program to store and retrive data using structure.
    11.2   Test a program sample program using union.

12   Test programs using files.
    12.1   Test a program to store information to or to read information from sequential file.
    12.2   Test a program to store information to or to read information from random file.
    12.3   Test a program to convert lower to uper case conversion. using file.

13   Test programs using graphics.
    13.1   Test a program to draw a line with different styles.
    13.2   Test a program to. draw a circle with different colours.
    13.3   Test a program to. generate nested ellipse.

Reference books:

1. programming in C – E. Balagurusamy.
2. Teach yourself C _ Herbert Schildt.

6632   **Computer Application -II**   **T**   **P**   **C**
                                                       0   **6**   **2**

OBJECTIVES

To develop skill on **S**preadsheet applications.
To develop skill on creating graphs.
To assist in the efficient use of database packages.
To develop skill on computerized database management.
To develop skill on programming with database management.

SHORT DESCRIPTION

Spreadsheet Analysis Package: Applications of spreadsheet; Using worksheet; Apply formula and functions in worksheet; Creating & printing graphs; Create simple macros.

Database management package: Creating the database; Editing the database; Searching the records; Customizing the data entry form; Creating the query; Arranging the records; Generating reports.

Database management language: Creating a command file; Writing simple database program using decision-making commands.

DETAIL DESCRIPTION

SPREAD SHEET ANALYSIS PACKAGE:

1   **Apply the basic skills of a spreadsheet software package**
    1.1   Run a spreadsheet software package.
    1.2   Identify and use different areas (working area, border area, control panel, mode
            indicator, and status indicator) of the worksheet screen.
    1.3   Identify the function of different keys (typing key, calculator key, text key, cursor key,
            etc.)of the keyboard.
    1.4   Move around the worksheet using keys and combination of key.
    1.5   Identify and use the on-screen help facility.
    1.6   Identify and use the types of data, numbers, labels and formula.
    1.7   Demonstrate menus, submenus, pop-up menu, etc.

2   **Manage workbooks and windows.**
    2.1   Make and use workbooks.
    2.2   Access different types of files.
    2.3   Open files as read only.
    2.4   Demonstrate the options for saving files.
    2.5   Display a workbook in more than one window.
    2.6   Work with more one workbook.
    2.7   Close a workbook.
3   **Create a worksheet and use simple commands.**

3.1 Activate entries in a worksheet.
3.2 Use edit key (F2) to correct or to modify entries.
3.3 Activate the command menus and select commands.
3.4 Save the worksheet.
3.5 Exit from spreadsheet .
3.6 Retrieve a previously saved worksheet.
3.7 Modify the worksheet.
3.8 Save a modified worksheet.

4 Apply formula, function and using templates.
4.1 Use simple formulae to solve arithmetical computation.
4.2 Use arithmetical operators in formula.
4.3 Edit formula.
4.4 Use mathematical function to solve simple equations.
4.5 Make and use workbook templates.
4.6 Make changes in existing workbook templates
4.7 Validate numbers, dates, times & text.
4.8 Show custom validation.

5 Solve engineering problems using formula and functions
5.1 Use mathematical functions to compute trigonometric values, absolute values, random number, square root, logarithmic values, etc for solving engineering problems.
5.2 Use logical functions to perform an operation depending on a condition in engineering problem.
5.3 Use statistical function to compute summation, average, minimum value, maximum value, etc in engineering problem.

6 Work with cell pointer to a particular cell.
6.1 Use GOTO key to move the cell pointer to particular cell.
6.2 Use the ABSOLUTE KEY to change cell address from one from to another in formula or in functions.
6.3 Enter range in formulae or in functions by typing directly or by using cell pointer.
6.4 Create a range name.
6.5 Use range name in formula & functions.
6.6 Copy, Move & Erase cell range.

7 Format a worksheet.
7.1 Change the width of a column, a range of column, and change the columns width globally.
7.2 Insert blank columns and blank rows in a worksheet.
7.3 Delete columns and blank rows in a worksheet.
7.4 Format the display of data of a worksheet globally or by referring a range of cells (e.g. currency format, exponential format, comma format, etc.).
7.5 Format the display of data and of a worksheet globally or referring of cells.
7.6 Protect worksheet, function, formula, important text and unprotect a range for entering entries.

7.7 Work with window for viewing worksheet in different ways and freeze rows or columns.

7.8 Create, change and delete a style.

8 Exercise on Sorting, Searching and Worksheet Printing.

8.1 Create a database program

8.2 Sort a database in different ways.

8.3 Search a record from the database using search criteria.

8.4 Extract records from the database that match a given criteria.

8.5 Delete records that a given criteria from the database using available database commands.

8.6 Show the Print Preview and adjust Page setup option.

8.7 Create and use page headers of footers.

8.8 Set print area, print titles and different print option

8.9 Print portion of worksheet and multiple worksheets

8.10 Print ranges from different worksheets on the same pages.

9 Create and Print graphs.

9.1 Create bar, line, X-Y and pie graphs.

9.2 Add color, titles, legend, gird and levels to the graph.

9.3 Add visual impact with colors.

9.4 Create linked pictures.

9.5 Save the graph and assign names to different graphs of a single worksheet.

9.6 Print graphs (low or high quality graphs.)

9.7 Plot graphs using a plotter using different colors.

9.8 Change graphs size, print & plot them.

10 Create Macros and using macro commands.

10.1 Create simple macros (e.g. to change the width of a cell, to format a cell display, to erase a range of cells etc.) using keystroke commands.

10.2 Create a macro to convert values into labels vice versa.

10.3 Create a macro for inserting blank rows between two rows of data in a worksheet.

10.4 Create a macro for deleting the inserted blank rows in a worksheet.

DATABASE MANAGEMENT PACKAGE:

11 Create the new database.

11.1 Identify the practical database in real world.

11.2 Identify the fields and records of a database.

11.3 Identify the different phases of database design.

11.4 Collect the data form a typical field.

11.5   Determine the category of a typical field.

11.6   Design a typical Paper- pencil database form raw data.

11.7   Run a generalized database management package and identify its display Screen

11.8   Identify the different options of the selected packages.

11.9   Use the on-screen help facilities of DBMS package

11.10   Create and save the table structure.

12   Change the table structure and edit database.

12.1   Modify and Edit the table structure.

12.2   Verify the structure (i.e. data of update, number of records. etc)

12.3   Enter or append the new records in the database.

12.4   Use the key combinations for editing.

12.5   Use the available options to edit fields.

12.6   Delete unwanted records and files.

12.7   Save & close database file.

12.8   Use different modes to append and edit records of database.

13   Search, display and arrange the records of database.

13.1   View a database using list and display command

13.2   Retrieve the database records with different conditions.

13.3   Search within a field.

13.4   Keep the track of specific records.

13.5   Keep the database up-to-date.

13.6   Sort a database on single or multiple fields.

13.7   Sort with qualifier (i.e. sort with specific subset of records).

13.8   Index the database on single or multiple fields.

13.9   Use the function to index on different field types.

13.10   Use the commands for selective indexing and to control the order of records.

14   Create the customized data entry form.

14.1   Draw a typical data entry screen with paper-pencil work.

14.2   Design the screen with all fields.

14.3   Move the field to make the entry form logical and easy to use.

14.4   Change the field width.

14.5   Add or delete field (if necessary).

14.6   Change the display characteristics of fields.

14.7   Use picture functions template and range to format the displayed data.

14.8   Use different options and commands in design menu.

14.9   Draw lines and boxes on the form.

15   Create the query.

15.1   Display and identify query design screen.

15.2   Build a simple query

15.3   Save & apply the query.

15.4   Use the query design menu options.

15.5   Use the symbols and operators to build query.

15.6   Search the records with matching on two or more fields.

15.7   Select the records within range using range operators.

15.8   Find the records with inexact and complex matching.

15.9   Sort the records within queries.

16   Generate the custom reports.

16.1   Send the reports to the screen or to a file.

16.2   Use the print menu options and dos-prompt options.

16.3   Produce a quick and selective report.

16.4   Plan the design of the report.

16.5   Design a custom columnar report.

16.6   Find the parts of a report specification.

16.7   Make the changes to the report specification.

16.8   Save & run the report.

17   Work with multiple database and relationship.

17.1   Merge the data form one file to another.

17.2   View   the files to relate two or more database files.

17.3   Set up the relationship.

17.4   Modify the relationship.

17.5   Create the report from relational database.

DATABASE MANAGEMENT LANGUAGE:

18   Create a simple command file using expression and function.

18.1   Identify the database editor.

18.2   Use the commands to assign different types of data values to variables.

18.3   Save the memory variable.

18.4   Display the memory variable.

18.5   Release & restore the memory variable.

18.6   Use the mathematical expression.

18.7   Use the mathematical, relational, logical and string operators.

18.8   Use the common function such as EOF, BOF DATE, UPPER & LOWER< CTOD, DTOS, SPACE, TRIM, STR, etc. in command file.

18.9   Use the commonly use commands such as SET TALK, SKIP, RETURN in command file.

18.10   Use the commands to display a string of characters and wait for user response.

18.11   Use commands to display or print text.

19   Design & write simple programs.

19.1   Identify the basic steps to design a program.

19.2   Write the pseudocode for simple program.

19.3   Convert the pseudocode into actual program code.

19.4   Verify & documents the simple program.

19.5   Save the command file and then exit.

19.6   Run the program.

20   Use the decision making commands in Programs.

12

20.1 Use DO WHILE ---- ENDDO, IF ---- ENDIF and DO CASE ---- ENDCASE to control program flow.
20.2 Use SCAN ---- ENDSCAN command instead of DO WHILE ---- ENDDO.
20.3 Use IF, ELSE and ENDIF commands to branch to the part the program.
20.4 Use nested IF ---- ENDIF statements.
20.5 Write simple program using decision making commands.
20.6 Use immediate IF function.
20.7 Write simple program using immediate IF function.
20.8 Use CASE ---- ENDCASE statement instead more than three IF ---- ENDIF statements.
20.9 Use the EXIT, CANCEL, WAIT and ZAP command in database program.
20.10 Use macro function within programs.

6841   **DIGITAL ELECTRONICS – I**   **T**   **P**   **C**
                                                       3   **3**   **4**

AIMS
- To develop knowledge & skill on number systems, binary arithmetic operation and codes.
- To provide knowledge & skill on logic gates, ICs, logic circuits and Boolean algebra.
- To assist to acquire the knowledge & skill on combinational logic circuit.

SHORT DESCRIPTION

Basic concept of digital electronics; Number system & codes; Logic gates & ICs; Boolean algebra and logic simplification & Combinational logic circuits.

DETAIL DESCRIPTION

BASIC CONCEPT OF DIGITAL ELECTRONICS

1   **Understand the aspects of digital electronics.**
- 1.1   Define digital electronics.
- 1.2   Mention the characteristics of digital and analog signal.
- 1.3   State the advantages of working in digital mode.
- 1.4   Define logic level.
- 1.5   Mention how voltage levels are used to represent digital quantities.
- 1.6   Describe various parameters of a pulse waveform such as rise time, fall time, pulse width, frequency, period, and duty cycle.

NUMBER SYSTEMS & CODES.

2   **Understand the number system and binary arithmetic operation.**
- 2.1   Describe decimal, binary, octal and hexadecimal number system.
- 2.2   Convert one number system to another.
- 2.3   Compute binary arithmetic (addition, subtraction, multiplication and division) including binary point.
- 2.4   Compute 1`s and 2`s complement subtraction.
- 2.5   State the applications of different number system.
- 2.6   Explain the representation of unsigned and floating point number in binary.

3   **Understand the arithmetic codes and code conversion.**
- 3.1   Define codes.
- 3.2   Distinguish weighted & non-weighted codes.
- 3.3   Describe the 8421, Excess–3 and other popular BCD codes?
- 3.4   Describe the addition and subtraction of 8421, Excess-3 and BCD coded number.
- 3.5   State the meaning of gray code.
- 3.6   Convert gray code to binary and vice versa.

3.7   State parity checked code and Hamming code.

3.8   Describe the error detection and correction with Hamming code. and parity checked code.

3.9   Describe the ASCII code & Unicode.

LOGIC GATES & ICs

4   Understand the concept of Logic gates.

4.1   Define logic gate..

4.2   Define AND, OR, NOT, NOR, NAND, and EX-OR gates.

4.3   Draw the symbols and use of logic gates.

4.4   Prepare the truth table and Boolean equations of logic gates.

4.5   Give the physical concept of AND, OR and NOT operations.

4.6   Explain the AND, OR and NOT operation with electronic circuit.

5   Understand the features of the logic families and digital IC's.

5.1   Mention the classification logic families.

5.2   Define SSI, MSI, LST and VLSI.

5.3   List the types of unipolar and bipolar logic families.

5.4   State the characteristics of digital IC's.

5.5   State the meaning of the terms propagation delay time, speed, noise immunity, logic level, power dissipation, fan-in, fan-out, floating input, Sourcing and sinking, standard loading, loading rules, operating temperature and power rating of logic circuits.

5.6   State the difference of DTL, TTL, MOS, I^2L and ECL families.

6   Understand the concepts of electronic circuit of logic gates.

6.1   Describe the operation of open collector & totempole output circuit for standard TTL NAND gate.

6.2   Describe the CMOS circuit operation.

6.3   State special logic gates such as buffer, tri-state and expandable gates.

6.4   Mention the basic principle of ORing and ANDing.

6.5   Define fixed function Integrated circuit (IC).

6.6   classify fixed function IC

6.7   Mention IC package, code numbers, important specification of TTL/MOS commercial IC gates.

6.8   Distinguish the difference between 74 and 54 series of logic circuit.

BOOLEAN ALGEBRA & LOGIC SIMPLIFICATION

7   Understand the process of logic simplification.

7.1   State the single and multi-variable theorems of Boolean algebra.

7.2   Explain the universality of NAND and NOR gates .

7.3   State DeMorgan's theorems and utilize them to simplify the logic expression.

7.4   State the terms-Sum of Product (SOP) form and Product Of Sum (POS) form.

7.5   Determine the SOP & POS form from truth table.

7.6   State the steps of algebraic simplification.

7.7   Define Karnaugh Map.

7.8   State the structure of Karnaugh map.

7.9   State the simplification process of Boolean expression from a K-map and design logic circuit (up to 4 variables).

COMBINATION LOGIC CIRCUIT.

8   Understand the features of combinational logic circuits.

8.1   Define combinational logic circuit with example.

8.2   Mention the application of combinational logic circuit.

8.3   Describe the operation of half and full adder with logic circuit and expression.

8.4   Describe the operation of controlled inverter.

8.5   State the principle of half subtraction and full subtraction.

8.6   Describe the operation of 4 bit parallel adder.

8.7   Describe the operation of 4 bit subtraction circuit..

8.8   Describe the operation of parity generator and detector circuit.

8.9   Describe the operation of 4 bit BCD & Excess-3 adder.

8.10   Describe the operation of multipliers & divisors.

9.   Understand the concepts of encoder, decoder and display devices.

9.1   Describe the operation of encoder, priority encoder and decoder circuit.

9.2   State the principle of operation of LCD, seven-segment display and dot matrix display.

9.3   Describe the operation and application of commonly available encoder & decoder.

9.4   Describe the operation of commonly used 4-bit BCD decoder/driver for seven segment display of common anode/cathode type.

10   Understand the features of multiplexers and demultiplexers.

10.1   Define multiplexers and demultiplexers.

10.2   Describe the operation of 2 and 4 input multiplexer and demultiplexer with logic diagram.

10.3   State the use of multiplexer & demultiplexer.

10.4   State the Pin signals of 2/4 input Multiplexer.

10.5   State the Pin signals of a 1 to 4 line Demultiplexer

10.6   Explain the operation of comparator.

10.7   Describe the Pin diagram of commonly used 4-bit comparator ICs.

10.6   Distinguish between Decoder and Demultiplexer.

SEQUINTIAL LOGIC CIRCUITS

11   Understand the features of sequential logic circuits.
        11.1   Define (i) sequential logic circuit (ii) Clock (iii) Timing diagram. (iv) Latch (v) Flip-Flop
        11.2   Explain the operation of logic circuit of a basic SR latch.
        11.3   Describe the operation of logic circuit of gated SR and D latch with waveform and truth table.
        11.4   Mention the difference between latch and flip-flop.
        11.5   Give concept of positive & negative edge triggering and level triggering,
        11.6   Explain the operation of logic circuit of J-K, D, T and Master-Slave J-K flip-flop with timing diagram and truth table..
        11.7   State the function of asynchronous inputs .
        11.8   Describe the pin diagram and internal architecture of commonly used flip-flop ICs Such as 74279,7474, 7475, 7476,74112.
        11.9   Describe the basic elements in a 555 timer .
        11.10   Set up a 555 timer as clock generator.

Practical :

1   To Verify the truth tables of logic gates (OR, AND, NOT)
        1.1   Select logic gate ICs.
        1.2   Draw the pin diagram and internal connection.
        1.3   Select appropriate circuits, required tools, equipments and materials.
        1.4   Connect the circuits as per diagram.
        1.5   Switch on the DC power supply,
        1.6   Verify the truth tables.

2   To Verify the truth tables of logic gates (NAND, NOR gate).
        2.1   Select logic gate ICs.
        2.2   Draw the pin diagram and internal connection.
        2.3   Select appropriate circuits, required tools, equipments and materials.
        2.4   Connect the circuits as per diagram.
        2.5   Switch on the DC power supply,
        2.6   Verify the truth tables.

3   Show the operation of the electronic circuits of basic gates.
        3.1   Draw appropriate circuits of basic bates using active and passive components.
        3.2   Select required tools, equipments and materials.
        3.3   Connect the circuits as per diagram.
        3.4   Switch on the DC power supply,
        3.5   Verify the truth tables.

4   Verify the Truth table of X-OR & X-NOR gate using basic gates.
        4.1   Select logic gate ICs.
        4.2   Draw the pin diagram and internal connection.

4.3   Select appropriate circuits, required tools, equipments and materials.
4.4   Connect the circuits as per diagram.
4.5   Switch on the DC power supply,
4.6   Verify the truth tables.

5   To design & develop a code converter circuits and observe its output operation.
5.1   Select logic gate ICs.
5.2   Draw the pin diagram and internal connection.
5.3   Select appropriate circuits, required tools, equipments and materials.
5.4   Connect the circuits as per diagram.
5.5   Switch on the DC power supply,
5.6   Verify the code conversion tables.

6   To Show the operation of NAND gate as universal gates.
6.1   Select logic gate IC of NAND gate.
6.2   Draw the pin diagram and internal connection.
6.3   Select appropriate circuits, required tools, equipments and materials.
6.4   Connect the circuits as per diagram for AND OR & NOT gate.
6.5   Switch on the DC power supply,
6.6   Verify the truth tables of AND OR & NOT gate.

7   To Show the operation of NOR gate as universal gates.
7.1   Select logic gate IC of NOR gate.
7.2   Draw the pin diagram and internal connection.
7.3   Select appropriate circuits, required tools, equipments and materials.
7.4   Connect the circuits as per diagram for AND OR & NOT gate.
7.5   Switch on the DC power supply,
7.6   Verify the truth tables of AND OR & NOT gate.

8   To develop the circuit to proof the Demorgan's theorems.
8.1   Select logic gate ICs.
8.2   Draw the pin diagram and internal connection.
8.3   Select appropriate circuits, required tools, equipments and materials.
8.4   Connect the circuits as per diagram.
8.5   Switch on the DC power supply,
8.6   Verify the theorem.

9   Verify the functions of half adder .
9.1   Select ICs.
9.2   Draw the pin diagram and internal connection.
9.3   Draw appropriate circuits.
9.4   Select required tools, equipments and materials.
9.5   Connect the circuits as per diagram.
9.6   Switch on the DC power supply,
9.7   Verify the truth tables.

10   Verify the functions of full adder.
        10.1   Select ICs.
        10.2   Draw the pin diagram and internal connection.
        10.3   Draw appropriate circuits.
        10.4   Select required tools, equipments and materials.
        10.5   Connect the circuits as per diagram.
        10.6   Switch on the DC power supply,
        10.7   Verify the truth tables.

11   Verify the output operation of binary 4 bit parallel adder.
        11.1   Select appropriate ICs.
        11.2   Draw the pin diagram and internal connection.
        11.3   Draw appropriate circuits.
        11.4   Select required tools, equipments and materials.
        11.5   Connect the circuits as per diagram.
        11.6   Switch on the DC power supply,
        11.7   Verify the truth tables.

12   Verify the functions of Subtractor .
        12.1   Select appropriate ICs.
        12.2   Draw the pin diagram and internal connection.
        12.3   Draw appropriate circuits.
        12.4   Select required tools, equipments and materials.
        12.5   Connect the circuits as per diagram.
        12.6   Switch on the DC power supply,
        12.7   Verify the truth tables.

13   Verify the output of a 4-bit 2`s compliment subtractor.
        13.1   Select appropriate ICs.
        13.2   Draw the pin diagram and internal connection.
        13.3   Draw appropriate circuits.
        13.4   Select required tools, equipments and materials.
        13.5   Connect the circuits as per diagram.
        13.6   Switch on the DC power supply,
        13.7   Verify the truth tables.

14   To Show the operation of encoder .
        14.1   Select appropriate ICs.
        14.2   Draw the pin diagram and internal connection.
        14.3   Draw appropriate circuits.
        14.4   Select required tools, equipments and materials.
        14.5   Connect the circuits as per diagram.

14.6   Switch on the DC power supply,
14.7   Verify the truth tables.

15   To Show the operation of decoder.
    15.1   Select appropriate ICs.
    15.2   Draw the pin diagram and internal connection.
    15.3   Draw appropriate circuits.
    15.4   Select required tools, equipments and materials.
    15.5   Connect the circuits as per diagram.
    15.6   Switch on the DC power supply,
    15.7   Verify the truth tables.

16   To Show the operation of a decoder driver & display operation using 7 segment display.
    16.1   Select appropriate ICs.
    16.2   Draw the pin diagram and internal connection.
    16.3   Draw appropriate circuits.
    16.4   Select required tools, equipments and materials.
    16.5   Connect the circuits as per diagram.
    16.6   Switch on the DC power supply,
    16.7   Verify the truth tables.

17   Show the operation of multiplexer.
    17.1   Select appropriate ICs.
    17.2   Draw the pin diagram and internal connection.
    17.3   Draw appropriate circuits.
    17.4   Select required tools, equipments and materials.
    17.5   Connect the circuits as per diagram.
    17.6   Switch on the DC power supply,
    17.7   Verify the truth tables.

18   Show the operation of demultiplexer.
    18.1   Select appropriate ICs.
    18.2   Draw the pin diagram and internal connection.
    18.3   Draw appropriate circuits.
    18.4   Select required tools, equipments and materials.
    18.5   Connect the circuits as per diagram.
    18.6   Switch on the DC power supply,
    18.7   Verify the truth tables.

19   Show the operation of parity generator and detector.
    19.1   Select appropriate ICs.
    19.2   Draw the pin diagram and internal connection.

19.3   Draw appropriate circuits.
19.4   Select required tools, equipments and materials.
19.5   Connect the circuits as per diagram.
19.6   Switch on the DC power supply,
19.7   Verify the truth tables.

20   Verify the truth table of different S-R flip-flops.
20.1   Select appropriate ICs.
20.2   Draw the pin diagram and internal connection.
20.3   Draw appropriate circuits.
20.4   Select required tools, equipments and materials.
20.5   Connect the circuits as per diagram.
20.6   Switch on the DC power supply,
20.7   Verify the truth tables.

21   Verify the truth table of different J-K flip-flops.
21.1   Select appropriate ICs.
21.2   Draw the pin diagram and internal connection.
21.3   Draw appropriate circuits.
21.4   Select required tools, equipments and materials.
21.5   Connect the circuits as per diagram.
21.6   Switch on the DC power supply,
21.7   Verify the truth tables.

22   Verify the truth table of different D flip-flops.
22.1   Select appropriate ICs.
22.2   Draw the pin diagram and internal connection.
22.3   Draw appropriate circuits.
22.4   Select required tools, equipments and materials.
22.5   Connect the circuits as per diagram.
22.6   Switch on the DC power supply,
22.7   Verify the truth tables.

23   Verify the truth table of different T flip-flops.
23.1   Select appropriate ICs.
23.2   Draw the pin diagram and internal connection.
23.3   Draw appropriate circuits.
23.4   Select required tools, equipments and materials.
23.5   Connect the circuits as per diagram.
23.6   Switch on the DC power supply,
23.7   Verify the truth tables.

24   Construct a Clock generator circuit using 555 timer IC. and observe the output.

24.1   Draw the pin diagram and internal connection.
24.2   Draw appropriate circuits.
24.3   Select required tools, equipments and materials.
24.4   Connect the circuits as per diagram.
24.5   Switch on the DC power supply,
24.6   Observe the on LED or CRO..

REFERENCE BOOKS

1.   Digital Fundamentals
        -    Thomas L. Floyd
2.   Digital Computer Electronics (An introduction to microcomputers)
        –   Albert Paul Malvino
3.   Digital Principles
        –   Roger L. Tokhem
5.   Digital system
        –   Ronald J. Tocci and Widmer.

Industrial Electronics

	T	P	C
	2	3	3

AIMS

- To provide understanding and skill on SCR and TRIAC.
- To provide understanding and skill on phase controlled rectifier.
- To provide understanding and skill on wave shaping circuits.
- To familiarize with integrated circuits.
- To give an understanding on the Operational Amplifier.
- To develop comprehensive knowledge and skill on power switching device.
- To provide understanding and skill on optoelectronic device and security system.
- To provide understanding and skill on special electronic equipment.
- To familiarize with the programmable logic controller.

SHORT DESCRIPTION

UJT, SCR, PUT, DIAC, TRIAC, controlled rectifier, wave shaping circuits, integrated circuit, Operational amplifier, Power switching devices; Optoelectronic device; Security system; Special electronic equipment and Programmable logic controller.

DETAIL DESCRIPTION

Theory:

1.   Understand the Concept of Unijunction Transistor (UJT).

1.1   Describe the structure and operation of UJT.

1.2   Identify the UJT by its equivalent circuit.

1.3   Define standoff ratio.

1.4   Explain why UJT is not a thyristor.

1.5   Analyze the operation of a UJT relaxation oscillator.

1.6   Analyze the operation of UJT controlled SCR dc operated time-delay circuit.

2.   Understand the Concept of Silicon Control Rectifier (SCR)

2.1   Define Thyristors.

2.2   Mention the types of Thyristors.

2.3   Describe the construction and operation of SCR.

2.4   Describe the I-V characteristics of SCR.

2.5   Explain the operation of SCR using two-transistor Equivalent circuit.

2.6   Derive the equation for anode current.

2.7   Explain how to turn an SCR on and off.

2.8   Define various parameters and mention the ratings of SCR.

2.9   Explain the operation of automatic battery charger, emergency lighting.

2.10   System, heater control, and over voltage protection circuits.

2.11   Mention the advantages of SCR as a switch.

2.12   Describe the construction and operation of light activated SCR (LASCR).

3   Understand the Concept of Controlled Rectifier.
    3.1   Define Controlled Rectifier.
    3.2   Mention the types of control rectifier.
    3.3   Describe the operation of half wave controlled rectifier using SCR for resistive and inductive load with wave shapes.
    3.4   Drive the equation for load current and voltage of half wave controlled rectifier for resistive and inductive load.
    3.5   Analyze the operation of single-phase full-wave mid-point controlled rectifier, Half controlled and full controlled bridge rectifier with wave shapes.
    3.6   Drive the equation for load current and voltage of full wave rectifier.
    3.7   Explain the effect of freewheeling diode in rectifier circuit with inductive load.
    3.8   Describe the operation of poly-phase controlled rectifier.
    3.9   Mention the operation of (a) Illumination circuit (b) Speed control of dc and ac motors.

4   Understand the Concept of Programmable Unijunction Transistor (PUT)

    4. 1   Describe the structure and operation of the PUT.
    4. 2   State how to set the trigger voltage of PUT.
    4. 3   Explain the difference between a PUT and UJT.
    4. 4   Analyze the operation of a PUT relaxation oscillator.

5.   Understand the Concept of DIAC and TRIAC

     5.1   Describe the structure and operation of DIAC.

     5.2   Explain the I-V characteristics curve of DIAC.

     5.3   Describe the structure of TRIAC.

     5.4   Discuss the SCR equivalent circuit of TRIAC.

     5.5   Explain the triggering modes of TRIAC.

     5.6   Describe the characteristics curve of TRIAC.

     5.7   State the commutation of TRIAC.

     5.8   Analyze the operation of TRIAC firing circuits using (i) DIAC (ii) UJT.

     5.9   Analyze the operation of a TRIAC phase control, lamp dimmer and Heat control circuit.

6.   Understand the features of wave shaping circuits.

     6.1   Mention the types of wave shaping circuit.

     6.2   Discuss the principles of RC and RL differentiating and integrating circuits.

     6.3   Analyze the output waves for various input wave shapes of differentiating and integrating circuit.

     6.4   Explain the operation of various clippers by PN junction diode, zener diode and transistor.

     6.5   Describe the operation of of diode clamping circuit for different input wave shape.

7.   Understand the Features of Integrated Circuit (IC).

     7.1   Define IC

     7.2   List the advantages and limitation of IC's.

     7.3   Mention the scale of integration.

7.4   Identify the types of integrated circuits.

7.5   Describe the fabrication monolithic integrated circuits.

7.6   Describe the fabrication of integrated circuit components resistor, capacitor BJT and FET.

8.   Understand the Features of Operational Amplifier (Op- Amp)

8.1   Define operational amplifier.

8.2   Recognize the Op-Amp symbol.

8.3   Identify the terminals on Op-Amp packages.

8.4   State the basic principle of Op-Amp.

8.5   Analyze the equivalent circuit of Op-Amp.

8.6   State the golden rule and virtual ground of Op-Amp.

8.7   List the characteristics of an ideal Op-Amp.

8.8   Describe the input& output impedance, input offset voltage, input bias current, input offset current, common-mode input voltage range, open-loop voltage gain, common-mode rejection ratio, slew rate, frequency response and unity-gain bandwidth.

8.9   Explain the operation of Op-Amp in inverter, scale changer, unity follower, comparator, phase shifter, adder, subtractor, differentiator, integrator, ramp generator, multichannel amplifier and filters.

9.   Understand the feature of advance power switching devices

9.1   Describe the construction of GTO, IGBT, MCT, SIT and SITH & LASCR.

9.2   Explain the principles of operation of GTO, IGBT, MCT, SIT and SITH & LASCR.

9.3   Mention the v-i characteristics of GTO, IGBT, MCT, SIT and SITH &LASCR devices.

9.4   List the application of various power switching devices.

10.   Understand the features of photo resistors, photo diodes and phototransistors.

   10.1   Describe the basic structure of photo resistors, photo diodes & photo transistors.

   10.2   Explain the operating principles of photo resistors, photo diodes & photo transistors.

   10.3   Explain the v-i characteristics curve of photo resistors, photo diodes and photo transistors.

   10.4   List typical applications of photo resistors, photo diodes and photo transistors.

   10.5   Explain a block diagram showing how photo detectors used in speed measuring system.

   10.6   Explain the operation of photo diode switching circuit.

   10.7   Explain the operation of photo transistor switching circuit.

11.   Understand the features of security system.

   11.1   Explain the operation fire (smoke) indication system using lionizatio detector and photo 11.2 transistor with block diagram.

   11.3   Describe the operation of touch and non-touch type person (thief) detector using Infrared detection system with block diagram.

   11.4   Explain the operation of video monitoring system using video camera and video monitor (With multiple monitor switching).

12.   Understand the features of special electronic equipment.

   12.1   Mention the principles of operation of UPS with block diagram.

   12.2   Mention the principles of operation of SMPS with block diagram.

   12.3   Mention the principles of operation of multimedia projector with block diagram.

13. Understand the features of programmable logic controllers (PLCs).

      13.1   Mention the basic operating and programming principles of PLCs.

      13.2   Draw a simplified block diagram showing the main parts of a PLC.

      13.3   State the function of main part of PLC.

Practical:

1   Determine the characteristics curve of UJT.
      1.1   Select an appropriate experiment circuit, required materials, tools and equipments.
      1.2   Connect the circuit as per diagram with meters.
      1.3   Check the circuit and switch on the power supply.
      1.4   Record the data for I-V curve.
      1.5   Plot the curve.

2   Study the gate control of forward breakdown voltage for an SCR.

      2.1   Select an appropriate circuit, required tools, equipments and materials.
      2.2   Connect the circuit as per diagram with meters.
      2.3   Switch on the power supply and make proper adjustments.
      2.4   Set the gate control at minimum and observe the breakdown voltage for I-V characteristics.
      2.5   Increase gate current in steps and observe the breakdown voltage.
      2.6   Plot the I-V characteristics curve.
      2.7   Compare different curves and breakdown voltage.

3   Study the Operation of a single phase controlled rectifier using SCR.
      3.1   Select an appropriate experiment circuit.
      3.2   Select required tools, equipments and materials.
      3.3   Connect the circuit as per diagram with Oscilloscope.
      3.4   Check the connection and switch on the power supply.
      3.5   Observe the wave shapes at relevant points of the circuit.

4   Study the Operation of a Illumination Circuit.
      4.1   Select an appropriate experiment circuit.
      4.2   Select required tools, equipments and materials.
      4.3   Connect the circuit as per diagram.
      4.4   Check the connection and switch on the power supply.
      4.5   Adjust the POT and observe the Illumination.

5   **Determine the characteristics curve of DIAC.**
  5.1   Select an appropriate experiment circuit, required materials, tools and
          equipments.
  5.2   Connect the circuit as per diagram with meters.
  5.3   Check the circuit and switch on the power supply.
  5.4   Record the data for I-V curve.
  5.5   Plot the curve.

6   **Study the Operation of a RC differentiating circuit.**
  6.1   Select a RC differentiating circuit.
  6.2   Select required materials, tools and equipments.
  6.3   Connect the circuit as per diagram with CRO.
  6.4   Switch on the power supply.
  6.5   Adjust the signal frequency   for the differentiating circuit.
  6.6   Observe the output wave for different input wave shape on CRO screen.

7   **Study the Operation of a RC Integrating circuit**.
  7.1   Select a RC differentiating circuit.
  7.2   Select required materials, tools and equipments.
  7.3   Connect the circuit as per diagram with CRO.
  7.4   Switch on the power supply.
  7.5   Adjust the signal frequency   for the differentiating circuit.
  7.6   Observe the output wave for different input wave shape on CRO screen.

8   **Study the operation of biased and unbiased series and shunt clipping circuits for
          positive and negative peak and bias clipping of a sine wave using switching diodes.**
  8.1   Select a required circuit.
  8.2   Select the associate equipments and materials.
  8.3   Buildup the circuit for required wave shapes.
  8.4   Switch on the power supply.
  8.5   Observe the output on CRO screen.

9   **Study the operation a clamping circuit.**
  9.1   Select a required circuit.
  9.2   Select the associate equipments and materials.
  9.3   Buildup the circuit for required wave shapes.
  9.4   Switch on the power supply.
  9.5   Observe the output on CRO screen.

10   Study the operation of Op-Amp (for IC 741) as inverting and non inverting amplifier, adder, comparator, buffer and subtractor.
10.1   Select a required circuit.
10.2   Select the associate equipments and materials.
10.3   Buildup the circuit as per function.
10.4   Switch on the power supply.
10.5   Observe the input and output wave shape on CRO screen.

11   Study the operation and application of SMPS./UPS
11.1   Select a SMPS/UPS
11.2   Identify different parts of SMPS/UPS
11.3   Observe the operation of SMPS/UPS

12   Determine the v-i characteristic curve of photo diode.
12.1   Select a required circuit.
12.2   Select tools and materials.
12.3   Build up the circuit
12.4   Check the connection.
12.5   Switch on the power supply
12.6   Record the data.
12.7   Plot the curve.

13   Study the operation of PLC.
13.1   Select a PLC trainer.
13.2   Identify different parts of turner
13.3   Observe the operation of PLC for specific purpose.

REFERENCES:

1.   Electronic Device and Circuit Theory

                              -   Robert L. Boylestad, Louis Nashelsky
2.   Electronic Devices

                              -    Floyd
3.   Power Electronics

                              -    Dr. P.S. Bimbhra
4.   Principles of Electronics
5.   A Text Book of Applied Electronics

                              -    R. S. Sedha

5931	**MATHEMATICS – III**	**T**	**P**	**C**
		3	**3**	**4**

AIMS

- To make understand the basic concept and techniques of composition and resolution of vectors and computing the resultant of vectors.

- To enable to use the knowledge of gradient of a straight line in finding speed, acceleration etc.

- To enable to use the knowledge of conic in finding the girder of a railway bridge, cable of a suspension bridge and maximum height of an arch.

- To provide ability to apply the knowledge of differential calculus in solving problem like slope, gradient of a curve, velocity, acceleration, rate of flow of liquid etc.

- To enable to apply the process of integration in solving practical problems like calculation of area of a regular figure in two dimensions and volume of regular solids of different shapes.

SHORT DESCRIPTION

Vector	*:* Addition and subtraction, dot and cross product.
Co-ordinate Geometry	: Co-ordinates of a point, locus and its equation, straight lines, circles and conic.
Differential Calculus	: Function and limit of a function, differentiation with the help of limit, differentiation of functions, geometrical interpretation of $\dfrac{dy}{dx}$, successive differentiation and Leibnitz theorem, partial differentiation.
Integral Calculus	: Fundamental integrals, integration by substitutions, integration by parts, integration by partial fraction, definite integrals.

DETAIL DESCRIPTION

Vector

1 **Apply the theorems of vector algebra.**
  1.1 Define scalar and vector.
  1.2 Explain null vector, free vector, like vector, equal vector, collinear vector, unit vector, position vector, addition and subtraction of vectors, linear combination, direction cosines and direction ratios, dependent and independent vectors, scalar fields and vector field.
  1.3 Prove the laws of vector algebra.
  1.4 Resolve a vector in space along three mutually perpendicular directions

1.5   solve problems involving addition and subtraction of vectors.

2   Apply the concept of dot product and cross product of vectors.
2.1   Define dot product and cross product of vectors.
2.2   Interpret dot product and cross product of vector geometrically.
2.3   Deduce the condition of parallelism and perpendicularity of two vectors.
2.4   Prove the distributive law of dot product and cross product of vector.
2.5   Explain the scalar triple product and vector triple product.
2.6   Solve problems involving dot product and cross product.

CO-ORDINATE GEOMETRY

3   Apply the concept of co-ordinates to find lengths and areas.
3.1   Explain the co-ordinates of a point.
3.2   State different types of co-ordinates of a point.
3.3   Find the distance between two points (x_1, y_1) and (x_2, y_2).
3.4   Find the co-ordinates of a point which divides the straight line joining two points in certain ratio.
3.5   Find the area of a triangle whose vertices are given.
3.6   Solve problems related to co-ordinates of points and distance formula.

4   Apply the concept of locus.
4.1   Define locus of a point.
4.2   Find the locus of a point.
4.3   Solve problems for finding locus of a point under certain conditions.

5   Apply the equation of straight lines in calculating various parameter.
5.1   Describe the equation $x=a$ and $y=b$ and slope of a straight line.
5.2   Find the slope of a straight line passing through two point $(x_1, y_1,)$ and (x_2, y_2).
5.3   Find the equation of straight lines:
       i)   Point slope form.
       ii)   Slope intercept form.
       iii)   Two points form.
       iv)   Intercept form.
       v)   Perpendicular form.
5.4   Find the point of intersection of two given straight lines.
5.5   Find the angle between two given straight lines.
5.6   Find the condition of parallelism and perpendicularity of two given straight lines.
5.7   Find the distances of a point from a line.

6   Apply the equations of circle, tangent and normal in solving problems.
6.1   Define circle, center and radius .
6.2   Find the equation of a circle in the form:

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

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

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

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

6.4 Define tangent and normal.

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

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

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

7. Understand conic or conic sections.

7.1 Define conic, focus, directrix and eccentricity.

7.2 Find the equations of parabola, ellipse and hyperbola.

7.3 Solve problems related to parabola, ellipse and hyperbola.

DIFFERENTIAL CALCULUS

FUNCTION AND LIMIT

8. Understand the concept of functions and limits.

8.1 Define constant, variable, function, domain, range and continuity of a function.

8.2 Define limit of a function

8.3 Distinguish between f(x) and f(a).

8.4 Establish

i) $\lim_{x \to 0} \dfrac{\sin x}{x} = 1$

ii) $\lim_{x \to 0} \dfrac{\tan x}{x} = 1.$

9. Understand differential co-efficient and differentiation.

9.1 Define differential co-efficient in the form of

$$\frac{dy}{dx} = \lim_{h \to 0} \frac{f(x+h)-f(x)}{h}$$

9.2 Find the differential co-efficient of algebraic and trigonometrical functions from first principle.

10. Apply the concept of differentiation.

10.1 State the formulae for differentiation:

      i)   sum or difference
      ii)   product
      iii)   quotient
      iv)   function of function
      v)   logarithmic function
             Find the differential co-efficient using the sum or difference formula, product formula and quotient formula.

10.2   Find the differential co-efficient function of function and logarithmic function.

11. Apply the concept of geometrical meaning of $\dfrac{dy}{dx}$

11.1   Interpret $\dfrac{dy}{dx}$ geometrically.

11.2   Explain $\dfrac{dy}{dx}$ under different conditions

11.3   Solve the problems of the type:
A circular plate of metal expands by heat so that its radius increases at the rate

of 0.01 cm per second. At what rate is the area increasing when the radius is 700 cm ?

12 Use Leibnitz's theorem to solve the problems of successive differentiation.
12.1   Find 2nd, 3rd and 4th derivatives of a function and hence find n-th derivatives.
12.2   Express Leibnitz's theorem
12.3   Solve the problems of successive differentiation and Leibnitz's theorem.

13 Understand partial differentiation.
13.1   Define partial derivatives.
13.2   State formula for total differential.
13.3   State formulae for partial differentiation of implicit function and homogenous function.
13.4   State Euler's theorem on homogeneous function.
13.5   Solve the problems of partial derivatives.

INTEGRAL CALCULUS
14 Apply fundamental indefinite integrals in solving problems.
14.1   Explain the concept of integration and constant of integration.
14.2   State fundamental and standard integrals.
14.3   Write down formulae for:
i) Integration of algebraic sum.
ii) Integration of the product of a constant and a function.
14.4   Integrate by method of substitution, integrate by parts and by partial fractions.

14.5   Solve problems of indefinite integration.

15   Apply the concept of definite integrals.
15.1 Explain definite integration.

15.2 Interpret geometrically the meaning of $\int_a^b f(x)dx$

15.3 Solve problems of the following types:

i) $\int_0^{\frac{\pi}{2}} \cos^2 xdx$ ii) $\int_0^1 \frac{(\sin^{-1} x)^2}{\sqrt{1-x^2}} dx$

P* =Practical continuous assessment

5922	PHYSICS–II	T	P	C
		3	3	4

AIMS

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

Short description

Thermometry; Calorimetry, Expansion of materials (effect of heat); Heat transfer;
Nature of heat and its mechanical equivalent; Engine.
Principles of light and Photometry; Reflection of light; Refraction of light ; lens.
Concept of Electron and photon; structure of atom, Theory of Relativity.

Detail description
<u>**Theory** :</u>
1. **Thermometry**
   1.1   Define heat and temperature.
   1.2   Mention the units of measurement of heat and temperature.
   1.3   Distinguish between heat and temperature.
   1.4   Identify the sources of heat.
   1.5   Identify the range of the Celsius scale determined by the boiling point and melting point of water
   1.6   Compare the Celsius scale, Roamer scale, Fahrenheit scale, Kelvin scale and Rankin scale of temperature measurement.
   1.7   State the construction and graduation of a mercury thermometer.
   1.8   Describe the operation of different types of thermometers (e.g., maximum and minimum thermometer, clinical thermometer).
2. **Heat capacity of materials (calorimetric)**
   2.1   State the heat as a form of energy.
   2.2   Define specific heat capacity.
   2.3   State SI units of measurement of specific heat capacity as J/Kgc^0 or J/Kgk^0.
   2.4   Define thermal capacity and water equivalent.
   2.5   Differentiate between thermal capacity and water equivalent.
   2.6   Mention the specific heat capacity of different materials.

2.7 Prove the total heat gained by an object is equal to the sum of the heat lost by all the surrounding objects.

2.8.1 Identify specific latent heat as the energy consumed or liberated when water vaporizes or condenses and when ice melts or freezes.

2.8.2 Explain the effects of a change in pressure on the melting point and boiling point of water.

2.9 Define various kinds of specific latent heat.

2.9.1 Determine the latent heat of fusion of ice and latent heat of vaporization of water.

3. Effects of heat on dimension of materials

3.1 Show that different materials change in size at different amounts with the same heat source.

3.2 Explain the meaning of differential expansion in bimetallic strip, thermostats, compensated pendulum etc.

3.3 Explain the methods of overcoming problems caused by the expansion of materials in buildings, machinery, railway lines and bridges.

3.4 Define the co-efficient of linear, superficial and cubical expansion of solids.

3.5 Mention the units co-efficient of linear, superficial and cubical expansion of solids.

3.6 Mention the linear, Superficial and cubical expansion of a range of common engineering materials.

3.7 Define real and apparent expansion of liquid.

3.8 Define and explain the co-efficient of real and apparent expansion of liquid.

3.9 Distinguish between the co-efficient of real and apparent expansion of liquid.

3.10 Determine the co-efficient of real and apparent expansion of liquid.

4. Heat transfer

4.1 Identify the phenomenon of heat transferring from hot bodies to cold bodies.

4.2 Explain the methods of heat transfer by conduction, convection and radiation with examples of each type of transfer.

4.3 Define thermal conductivity (K) & rate of heat transfer.

State the SI units of thermal conductivity as $\frac{w}{mk}$ or $\frac{w}{mc}$

4.4 List the factors which determine the quantity of heat (Q) flowing through a material.

4.5 Show that the quantity of heat flowing through a material can be found from Q $= \frac{KA\,(\theta_H - \theta_C)t}{d}$

4.6 Outline the properties of materials which give thermal insulation.

4.7 Explain Characteristics of radiant heat energy.

4.8 Describe Emissive power and absorptive power of radiant heat.

4.9 State Stefan-Boltzman Law,
4.10 State Newton's law of cooling.
4.11 State wiens law.
4.12 Explain Green house effect.

5. Nature of heat and its mechanical equivalent
5.1 Describe the caloric theory and kinetic theory of heat.
5.2 State the drawbacks of the caloric theory of heat.
5.3 Explain the mechanical equivalent of heat.
5.4 Explain the first law of thermodynamics .
5.5 Explain Isothermal and adiabatic change.
5.6 Explain Specific heat of a gas, Molar specific heat or molar heat capacity.
5.7 Relate between pressure and volume of a gas in adiabatic Change i, e;$PV\gamma$=const.
5.8 Difference between C_P and C_v for an ideal gas (C_P-C_v=R)

6. 2nd law of thermodynamics
6.1 State and Explain Reversible process and irreversible process.
6.2 State & explain 2nd law of thermodynamics
6.3 Explain heat engine.
6.4 Explain the principle of work of a heat engine.
6.5 Identify thermal efficiency of a heat engine.
6.6 Explain the working principles of internal combustion and external combustion engines (with fair sketches)
6.7 Distinguish between internal combustion engine and external combustion engine. Entropy : Definition, unit and significant.
6.8 Explain Change of entropy in a reversible and irreversible process.
6.9 Give an example of increase of entropy in irreversible process.

7. Preliminaries of light and photometry
7.1 Define light, medium (transparent, translucent, opaque), luminous & non-luminous bodies, parallel, convergent & divergent rays, beam.
7.2 Show the travel of light in straight line.
7.3 Define photometry, luminous intensity, luminous flux, brightness and illuminating power.
7.4 Mention the units of luminous intensity, luminous flux, brightness and illuminating power.
7.5 Mention relation between luminous intensity & illuminating power.
7.6 Explain inverse square law of light.
7.7 Describe the practical uses of light waves in engineering.

8. Reflection of light

    8.1   Define mirror (plane & spherical), image (real & virtual) and magnification of images.

    8.2   Describe the reflection of light.

    8.3   State the laws of reflection of light.

    8.4   Express the verification of laws of reflection.

    8.5   Define pole, principal axis, center of curvature, radius of curvature, principal focus in case of concave & convex mirrors.

    8.6   Find the relation between focal length & radius of curvature of a concave & convex mirror.

    8.7   Express the general equation of concave and convex mirror.

9.   refraction of light

    9.1   Define refraction of light Give examples of refraction of light

    9.2   State the laws of refraction and Express the verification of laws of refraction

    9.3   Define absolute and relative refractive index and Relate absolute and relative refractive index

    9.4   Explain the meaning of total internal reflection and critical angle and Relate total internal reflection and critical angle.

    9.5   Give examples of total internal reflection.

    9.6   Describe refraction of light through a prism.

    9.7   Express the deduction of the relation between refractive index, minimum deviation and angle of the prism.

    9.8   Explain Dispersion of light.

    9.9   Define lens and mention the kinds of lens.

    9.10   Define center of curvature, radius of curvature, principal axis, 1_{st} and 2_{nd} Principal focus, optical center and power of lens.

    9.11   Express the deduction of the general equation of lens (eoncave & convex).

    9.12   Define Combination of two thin lenses and equivalent lens.

    9.13   Identify and List uses of lens.

10.   Electron and photon :

    10.1   Describe Electrical conductivity of gases.

    10.2   Describe Discharge tube.

    10.3   Cathode ray : Definition and its properties

    10.4   X-ray : Definition, properties & uses

    10.5   Discuss Photo electric effect .

    10.6   Derive Einstein's photo electric equation

11. **Structure of atom :**
   11.1   Atomic models : Thomson, Rutherford and Bohr model.
   11.2   Bohr Hydrogen atom & the theory of hydrogen spectra .
   11.3   Define and explain Radio activity.
   11.4   Describe Radio active rays.
   11.5   Deduce radioactive decay law.
   11.6   Define half-life & mean life of radioactive atoms.
   11.7   Define nuclear fission & fusion.

12. **Theory of relativity :**
   12.1   Express the theory of relativity.
   12.2   Mention different Kinds of theory of relativity.
   12.3   Explain special theory of relativity and its fundamental postulate.
   12.4   Deduce Einstein's mass -energy relation

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

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OBJECTIVES

To provide opportunity to acquire knowledge and understanding on :
- importance of civics and its relationship with other social sciences
- the relationship of an individual with other individuals in a society
- social organizations, state and government
- rule of law, public opinion and political parties
- UNO and its roles
- the basic concepts and principles of economics and human endeavor in the economic system.
- the realities of Bangladesh economy and the current problems confronting the country.
- the role of Diploma Engineers in industries.
- occupations and career planning for Diploma Enginers.

SHORT DESCRIPTION

Civics and Social Sciences; Individual and Society; Nation and Nationality; Citizenship; state and government; Law; Constitution; Government and its organs; public Opinion; Political Party; UNO and its organs;

Scope and importance of Economics; Basic concepts of Economics- Utility, Wealth, consunmption, income wages and salary and savings; Production – meaning, nature, factors and laws; Demand and Supply; Current economic problems of Bangladesh; Role of Diploma Engineers in the economic development of Bangladesh; Occupations and career planning; Engineering teem.

Part-1 (Civics)

1. Understand the meaning and scope of civics and inter relations of social sciences.
   1.1. Define social science.
   1.2. State the meaning and scope of civics.
   1.3. Explain the importance of civics in the personal and social life of an individual.
   1.4. Describe the relationship of all social science (civics, Economics, political science, sociology, ethics)

2. Understand the relationship of the individual with the society, Nationality and nation, Rights and duties of a citizen.
   2.1 Define the concept (individual, society, Nation, Nationality, citizen and citizenship).
   2.2 State the relationship among the individuals in the society.
   2.3 Differentiate between nation and nationality.
   2.4 Describe the elements of nationality

2.5   Describe the criteria of Bangladesh nationalism.
2.6   Diferentiate between a citizen and an alien.
2.7   Discuss the methods of acquiring citizenship and state the causes of losing citizenship
2.8   Describe the rights of a citizen and state the need for developing good citizenship.

3.   Appreciate the relationship between the state and government, law and organs of government.
    3.1   Meaning the state, government and law
    3.2   Discuss the elements of state.
    3.3   Discuss the classification of the forms of government
    3.4   Distinguish between cabinet form of Government and presidential form of government.
    3.5   Describe the main organs of Government (legislature, Executive and judiciary)
    3.6   Discuss the sources of law

4.   Understand and the classification of constitution
    4.1   Explain the deferent form of Constitution
    4.2   Explain the merits and demerits of different forms of constitution and state the salient feature of Bangladesh constitution

5.   Understand the importance of the formation of public opinion and the role of political parties in the affairs of state and government.
    5.1   Define the public Opinion and political party.
    5.2   Explain the importance of public opinion in the modern democratic society.
    5.3   Discuss the role of different media in forming public opinion.
    5.4   Discuss the importance of political parties in democracy.

6.   Understand the role of UNO in maintaining world peace
    6.1   Explain the major functions of UNO.
    6.2   State the composition and functions of General Assembly.
    6.3   Describe the Composition and functions of security council.
    6.4   Discuss the role of Bangladesh in the UNO.

Part-2 (Economics)

1. Understand the importance of the study fundamental concepts of economics.
    1.1   Discuss the definition of Economics as given by eminent economists.
    1.2   Describe the scope and importance of economics of Technical Student.
    1.3   Define commodity, utility, value, wealth, consumption, income, savings wages and salary.
    1.4   Differentiate between value in use and value in exchange.
    1.5   Explain wealth with its characteristics.

2.   Understand the production process and the concept of the law of diminishing returns in the production process.
    2.1   Discuss production mode and process
    2.2   Explain the nature of different factors of production.
    2.3   Discuss the law of diminishing returns.
    2.4   State the application and limitations of the law of diminishing returns.
    2.5   Describe the law of production (increasing constant and diminishing).

3.   Appreciate the importance of the concept of elasticity of demand.
    3.1   Illustrate the law of diminishing utility.
    3.2   Define the marginal utility explain the law of dimishing marginal utility.
    3.3   define the term, "demand"
    3.4   Describe elasticity of demand and factors which determine the elasticity of demand
    3.5   Describe elasticity of supply with the help a supply curve.

4.   Understand national income and population control.
    4.1   Explain national income.
    4.2   Discuss GDP and GNP.
    4.3   Discuss growth rates.
    4.4   Explain features of Bangladesh population.
    4.5   State measures to be undertaken to arrest high growth rate of population.

5.   Understand the current issues and the avilability and use of natural resource in the economic development of Bangladesh
    5.1   Identify major problems of rural and urban economy.
    5.2   Explain income distribution in alleviating poverty in equality and discrimination.
    5.3   Explain the migration of rural population to urban areas.
    5.4   List of the Natural resource of Bangladesh and classify them according to sources of availability.
    5.5   Explain the importance of the mine, forest and water resources and protential uses for sustainable development.

6. Understand the role of a Diploma Engineer in the Development of Bangladesh Economy.
    6.1 Explain the concept of the term, "Engineering team"
    6.2 Identify the functions of Engineers, Diploma Engineers, craftsmen forming the engineering team.
    6.3 Discuss the role of a Diploma Engineer in the overall economic development of Bangladesh.

7. Appreciate the career prospects for Diploma Engineers in different production/service engineering organizations.
    7.1 Explain the employment opportunities for diploma engineers in different sectors and sub Sectors of economy
    7.2 Explain socio-economic status of a diploma Engineer.
    7.3 Explain prospects of diploma Engineers in self-employment.