

- 1.0 SUBJECT TITLE : Programming in C**  
**2.0 SUBJECT CODE : 201**  
**3.0 PAPER CODE : 6341**  
**4.0 SEMESTER : Two**  
**5.0 RATIONALE :**

'C' is a general-purpose computer programming language. Originally C was designed for implementing system software; it is also widely used for developing portable application software. C is one of the most popular programming languages. It is widely used on many different software platforms for developing versatile applications.

For Diploma course this subject intends to develop basic programming skills in the students'. The students will learn the step by step procedure (i.e. Algorithm and flowcharting) in any program development process. The programming skills thus acquired using 'C' language can be used in developing programs for the scientific and business purposes. This subject will also serve as a first course of programming language later which will be useful to understand more advanced Object oriented Languages such as C++ or Java.

## 6.0 TEACHING AND EXAMINATION SCHEME;

THEORY COMPONENT							PRACTICAL COMPONENT					
LECTURES HRS. PER WEEK	CONTINUOUS EVALUATION			END OF THE TERM / SEMESTER EVALUATION		TOTAL MARKS (THEORY)	PRACTICAL HRS. PER WEEK LAB. WORK	CONTINUOUS EVALUATION	END OF THE TERM/ SEMESTER EVALUATION		TOTAL MARKS (PRACTICAL)	TOTAL MARKS (THE. + PRACTICAL)
	TERM WORK	PROGRESSIVE TESTS		THEORY PAPER				LAB. WORK	PRACT./ ORAL EXAM. (VIVA -VOCE)			
		I	II	MARKS					MARKS	DURATION (Hrs.)		
5	15	10	10	100		135	3	15	50	3 hrs.	65	200

## 7.0 ENABLING OBJECTIVES:

The students after completing the course will be able to –

- 7.1 Use a C programming environment including an editor, compiler, linker, and debugger.
- 7.2 Create simple programs for input and output operations
- 7.3 Understand and apply control structures of a procedural programming language
- 7.4 Understand and apply the principles of data storage and manipulation
- 7.5 Develop program modularity by creating functions and using library functions and header files
- 7.6 Perform tests in programs by using the "if" and "switch" control flow branching statements and repeat code segments by including "for, while," and "do...while" control flow loops
- 7.7 Use critical thinking skills to develop and debug C programs
- 7.8 Read and modify C programs written by others

## 8.0 DETAILED COURSE CONTENTS:

### CHAPTER – Introduction To 'C' Programming 1.0

- 1.1
  - Introduction
    - Algorithms, Flowcharts, structured programming Concepts, History and features of 'C', 'C' Programme structure, Pre-processor directives
  - Character set and data types
- 1.2
  - Character set of 'C', identifiers, keywords, variables, Constants, data types, int, float, double, char, Qualifiers, long, short, unsigned and signed data type conversion, Escape sequences ((like \n, \b etc.), Comments
  - Operators and Expressions
    - Arithmetic, Relational, Logical, Assignment operators, unary & ternary operations, hierarchy of operators.
- 1.3
  - Input & Output Statements
    - Input and Output statements, Printf, Scanf, getchar, putchar, getch, putch, Conversion specifiers in format control string,
- 1.4

### CHAPTER – Decision Control Statements 2.0

- Conditional branching statements: if statement,
- if- else, nested if
- use of logical operators and Compound Relational Tests
- Unconditional branching: goto statement
- Multiple branching statements: switch case statement.

**CHAPTER – 3.0 Loop Control Statements**

- Loop Statements: syntax and use of 'for' statement, while statement, 'Do-while' statement, 'break-continue' statement, nested looping.

**CHAPTER – 4.0 Arrays & Strings**

- 4.1 • Arrays:
  - Concept of one dimensional and Multi-dimensional array, array declaration, Array initialisation, operations on one and two-dimensional arrays.
- 4.2 • String Manipulations
  - Strings, gets, puts, string operations, string function (concatenation, comparison, length of a string etc.)

**CHAPTER – 5.0 Functions & Macro**

- Library and User-Defined Functions
  - Concepts of library functions, Library functions (ceil, floor, exp, log, pow, fmod, abs, fabs, rand, srand, toupper, tolower, toascii etc.)
  - user-defined Functions, Function declaration, Function prototype, local and global variables
  - Parameter passing mechanisms, recursion
  - Storage classes –static auto, extern, register
  - simples and Conditional Macros and Its expansions

**CHAPTER – 6.0 Pointers**

- 6.1 • Definition, Types, Declaration, & and \* operator, pointer expression, pointer arithmetic, pointer to pointer, array of pointer, pointer to function.
- Dynamic memory management functions-malloc, calloc and free.

6.2

**CHAPTER – 7.0 Structure, Union and Enumeration**

- 7.1 • Structure:-Definition, Declaration, initializing structure, membership operator, accessing structure elements, structure within structure , array of structure, pointer to structure.
- Union:-Definition, Declaration and Implementations
- 7.2 • Enumerated Data Type:- Definition, Declaration and Type Def
- 7.3 • Command line argument.
- 7.4

**CHAPTER – 8.0 File handling**

- File system basics, Opening & closing file, Reading & writing in file, File opening modes, String I/O in files.

**9.0 SUGGESTED SPECIFICATION TABLE (THEORY) :**

CH. NO.	CHAPTER NAME	HOURS/ PERIODS	TENTATIVE DISTRIBUTION OF MARKS			
			K	U	A	TOTAL MARKS
1.	Introduction To 'C' Programming					14
2.	Decision Control Statements					12
3.	Loop Control Statements					14
4.	Arrays & Strings					10
5.	Functions & Macro					14
6.	Pointers					12
7.	Structure, Union and Enumeration					12
8.	File handling					12
<b>TOTAL</b>						100

**Abbreviations:** K=Knowledge level, U = Understanding Level,  
A=Application level

**10.0 SUGGESTED IMPLEMENTATION STRATEGIES :**

The teachers are expected to give assignments to develop programs to the students soon after the completion of the concerned topic. The number of assignment will depend upon the availability of time. Sample question on the topic covered can be given to the students to make the teaching/learning process more effective. The programs that the teachers give to the students either in the classroom or as a take home assignment can be problems related to the other Courses taught in the discipline, like from mathematics/physics/mechanics/fundamental of electrical engineering etc.

The program that will be developed by the students should be general, interactive and structured. At the completion of this course the students are expected to understand the syntax and semantic of 'C' Language and develop proficiency in programming skills.

**11.0 SUGGESTED LIST OF EXPERIENCES/TUTORIALS :**

- 11.1 Assignment to prepare general algorithms and flow chart.
- 11.2 Study of turbo C editor -file menu, edit menu, run menu, compile menu etc.
- 11.3 Assignment to write character, operator set of C Language.
- 11.4 Assignment to identify valid and invalid variables, constants and expressions.
- 11.5 Program based on Input/Output statements.

- 11.6 Programs based on Arithmetic expression.
- 11.7 Programs based on goto statement.
- 11.8 Programs based on 'if' and 'Nested if'
- 11.9 A Program based on 'switch case' statement.
- 11.10 At least one program based on each:
  - i. 'for' statement
  - ii. 'while' statement
  - iii. 'do-while' statement
  - iv. break continue statement
- 11.11 program based on pointer expression.
- 11.12 program based on pointer arithmetic.
- 11.13 program based on pointer to pointer.
- 11.14 program based on array of pointer.
- 11.15 program based on dynamic memory management functions.
- 11.16 Program based on two dimensional array.
- 11.17 Program based on Library functions
- 11.18 Programs based on string operations
- 11.19 Programs based on functions.
- 11.20 program based on pointer to function.
- 11.21 program based on Parameter passing mechanisms.
- 11.22 programs based on recursion .
- 11.23 program based on macros.
- 11.24 program based on storage classes.
- 11.25 program based on structure,union and enumeration.
- 11.26 program based on command line argument
- 11.27 programs based on files.

(Above list a tentative list of possible practical/ experiments/ demonstration etc. teachers can design new and innovative practical and give more opportunities for the students to learn practical skills)

## 12.0 SUGGESTED LEARNING RESOURCES:

12.1 Textbooks/Reference books (as mentioned below).

S.No.	TITLE	AUTHOR, PUBLISHER, EDITION AND YEAR OF PUBLICATION	ISBN NUMBER
1.	Programming in C	Balagurusamy ,Tata Mc-Graw hill Publishing Company Ltd., New Delhi, IInd Edition 2000.	
2.	Let us Learn 'C'	Yashwant Kanetkar ,BPB Publications, B-14, Connaught Place, New Delhi, IIIrd - Edition,2000.	
3.	The Spirit of C	Mullish Cooper, Jaico Publishing House, 121, N.G. Road, Mumbai,	

		2000	
4.	The C Programming Language .	<u>Kernighan, Brian W.; Dennis M. Ritchie, Prentice Hall</u>	<u>ISBN 0-13-110163-3</u>
5.	C: The Complete Reference	Herbert Schildt, 4 edition, McGraw-Hill Osborne Media;	
6.	Exploring C	Yashwant Kanetkar ,BPB Publications, B-14, Connaught Place	

## 12.2 Web sites

<http://www.w3schools.com>

## 13.0 TENTATIVE LIST OF LABORATORY EQUIPMENT ;

13.1 Computers equipped with all necessary software.

## 14.0 LIST OF EXPERTS AND TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

1. Mr. Anupam Chaudhary, Lecturer CSE, Govt. Kalaniketan Polytechnic, Jabalpur
2. Mr. Dharmendra Likhare, Lecturer CSE, Govt. Kalaniketan Polytechnic, Jabalpur

\*\*\*\*\*

- 1.0 SUBJECT TITLE : ENVIRONMENTAL ENGINEERING & SAFETY**  
**2.0 SUBJECT CODE : 202.**  
**3.0 PAPER CODE : 6035**  
**4.0 SEMESTER : TWO**  
**5.0 RATIONALE :**

In the era of technology integration , it has become unavoidable to possess the basic knowledge of interdisciplinary area Environmental Engineering & Safety. Engineers and scientists from a number of related disciplines have been involved over years in the development of an academic basis for understanding and management of the environment. The purpose of keeping the Environment Engineering & Safety is to introduce a unique approach to the overall concept of environmental engineering that emphasizes the relationship between the principles observed in natural purification processes and those employed in engineered processes.

#### 6.0 TEACHING AND EXAMINATION SCHEME :

TEACHING AND EXAMINATION SCHEME :													
LECTURES  HRS.  PER WEEK	THEORY COMPONENT					TOTAL  MARKS (THEORY)	PRACTICAL  HRS. PER WEEK	PRACTICAL COMPONENT				TOTAL  MARKS (PRACTICAL)	TOTAL MARKS (THEORY + PRACTICAL)
	CONTINUOUS EVALUATION		END OF THE TERM / SEMESTER EVALUATION					CONTINUOUS EVALUATION LAB. WORK	END OF THE TERM/ SEMESTER EVALUATION		TOTAL MARKS (PRACTICAL)		
	TERM WORK	PROGRESSIVE TESTS		THEORY PAPER					PRACT./ ORAL EXAM. (VIVA -VOCE)				
		I	II	MARKS	DURATION (Hrs.)					MARKS			
06	15	10	10	100	03	135	02	15	50	03	65	200	

#### 7.0 ENABLING OBJECTIVES :

The students after completing the course will be able to –

- 7.1 identify the sources and effects of air pollution.
- 7.2 explain the meteorological aspects of air pollutant dispersion.
- 7.3 understand the air pollution control methods and equipment.
- 7.4 determine SPM, CO, NO<sub>x</sub>, SO<sub>2</sub> in air.

- 7.5 determine CO, HC, in exhaust gases from petrol vehicle.
- 7.6 identify the sources and effects of water pollution.
- 7.7 determine BOD/COD ratio in industrial waste water.
- 7.8 determine pH, alkalinity and acidity in industrial waste water.
- 7.9 determine solids in industrial waste water.
- 7.10 determine turbidity, colour and temperature of industrial waste water.
- 7.11 describe standards for drinking water and air pollution.
- 7.12 describe effluent standards for water disposal.
- 7.13 describe the waste water treatment methods.
- 7.14 describe the safety practices.

## **8.0 DETAILED COURSE CONTENTS :**

### **Chapter 1.0 INTRODUCTION TO ENVIRONMENT.**

- 1.1 The Biosphere, biotic and abiotic
- 1.2 An aquatic ecosystem
- 1.3 Types of pollution
- 1.4 Impact of human being on environment.
- 1.5 Impact of environment on human being
- 1.6 Basic approach to improve environmental qualities
- 1.7 Role of an environmental engineer

### **Chapter 2.0 AIR POLLUTION SOURCES AND EFFECTS**

- 2.1 Standard definition of air pollution
- 2.2 Composition of natural air
- 2.3 Names of air pollutants
- 2.4 Classification of air pollutants, primary and secondary pollutants
- 2.5 Classification of source of air pollutants on different bases
- 2.6 Definition of different types of aerosols.
- 2.7 Effect of air pollution on: human health, material properties, vegetation.
- 2.8 Major toxic metals and their effects
- 2.9 Major environmental phenomenon e.g., acid rain, global warming, greenhouse effect, ozone layer depletion.
- 2.10 Air quality standards
- 2.11 Brief description of air pollution laws.

### **Chapter 3.0 METEOROLOGICAL ASPECTS OF AIR POLLUTANT**

#### **DISPERSION**

- 3.1 Meteorological parameters influencing air pollution
- 3.2 Environmental lapse rate, temperature inversion, atmospheric stability and adiabatic loss rate.
- 3.3 Turbulence, topographical effects,
- 3.4 Plume behavior, looping, coning, fanning fumigation, lofting, trapping.



**Chapter 4.0 AIR POLLUTION CONTROL METHODS AND EQUIPMENTS**

- 4.1 Natural purification processes of air
- 4.2 Artificial purification methods of air
- 4.3 Brief description of following control equipments along with sketch e.g, gravitation settling chamber, cyclone, scrubber, bag house filter, electrostatic precipitator.
- 4.4 Brief description of following processes for the control of gaseous pollutants e. g., absorption, adsorption, condensation, combustion etc

**Chapter 5.0 WATER POLLUTION SOURCES AND CLASSIFICATION**

- 5.1 Water resources
- 5.2 Uses of water
- 5.3 Classification of water
- 5.4 Origin, composition and characteristics of domestic waste water as well as industrial waste water
- 5.5 Biochemical oxygen demand
- 5.6 Water pollution laws and standards
- 5.7 Uses of waste water
- 5.8 Classification of waste water
- 5.9 Chemical oxygen demand

**Chapter 6.0 WASTE WATER TREATMENT METHOD**

- 6.1 Basic processes of water treatment
- 6.2 Meaning of primary, secondary and tertiary treatment
- 6.3 Flow chart of a simple effluent treatment plant
- 6.4 Theory of industrial waste treatment
- 6.5 Volume reduction, neutralization and proportioning

**Chapter 7.0 SOLID WASTE MANAGEMENT**

- 7.1 Sources and classification of solid waste
- 7.2 Public health aspects
- 7.3 Disposal methods – open dumping , sanitary , land fill
- 7.4 Incineration , compositing
- 7.5 Potential methods of disposal
- 7.6 Recovery and recycling of paper, glass, metal and plastic

**Chapter 8.0 NOISE POLLUTION AND CONTROL**

- 8.1 Sources of noise pollution
- 8.2 Units of Noise pollution measurement
- 8.3 Allowable limits for different areas
- 8.4 Problems of noise pollution and measures to control it
- 8.5 Noise pollution control devices brief discussion

## Chapter 9.0 SAFETY PRACTICES

- 9.1 Responsibility of employees and employers regarding health and safety
- 9.2 Fire hazards ,prevention and precautions
- 9.3 Industrial hazards prevention and protection
- 9.4 Protection from air and noise pollution

### 9.0 SUGGESTED SPECIFICATION TABLE (THEORY) :

CH. NO.	CHAPTER NAME	HOURS/ PERIOD S	TENTATIVE DISTRIBUTION OF MARKS			
			R	U	A	TOTAL MARKS
1.0	Introduction to Environment.	08	3	3	-	06
2.0	Air Pollution Sources and Effects	10	2	4	4	10
3.0	Meteorological Aspects of Air Pollutant Dispersion	08	2	4	4	10
4.0	Air Pollution Control Methods and Equipments	12	2	4	4	10
5.0	Water Pollution Sources and Classification	14	4	4	4	12
6.0	Waste Water Treatment Method	14	4	4	4	12
7.0	Solid Waste Management	10	4	4	4	12
8.0	Noise Pollution and Control	08	2	4	2	08
9.0	Safety Practices	06	2	4	4	10
		90				100

**Abbreviations:** R=Remembrance, U = Understanding Level,  
A=Application level

### 10.0 SUGGESTED IMPLEMENTATION STRATEGIES :

Students should be given live demonstrations of different concepts related to air, water, noise pollution and safety practices to be followed. visits should be arranged for water treatment plant, sewage treatment plant and to maintenance work of water supply mains and sewage system.

### 11.0 SUGGESTED LIST OF PRACTICALS/DEMONSTRATIONS (PRACTICAL HOURS : 30 Hrs.)

S.NO.	LIST OF PRACTICALS
1	<b>GROUP A : AIR POLLUTION ( Any one experiment may be selected from this group)</b>
2	1) Air monitoring and determination of SPM , CO, NO <sub>x</sub> , SO <sub>2</sub> with high volume sampler. 2) Monitoring of stack gases and determination of SPM , CO, NO <sub>x</sub> , SO <sub>2</sub> with slack monitoring kit. 3) Determination of CO,HC, in exhaust gases from petrol vehicle
3	<b>GROUP B : NOISE POLLUTION</b> 1) Determination of sound pollution in (a) Auditorium (b) Factories (c) Busy roads (d) Theatre (e) TV rooms ( select any three situations)
4	<b>GROUP C : INDUSTRIAL WASTE WATER (Any Two experiment may be selected from this group)</b> 1) Determination of BOD/COD ratio in industrial waste water. 2) Determination of pH and alkalinity/ acidity in industrial waste water. 3) Determination of solids in industrial waste water. 4) Determination of turbidity, colour, and temperature of industrial waste water.
	<b>GROUP D : POLLUTION STANDARDS(Any Two experiment may be selected from this group)</b> 1) Study of drinking water standards. 2) Study of effluent standards for water disposal. 3) Study of air pollution standards.

### 12.0 SUGGESTED LEARNING RESOURCES :

- (1) Reference Books.
- (2) Laboratory Manuals
- (3) CAI Packages
- (4) OHP Transparencies
- (5) Laboratory Model, Demonstration and Charts
- (6) IS Codes

### 12.1 REFERENCE BOOKS :

S. NO.	TITLE	AUTHOR/PUBLISHED /EDITION AND YEAR OF PUBLICATION
(1)	Environmental pollution control Engineering	C.S. Rao
(2)	Air pollution and control	Seth
(3)	Air pollution	M.N Rao
(4)	Industrial waste and its treatment	Seth
(5)	Paryavaran Yantriki	Hindi Granth Acadamy

**13.0 TENTATIVE LIST OF LABORATORY EQUIPMENT ;**

- 1 DIGITAL PH METER  
PH Range – 0 to 14 pH  
Millivolt Range – 0 to 1999 MV  
Resolution – 0.01 ph, 1 MV  
Repeatability - + 0.01 ph 1 digit + 1 MV + 1 digit  
Temperature 0 to 100 degree C  
Compensation – 4 digit LCD Display with Automatic Polarity Indication  
Power Supply 220/240 V., 50 Hz., Single phase.  
Included – One set of standard glass and referenced electrode with stand clamp
- 2 TURBIDITY METER  
Range : 0 to 1000 NTU  
Accuracy : + 3% of FSD in 0-1000 NTU  
Detector : Variable range tube  
Calibration : With formazine standard solution  
Power Supply 220 V, 50 Hz, Single phase  
A.C. 220 to 240 V.
- 3 PHOTOCHEM COLORIMETER  
Complete with built 1-5 filter disc with glass filter (Having peak transmission at 420mm, 490, 540,590,650mm), test tube holder one dozen matched and marked test tube, dust cover, spare lamp with digital display of percentage transmission (%T) and concentration.
- 4 DIGITAL TYPE CHLOROSCOPE FOR RESIDUAL CHLORINE  
Range – 0 to 10 Mg. per litre  
Resolution – 0.1 Mg/litre  
Electrode – Membrane Type Pole Graphics  
Power – Dry Batteries
- 5 DIGITAL D.O. METER FOR SEWAGE SAMPLE  
Digital display type  
Range 0 to 20 Mg./litre. Automatic temp. compensation Temp. range 0 to 45 C.
- 6 B.O.D. INCUBATOR FOR SEWAGE SAMPLE  
Electronic digital read out. Temp. range 50 C with accuracy + 10 C.  
Thermostatic controlled +50C. Capacity 285 litre with built in Thermometer and three compartments with usual accessories.
- 7 SOXHLET APPARATUS FOR COD EXPERIMENT  
Fitted with suitable condenser Heating arrangement consisting of soxhlet Extraction heater for 6 Flasks each of 250 ml. And with individually indicator lamp/regulator and provided with steel upright bars with cross arms Adjustable for Height
- 8 BACTERIOLOGICAL COLONY COUNTER  
With 110 mm Magnifying glass and Lighting arrangement.
- 9 BACTERIOLOGICAL INCUBATOR (HOT COUNT)  
For variable temp. control 30 XC to 70 degree C for M.P.N. Count and plate count chamber.  
Size 4000 X 380 X 700 mm Double door.
- 10 JAR TEST (FLOCCULATOR)

- With six stainless steel stirrers and six jars having capacity 1 litre each with variable speed arrangement speed controlled from 10 to 150 R.P.M. complete with paddles and illuminator.  
Power Supply 230 V, 50 Hz, AC
- 11 CENTRIFUGE  
Maximum speed : 3500 R.P.M.  
No. of tubes : 4  
Tubes size : 15 ml.  
Power Supply 230 V, 50 Hz, AC
- 12 MECHANICAL STIRRER  
Capacity 6-8 litres  
Variable speed from 50 hrs/hrs Output capacity with up flow treatment and with pre-filter cation, anion resin columns.  
Not general use
- 13 WATER SOFTNER (DC IONIZER) PORTABLE TYPE  
Minimum 50 hrs/hrs Output capacity with up flow treatment and with pre filter cation, anion resin columns  
Not general use.
- 14 WATER ANALYSIS KIT  
It can test for total dissolved solids, Nitrates, chlorides/sulphates, carbonates, pH, Bacteriological test, comprise of chloride tablets, Nitrates tablet, tubes, Thermometer beaker, dunnel & T.D.S. meter
- 15 HOT AIR OVEN  
Double walled with annealed inner chamber made of stainless/stainless steel sheet and outer surface of M. Sheet  
Range – 0 to 125 degree C  
Size 355 X 355 mm with 2 nos. shelves and air circulating fan
- 16 REFRIGERATOR  
Capacity 165 Litre  
Power Supply 230 V, 50 Hz, AC
- 17 WATERBATH  
Capacity of 5 litres  
Electrically operated with temp, control, Range 0 to 250 C + 1 C
- 18 L.P.G. CYLINDERS  
With regulator for burner's (With tube & burner)
- 19 WATER SAMPLER  
Shallow and deep well water samplers
- 20 SPECTROPHOTOMETER DIGITAL  
Wavelength range 200-900 nm resolution 5 nm photometric accuracy  
+ 0.002 ABS (ABSO 0.5 – 1)  
+ 0.004 ABS (ABO 0.5 – 1)  
+ 0.3% T  
Fixed slit width, 5 mm spectral bandwidth silicon cell, with light sources of Halogen lamp.
- 21 HOT AIR OVEN  
Double walled, sturdy outer chamber steel inner chamber-anodized Aluminum size 605 X 605 X 605 mm shelves 0 to 250 degree c. hermostate controlled + 1 degree cent.

- 22 VERTICAL AUTOCLAVE BRASS BOILER AND ALUMINIUM BASKET  
Size 300 X 500 mm depth with water level arrangement 0.5 to 1.5 kg./cm<sup>2</sup>, Single phase power supply 220 v, 50 Hz.
- 23 ELECTRIC HOT PLATE WITH REGULATOR ROUND  
205 MM DIA, TEMP. 350 deg. c top surface, Temp. controlled loader I-Phase
- 24 HEATING MANTELS WITH MAX SURFACE TEMP. 400 DEGREE C  
High quality with off on switch single size ; 20 lit, 3 X 600 with energy regulator.  
Single phase 220 v, 50 Hz.
- 25 INVERTED MICROSCOPE  
Heavy Stable base with off on switch single size : 20 lit, 3 X 600 with energy regulator.  
Single phase 220 v, 50 Hz.
- 26 REFRIGERATED WATER LIQUID BATH  
Heating cooling bath temp. range – 10 to 60 degree C.  
Accuracy + 1 degree C.  
Size 500 X 250 X 250 mm  
Inside – Stainless Steel  
Outside – Mild Steel
- 27 WATER DISTILLATIONS APPARATUS  
With fume duct and mild steel stand (Tubular)  
Codenser rock and individual heater of 500 W for 300, 500 and 800 ml flasks with 3 test heating mantle and energy regulator 220 Vertical, 10, 50 Hz.
- 28 HIGH VOLUME AIR SAMPLER WITH ATTACHMENTS FOR GASEOUS  
Electronic timer with quartz crystal clock and battery backup of time programming  
By 6 digits impulse to records, actual time in minutes.  
Range 0-24 hrs.  
Specification : Section – Unit.  
Flow Rate, Filter Holders, Cabinet Voltage Stabiliser, Flow Measurements,  
Particulars Sampling Time Up, Gaseous Sampling Kits, Gas Fibre Filter Papers,  
Size 8" X 10" – One pkts. Gas Impugner 35 ml. Moulded Reinforced Plastic Tray for Impugner, Impugner Carry Case for 27 Impugners, Carbon Burses.
- 29 WATER DISTILLATION APPARATUS :  
Table pattern, Barnstead type, capacity 8 litres per hour.
- 30 GLASSWARE (of different size)  
Beaker, Watch Glass, Spatula, Crucible, Reservoir Bottle, Burette, Pipette, Wire Gauge, Reagent Bottle, Conical Flask, RBFB 24, Condenser Vertical, Measuring Cylinder, Crucible Adopter, Volumetric Flask, Burette Stand, Bunsen Burner, Wash Bottle, Test Tube, Test tube stand, Pipette Stand, Thermometer, Separating Funnel, Petri Dish.

31      CHEMICALS : (As per requirement)

**14.0 LIST OF EXPERTS AND TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM ;**

- |                        |   |   |
|------------------------|---|---|
| (1) Shri R.C. Gupta    | - | Selection grade Lecturer(Civil Engg),<br>Ujjain Polytechnic College, Ujjain |
| (2) ShriH.P. Dishoriya | - | Sr.Lecturer (Civil Engg)<br>S.V.Polytechnic College, Indore                 |
| (3) Subhash Laad       | - | Sr.Lecturer (Civil Engg)<br>S.V.Polytechnic College, Indore                 |

-----

**1.0 SUBJECT TITLE : DIGITAL TECHNIQUES**

**2.0 SUBJECT CODE : 203**

**3.0 PAPER CODE : 6342**

**4.0 SEMESTER : TWO**

**5.0 RATIONALE :**

This subject will help the students to learn facts, Concepts, principle and procedure of digital electronics. These techniques can be used for designing sequential and combinational circuits, which forms the basis of any electronic device.

## **6.0 TEACHING AND EXAMINATION SCHEME ;**

THEORY COMPONENT							PRACTICAL COMPONENT					
LECT- URES Hrs. PER WEEK	CONTINUOUS EVALUATION			END OF THE TERM / SEMESTER EVALUATION		T O T A L  M A R K S (T H E O R Y)	PRA- CTI- CAL Hrs. Per Week	CONTINUOUS EVALUATION  LAB. WORK	END OF THE TERM/ SEMESTER EVALUATION		T O T A L  M A R K S (P R A C.)	T O T A L  M A R K S (T H E. + P R A C.)
	TERM WORK	PROG- RESSIVE TESTS (TWO)		THEORY PAPER					PRACTICAL/ ORAL EXAMINATION (VIVA)			
				MARKS	DUR- ATION (Hrs.)							
		I	II									
4	15	10	10	100	3 Hrs.	135	2	15	50	3 Hrs.	65	200

## **7.0 ENABLING OBJECTIVES :**

The students after completing the course will be able to –

- 7.1 Compare analog & Digital Signals
- 7.2 Explain Logic gates
- 7.3 Verify Demorgan's theorem
- 7.4 Design Simple Combinational logic circuits using K-Map
- 7.5 Design Simple Combinational Logic circuits. Using MSI & LSI circuits
- 7.6 Explain the concepts of various ICs
- 7.7 Explain various sequential logic circuits.



## **8.0 DETAILED COURSE CONTENTS:**

### **CHAPTER – 1.0 FUNDAMENTAL CONCEPTS:**

- 1.1 Comparison between analog and digital signals.
- 1.2 Different types of number system and codes used in digital computers.

### **CHAPTER – 2.0 LOGIC GATES :**

- 2.1 Basic Logic Gates: Logic symbols and truth table of all gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR
- 2.2 Realization of all other gates using universal gate.

### **CHAPTER – 3.0 BOOLEAN ALGEBRA:**

- 3.1 Rules and laws of Boolean algebra, Demorgan's theorem.
- 3.2 Evaluation of logic expression, algebraic reduction of Boolean

### **CHAPTER – 4.0 COMBINATIONAL LOGIC DESIGN**

- 4.1 Introduction to logic design
- 4.2 Karnaugh map representation of logical functions, Simplification of logical function using K-map, (2, 3, 4 variable) Sum of products (SOP) Product of Sum (POS)
- 4.3 Don't care conditions.
- 4.4 Design example: half adder, full adder, Half subtractor, full subtractor, BCD to seven-segment decoder (using k-map)
- 4.5 Gray to binary code converter (using k-map)
- 4.6 Universal Gate

### **CHAPTER – 5.0 COMBINATIONAL LOGIC DESIGN USING MSI AND LSI CIRCUITS**

- 5.1 Multiplexer (1:1) demultiplexer (1:4), Decoder (3:8) encoder (8:3) using combinational logic design.
- 5.2 BCD adder, using (7483). ALU(74181). Digital comparator (7485), Parity generator/checkers(74180).
- 5.3 Code converters: BCD to binary(74184), Binary to BCD(74185A)
- 5.4 Priority encoder: Decimal to BCD(74147), Octal to binary priority encoder (74148) Hexadecimal to binary priority encoder using 74148 encoders.
- 5.5 Decoder/drivers for display device: BCD to decimal decoder/driver (7447, 7448)

### **CHAPTER – 6 LOGIC FAMILIES:**

- 6.1 Digital integrated circuits, its introduction
- 6.2 Introduction: RTL, DTL, IIL, ECL, MOS families
- 6.3 Propagation delay time, speed, power consumption, fan\_in, fan\_out.
- 6.4 TTL and C-MOS logic families: Introduction

- 6.5 Analysis of open collector and tri-state logic, Input/output parameters, advantages, applications,  
 6.6 IC-interfacing, TTL driving CMOS, CMO driving TTL

## CHAPTER – 7 SEQUENTIAL LOGIC CIRCUIT:

- 7.1 Introduction : One bit memory cell  
 7.2 Flip-Flop-S-R, Clocked RS, T,D, J-K, master slave , JK  
 7.3 Triggering of flip-flops, analysis of clocked sequential circuits, state reduction and assignment, Flip-flop excitation table, design procedures, design of counters, design with state equation. Working Principle and Truth-Table  
 7.4 Registers ,shift registers. Working with SISO,SIPO,PISO,PIPO shift registers .  
 7.5 Counters : Ripple counters, synchronous and asynchronous counters, timing sequences, Ring and Johnson counter, application of counters, Counter 4 Bit Counter, BCD

## 9.0 SUGGESTED SPECIFICATION TABLE (THEORY) :

CH. NO.	CHAPTER NAME	HOUR S/PER IODS	TENTATIVE DISTRIBUTION OF MARKS			
			K	U	A	TOTAL MARKS
1.0	FUNDAMENTAL CONCEPTS	6				8
2.0	LOGIC GATES	8				8
3.0	BOOLEAN ALGEBRA	8				10
4.0	COMBINATIONAL LOGIC DESIGN	12				20
5.0	CONBINATIONAL LOGIC DESIGN USING MSI AND LSI CIRCUITS	10				18
6.0	LOGIC FAMILIES	10				18
7.0	SEQUENTIAL LOGIC CIRCUIT	10				18
	<b>TOTAL</b>	64				100

**Abbreviations:** K=Knowledge level, U = Understanding Level,  
 A=Application level

## 10.0 SUGGESTED IMPLEMENTATION STRATEGIES :

- The subject will be taught as per the given study scheme for theory as well as practical.
- The identified practical sections will be conducted along with theory section.
- The subject teacher will prepare & provide learning material to students.
- A CBT ( Computer Based Training) may be more useful to learn these topics of digital techniques.

**11.0 SUGGESTED LIST OF EXPERIENCES/TUTORIALS :**

- 11.1 Study and Verify the truth table of logic gates (74xx series).
- 11.2 Realization of AND, OR, NOT and Ex-OR logic gates using NAND and NOR gate
- 11.3 Verification of Demorgan's theorem
- 11.4 Implementation of full adder, subtractor using gates
- 11.5 Study of gray to binary code convertor using gates
- 11.6 Study to multiplexer and demultiplexers.
- 11.7 Implementation of combination logic circuit using mux and Dmux.
- 11.8 Study of BCD adder
- 11.9 Study of BCD to seven segment decoder.
- 11.10 Verification of truth table of flip flop using IC's
- 11.11 Shift registers using D flip-flop.
- 11.12 Presetable shift right, shift left registers.
- 11.13 Ripple counter using J-K flip-flop.
- 11.14 Decode counter 7490.
- 11.15 Synchronous counter using J-K flip-flops.
- 11.16 Up/down counter.
- 11.17 Mod N counter using J-K flip-flop
- 11.18 Study of 6116 RAM.
- 11.19 Study of 2732 EPROM

**12.0 SUGGESTED LEARNING RESOURCES :**

12.1 Textbooks/Reference books (as mentioned below).

**12.1 REFERENCE BOOKS :**

S.No.	TITLE	AUTHOR, PUBLISHER, EDITION AND YEAR OF PUBLICATION	ISBN NUMBER
•	Digital principles	Malvino & Leach, Tata McGraw-Hill Publishing Company Ltd. New Delhi, Latest, 2000	
•	Modern Digital Electronics	R.P.Jain, Tata McGraw-Hill Publishing Company Ltd. New Delhi, 2nd Edition, 2000	
•	Digital Electronics	V.K. Puri, Tata McGraw-Hill Publishing Company Ltd. New Delhi, 1st Edition, 2000	
•	Computer Design Latest & Digital Techniques	Morris Mano, Tata MacGrawHills	
1.	Digital principles	Malvino & Leach, Tata McGraw-Hill Publishing Company Ltd. New Delhi, Latest, 2000	
2.	Modern Digital Electronics	R.P.Jain, Tata McGraw-Hill Publishing Company	

		Ltd. New Delhi, 2nd Edition, 2000	
3.	Digital Electronics	V.K. Puri, Tata McGraw-Hill Publishing Company Ltd. New Delhi, 1st Edition, 2000	
4.	Computer Design Latest & Digital Techniques	Morris Mano, Tata MacGrawHills	
5.	Digital principles	Malvino & Leach, Tata McGraw-Hill Publishing Company Ltd. New Delhi, Latest, 2000	
6.	Modern Digital Electronics	R.P.Jain, Tata McGraw-Hill Publishing Company Ltd. New Delhi, 2nd Edition, 2000	

### 13.0 TENTATIVE LIST OF LABORATORY EQUIPMENT ;

#### *S.No. Name of Item*

1. Digital LCR Meter
2. Analog Multimeter
3. Digital Multimeter
4. D.C. Ammeter
5. D.C. Voltmeter
6. AC Ammeter
7. AC Voltmeter
8. DC Regulated Low Voltage Variable Power Supply
9. DC Regulated Multiple Output Power Supply
10. Digital IC Power Supply
11. CRO Dual Trace, 20MHz
12. Digital Universal Counter
13. Pulse Generator
14. Digital IC Trainer (TTL)
15. Digital Logic Trainer (TTL)
16. Digital Logic Trainer (CMOS)
17. Logic Trainer Boards
18. Computer Trainer
19. Digital IC Function Tester

### 14.0 LIST OF EXPERTS AND TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM ;

- 1.
- 2.
- 3.

\*\*\*\*\*

- 1.0 SUBJECT TITLE : BASIC ELECTRICAL, ELECTRONICS & MEASUREMENTS**  
**2.0 SUBJECT CODE : 204**  
**3.0 PAPER CODE : 6343**  
**4.0 SEMESTER : TWO**  
**5.0 RATIONALE :**

The students after studying this subject will be able to understand the basics of electrical, electronics and measurements. Electricity finds its base as basic energy for modern industrial activities. Electronics, which is being extensively, used today, in all industries, power system operation, communication systems, computers and information technology. This course will form the base for handling various types of equipment used in IT industry and will facilitate in operation and maintenance to carry out his/her job function effectively.

#### 6.0 TEACHING AND EXAMINATION SCHEME ;

THEORY COMPONENT							PRACTICAL COMPONENT						T O T A L  M A R K S (T H E . + P R A C .)
LECT- URES Hrs. PER WEEK	CONTINUOUS EVALUATION		END OF THE TERM / SEMESTER EVALUATION		T O T A L  M A R K S (T H E O R Y)	PRA- CTI- CAL Hrs. Per Week	CONTINUOUS EVALUATION	END OF THE TERM/ SEMESTER EVALUATION		T O T A L  M A R K S (P R A C .)			
	TERM WORK	PROG- RESSIVE TESTS (TWO)	THEORY PAPER					LAB. WORK	PRACTICAL/ ORAL EXAMINATION (VIVA)				
MARKS			DUR- ATION (Hrs.)	MARKS	DURA- TION (Hrs.)								
	I	II											
6	15	10	10	100	3 Hrs.	135	2	15	50	3 Hrs.	65	200	

## **7.0 ENABLING OBJECTIVES:**

The students after completing the course will be able to –

- 7.1 Explain the concept of basic A.C. & D.C. circuits' parameters
- 7.2 Explain the concept of magnetic field
- 7.3 State faraday's law of electromagnet induction
- 7.4 Explain the concept of basic electrical A.C. quantities.
- 7.5 Describe motor, generator & transformer on the basis of
  - working principle
  - Combination
- 7.6 Explain the properties of semiconductor material
- 7.7 Describe half wave & full wave rectifier circuits
- 7.8 Explain the working principle of BJT
- 7.9 Explain the working principle of Basic measuring instruments.

## **8.0 DETAILED COURSE CONTENTS:**

### **CHAPTER – 1.0 REVIEW OF GENERAL TOPICS:**

- 1.1 Atomic Structure of Conducting and Semi-Conducting materials.
- 1.2 Behavior of materials with electricity.
- 1.3 Concept of unit of Electric current and Voltage
- 1.4 Ohm's Law, Concept of Resistance, Conductance, Resistivity and Conductivity. Their units and dependence on temperature
- 1.5 Power & Energy, heating effect of electric current and conversion of units (Mechanical to Electrical)
- 1.6 Kirchoff's Voltage and current Laws & their applications in simple DC Circuits.
- 1.7 Series & Parallel combination of resistance and wattage, Consideration with Simple Problems.

### **CHAPTER – 2.0 ELECTROMAGNETISM**

- 2.1 Concept of magnetic field production by flow of current, concept of magnetic flux, reluctance, permeability, Analogy between electrical & magnetic circuits.
- 2.2 Faraday's Laws of electromagnetic induction, self and mutually induced electromotive forces, simple numerical problems.

### **CHAPTER – 3.0 A.C. THEORY**

- 3.1 Concept of alternating voltage and current, difference between AC and DC.
- 3.2 Concept of cycle, frequency, period, amplitude, instantaneous value, average value, r.m.s. value and peak value, form factor (definitions only.)
- 3.3 Concept of impedance, phase angle, numerical problems, RL & RLC series circuits.

## **CHAPTER – 4.0    GENERAL ELECTRICAL MACHINES**

- 4.1    Introduction, definition of motor & generator and common features of static & rotating electrical machines.
- 4.2    Transformer- Construction- core type, shell type, transformation ratio and e.m.f equation

## **CHAPTER – 5.0    SEMI-CONDUCTOR PHYSICS**

- 5.1    Conducting materials, effect of temperature conductivity in Germanium and Silicon.
- 5.2    Extrinsic Semi-Conductors, doping, P-N type Semi-Conductor, majority and minority carriers, effects of temperature.
- 5.3    P-N junction, drift and diffusion currents, depletion layer, potential barrier , effects of forward and reverse biasing of P-N junction. Energy band diagrams, breakdown mechanism.

## **CHAPTER – 6.0    SEMI CONDUCTOR DIODES**

- 6.1    Use of diode as half wave and full wave (Centre tapped and bridge type) rectifiers. Relation between d.c. output and a.c. input voltage.
- 6.2    Concept of ripples, filter circuits, Shunt capacitor, Series inductor & filters and their applications.
- 6.3    Zener-diode and its V-I Characteristics.

## **CHAPTER – 7.0    TRANSISTORS**

- 7.1    Construction of bi-polar junction transistor with respect to :-
  - 7.1.1    Working-principle of transistor, forward and reverse biasing.
  - 7.1.2    Transistor Configuration-Common Base (CB), Common Emitter (CE) and Common Collector (CC), their Comparison of configuration and applications. General introduction of UJT, FET and SCR.

## **CHAPTER – 8.0    REGULATED POWER SUPPLY**

- 8.1    Need of regulated power supply, regulation, Block diagram of regulated power supply, stabilisation of voltage by Zener-diode, its limitations.
- 8.2    transistorised regulated power supply and short circuit protection

## **CHAPTER – 9.0    MEASURING INSTRUMENTS**

- 9.1    Working principle and Construction of Ammeters and Voltmeter, difference between them, extension of range and simple numerical problems.
- 9.2    Principle and working of Watt meter (dynamometer type) and Energy meter (static type)
- 9.3    Digital measuring instruments, Basic concepts of CRO.

**9.0 SUGGESTED SPECIFICATION TABLE (THEORY) :**

CH. NO.	CHAPTER NAME	HOURS/PERIODS	TENTATIVE DISTRIBUTION OF MARKS			
			K	U	A	TOTAL MARKS
1.0	REVIEW OF GENERAL TOPICS	8	10	8	0	18
2.0	ELECTROMAGNETISM	6	3	3	2	6
3.0	A.C. THEORY	6	6	4	2	12
4.0	GENERAL ELECTRICAL MACHINES	8	5	3	-	8
5.0	SEMI-CONDUCTOR PHYSICS	12	6	6	-	10
6.0	SEMI CONDUCTOR DIODES	12	5	5	-	12
7.0	TRANSISTORS	12	6	6	-	12
8.0	REGULATED POWER SUPPLY	8	3	3	-	6
9.0	MEASURING INSTRUMENTS	8	5	6	5	16
	<b>TOTAL</b>	80				100

**Abbreviations:** K=Knowledge level, U = Understanding Level,  
A=Application level

**10.0 SUGGESTED IMPLEMENTATION STRATEGIES :**

- According to the theory and practical schedules the subject teacher will complete the session.

**11.0 SUGGESTED LIST OF EXPERIENCES/TUTORIALS :**

- 11.1 Verification of Ohm's law
- 11.2 Verification of Kirchoff's law
- 11.3 Find out the value of capacitance of corrector
- 11.4 Plotting V-I Characteristics of semi-conductor diode.
- 11.5 Plotting V-I characteristics of Zener diode and finding its reverse breakdown voltage.
- 11.6 Observation of output wave shapes and input wave shapes of Full wave/Half wave rectifier.
- 11.7 Plotting input/output characteristics of CE configuration of transistor.
- 11.8 Measure voltage, current, power and energy in single phase AC circuit.
- 11.9 Colour coding of resistance and units of capacitance.
- 11.10 Study of AC/DC Voltmeter
- 11.11 Study of AC/DC Ammeter
- 11.12 Study of AC/DC Wattmeter



11.13 Study of Digital Instruments and Displays

11.14 Study of Regulated Power Supply

**12.0 SUGGESTED LEARNING RESOURCES :**

12.1 Textbooks/Reference books (as mentioned below).

**12.1 REFERENCE BOOKS :**

S.No.	TITLE	AUTHOR, PUBLISHER, EDITION AND YEAR OF PUBLICATION	ISBN NUMBER
1.	Electronic Technology	E.admiralty	
2.	Electrical Engineering basic technology	Hubscher, Klaue pfloger,Appelt, Willey Eastern Ltd, New Delhi	
3.	Electrical Engineering	J.B. Gupta	
4.	Experiments in basic electrical Engineering	S.K. Bhattacharya, S.K. Rastogi, K.M., New Age International , New Delhi	
5.	Problems in Electrical Engineering	Smith P., 1st ,1996,	
6.	A Text book of Applied Electronics	R.S. Sedha, S. Chand & Co.New Delhi	
7.	Principals of Electronics	Latest ,V.K.Mehta , S.Chand Publication	
8.	Electronics Principles	Malvino TMH	
9.	Electrical Technology	B.L.Thereja ,Chand Rai	
10.	Electronic Technology	E.admiralty	

**13.0 TENTATIVE LIST OF LABORATORY EQUIPMENT ;****S.No. Name of Item**

1. Ammeter (Moving Iron and Moving Coil)
2. Voltmeter
3. Multimeter(Analogue)
4. Multimeter(digital)
5. CRO
6. Wattmeter
7. Energymeter (static)
8. Power supply

**COMPONENTS**

1. Diode
2. Transistors
3. Resisters
4. Inductor
5. Capacitor
6. Connecting wires

**14.0 LIST OF EXPERTS AND TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM ;**

- 1.
- 2.

\*\*\*\*\*

**1.0 SUBJECT TITLE : ELECTRONIC WORKSHOP.**

**2.0 SUBJECT CODE :**

**3.0 PAPER CODE : 205**

**4.0 SEMESTER : TWO**

**5.0 RATIONALE :**

This subject envisages to develop practical skills in handling various tools, accessories, equipment used in the manufacturing and testing electronic circuits. It will also make the students familiar with the measuring techniques used in electrical/electronics systems. The student will also be able to implement, test electronics circuits on breadboard and prepare PCB.

## **6.0 TEACHING AND EXAMINATION SCHEME ;**

THEORY COMPONENT							PRACTICAL COMPONENT						
LECT- URES Hrs. PER WEEK	CONTINUOUS EVALUATION			END OF THE TERM / SEMESTER EVALUATION		T O T A L  M A R K S (T H E O R Y)	PRA- CTI- CAL Hrs. Per Week	CONTINUOUS EVALUATION	END OF THE TERM/ SEMESTER EVALUATION		T O T A L  M A R K S (P R A C.)	T O T A L  M A R K S (T H E. + P R A C.)	
	TERM WORK	PROG- RESSIVE TESTS (TWO)		THEORY PAPER					LAB. WORK	PRACTICAL/ ORAL EXAMINATION (VIVA)			
				MARKS	DUR- ATION (Hrs.)								
		I	II										
1	15	10	10	-	-	35	3	15	50	3 Hrs.	65	100	

## **7.0 ENABLING OBJECTIVES :**

The students after completing the course will be able to –

- 7.1 use different tools and accessories used in manufacturing of electronic circuits.
- 7.2 identify basic electronic components
- 7.3 use digital multimeter, function generator & CRO
- 7.4 use different cables and connectors
- 7.5 use different display devices
- 7.6 Prepare Printed Circuit Boards

## **8.0 DETAILED COURSE CONTENTS :**

### **CHAPTER – 1.0 TOOLS AND ACCESSORIES USED IN MANUFACTURING OF ELECTRONIC CIRCUITS.**

- 1.1 Different types of cutters.
- 1.2 Nose pliers.
- 1.3 Wire strippers
- 1.4 Screw drivers
- 1.5 Lead straightners
- 1.6 Extracters
- 1.7 Soldering Iron
- 1.8 Desoldering Pump
- 1.9 Crimping tool.

### **CHAPTER – 2.0 BASIC ELECTRONIC COMPONENTS**

- 2.1 Colour coding of resistors and capacitors
- 2.2 Types of resistors, capacitors inductors
- 2.3 Identification of components i.e. Diodes, Transistors, FET,UJT,SCR, Transformers.
- 2.4 Study and use analog multi-meter to measure:
  - 2.1.1 AC and DC voltage.
  - 2.1.2 AC and DC current
  - 2.1.3 Different resistor
  - 2.1.4 Continuity testing

### **CHAPTER – 3.0 DIGITAL MULTIMETER :**

- 3.1 Study and use digital multimeter to measure:
  - 3.1.1 AC and DC voltage
  - 3.1.2 AC and DC current
  - 3.1.3 Different resistor
  - 3.1.4 Continuity testing

### **CHAPTER – 4.0 FUNCTION GENERATOR**

- 4.1 Front panel controls and there uses
- 4.2 Frequency changer and amplifier

### **CHAPTER – 5.0 CRO**

- 5.1 Front panel control and their functions
- 5.2 Different waveforms.
- 5.3 Measurement of amplitude and frequencies

## **CHAPTER – 6.0 DIFFERENT CABLES & CONNECTORS**

- 6.1 Co-axial cable
- 6.2 Twisted pair cable
- 6.3 Flat ribbon cable
- 6.4 Fibre optic cable

## **CHAPTER – 7.0 DIFFERENT CONNECTORS**

- 7.1 BNC connector
- 7.2 Banana connector
- 7.3 Crocodile connector
- 7.4 Male and female Dtype connector
- 7.5 Flat cable connector
- 7.6 Printed circuit connector
- 7.7 UTP connector

## **CHAPTER – 8.0 DIFFERENT SWITCHES**

- 8.1 Toggle switches-SPST, SPDT, DPST, DPDT
- 8.2 Thumb-wheel switches
- 8.3 Rotary switches
- 8.4 Push on/Push off switches
- 8.5 Keyboard switches-mechanical, capacitive, membrane
- 8.6 DIP switches

## **CHAPTER – 9.0 DIFFERENT DISPLAY DEVICES**

- 9.1 LED display
- 9.2 Seven segment display
- 9.3 LCD display

## **CHAPTER – 10.0 PREPARING CABLES AND BOARDS**

- 10.1 Prepare computer network cable (use different type of cable and connectors stated as in chapter 6).
- 10.2 Study and use bread boards to implement simple electronic circuits using resistors/ capacitors/ diodes/transistors/switches/display devices.
- 10.3 Prepare two simple electronic circuits using general purpose PCBs.
- 10.4 Prepare two PCBs for simple electronic circuits

**9.0 SUGGESTED SPECIFICATION TABLE (THEORY) :**

CH. NO.	CHAPTER NAME	HOUR S/PER IODS	TENTATIVE DISTRIBUTION OF MARKS			
			K	U	A	TOTAL MARKS
1.0	TOOLS AND ACCESSORIES USED IN MANUFACTURING OF ELECTRONIC CIRCUITS.	3				
2.0	BASIC ELECTRONIC COMPONENTS	2				
3.0	DIGITAL MULTIMETER	1				
4.0	F FUNCTION GENERATOR	2				
5.0	CRO	2				
6.0	DIFFERENT CABLES & CONNECTORS	1				
7.0	DIFFERENT CONNECTORS	1				
8.0	DIFFERENT SWITCHES	1				
9.0	DIFFERENT DISPLAY DEVICES	1				
10	PREPARING CABLES AND BOARDS	1				
	TOTAL	15				

**Abbreviations:** K=Knowledge level, U = Understanding Level,  
A=Application level

**10.0 SUGGESTED IMPLEMENTATION STRATEGIES :**

- The subject content is expected to be taught by the teacher from electronics department. The teacher is expected to explain functions of the front panel controls of all electronic instruments/equipments along with measuring techniques. Teacher in the electronic workshop should demonstrate and guide students for developing the skills of soldering and PCB manufacturing.

**11.0 SUGGESTED LIST OF EXPERIENCES/TUTORIALS :**

- 11.1 Identify the various types of resistors and find out the values from color bands /written values on them and measure with multimeter.
- 11.2 Identify the (i) terminals of a diode and its polarity, (ii) zener, LED, Photodiode, IR diode (ii) terminals of a Transistor and its Type (n-p-n or p-n-p).
- 11.3 Identify and use different tools and accessories used in manufacturing of electronic circuits.
  - Different types of cutters.
  - Nose pliers
  - Wire strippers
  - Screw drivers

- Lead strengtheners
  - Extractors
  - Soldering iron
  - Desoldering pump
  - Crimping tool
- 11.4 Identify the type of components(L,C,R) and find out the values using LCR-Meter
- 11.5 Identify the various waveforms of Function Generator using CRO. Measure Amplitude & Frequency for various waveforms using CRO.
- 11.6 Use regulated power supply and identify front panel controls and their functions.
- 11.7 Use DC and AC voltmeter and ammeter to measure DC and AC voltage current.
- 11.8 Use analog multi-meter to measure.
- AC and DC voltage
  - AC and DC current
  - Resistance of Different resistors
  - Continuity testing.
- 11.9 Use digital multi meter to measure:
- AC and DC voltage
  - AC and DC current
  - Different resistor
  - Continuity testing.
- 11.10 Identify various kinds of electronic components
- 11.11 Use different switches
- Toggle switches – SPST, SPDT, DPST, DPDT
  - Thumb-wheel switches
  - Rotary switches
  - Push on/Push off switches
  - Keyboard switches – mechanical, capacitive, membrane
  - DIP switches
- 11.12 Use of different display devices
- 11.13 LED display
- 11.14 Seven segment display
- 11.15 LCD display
- 11.16 Solder the joint connection of wires and components on a PCB and check it. De-solder it and Re-solder.
- 11.17 Prepare computer network cable (use different type of cable and connectors)
- 11.18 Use of breadboards to implement simple electronic circuits using resistors/ capacitors/diodes/transistors/switches/display devices.
- 11.19 Prepare two simple electronic circuits using general purpose PCBs.
- 11.20 Prepare two PCBs for simple electronic circuits.
- 11.21 Assemble circuit on breadboards and PCBs (e.g rectifiers, oscillators, amplifiers).

**12.0 SUGGESTED LEARNING RESOURCES :**

12.1 Textbooks/Reference books (as mentioned below).

**12.1 REFERENCE BOOKS :**

S.No.	TITLE	AUTHOR, PUBLISHER, EDITION AND YEAR OF PUBLICATION	ISBN NUMBER
1.	Electronic Component and Materials	S.M.Dhir, Tata McGraw Hills publishing company Ltd., N.Delhi,	
2.	Printed circuit boards design and technology	W.C.Bosshart, Tata McGraw Hills publishing company Ltd., N.Delhi	
•	Electronics Project for Beginners	A.K. Maini	

**13.0 TENTATIVE LIST OF LABORATORY EQUIPMENT ;**

S.No.	Name of Equipment
1.	Digital LCR Meter
2.	Electronic Energy Meter
3.	Analog Multimeter
4.	Digital Multimeter
5.	D.C. Ammeters
6.	D.C. Voltmeter
7.	A.C. Ammeter
8.	A.C. Voltmeter
9.	CRO
10.	Function Generator
11.	Coil Winding Machine (Motorised)
12.	Coil Winding Machine (Hand Operated)
13.	Bench Drilling Machine
14.	Portable Drilling Machine
15.	Screw Driver Set
16.	Different types of Pliers
17.	Various tools (wire cutter, wire stripper, wire lead bender, various pliers, screw drivers tongs & tweezers, IC extractor)
18.	Soldering Gun Set
19.	Screw Extractor Set
20.	Soldering Iron
21.	Desoldering pump
22.	Soldering station
23.	Dual-In-Line IC Extraction System
24.	Different types of Cables
25.	Different types of Connectors
26.	Breadboards
27.	Printed Circuit Board

<i>S.No.</i>	<i>Name of Equipment</i>
28.	Different types of discrete electronic components
29.	Different types of Integrated Circuits
30.	Different types of switches
31.	Different types of Display devices
32.	Furniture

**14.0 LIST OF EXPERTS AND TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM ;**

- 1.
- 2.
- 3.

\*\*\*\*\*