



**UTTARAKHAND BOARD OF TECHNICAL EDUCATION**  
**JOINT ENTRANCE EXAMINATION AND TRAINING, RESEARCH DEVELOPMENT CELL, DEHRADUN**  
**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME**

**BRANCH NAME – ELECTRONICS AND COMMUNICATION ENGINEERING (INDUSTRY INTEGRATED) SEMESTER – III**

Subject Code	Subject	L	T	P	T O T	EVALUATION SCHEME						Total Marks	Credit Point
						Internal		External					
						Theory	Practical	Theory		Practical			
						Max Marks	Max Marks	Max Marks	Hrs.	Max Marks	Hrs.		
Period/Weeks		Max Marks	Max Marks	Max Marks	Hrs.	Max Marks	Hrs.	Total Marks	Credit Point				
093004	Basics of Electrical Engineering and Machinery	3	1	4	8	35	30	75	2.5	50	3.0	190	6
093001	Analog Electronics	4	1	4	9	35	30	75	2.5	50	3.0	190	6
093002	Digital Electronics	4	1	4	9	35	30	75	2.5	50	3.0	190	6
093005	Communication Engineering	4	1	4	9	35	30	75	2.5	50	3.0	190	5
093003	Basics of C Programming	4	1	4	9	35	30	75	2.5	50	3.0	190	5
093052	Industrial Exposure (Assessment at Inst. Level)+	-	-	-	-	-	25	-	-	-	-	25	1
013054	General Proficiency #	-	-	4	4	-	25	-	-	-	-	25	1
<b>Total</b>		<b>19</b>	<b>5</b>	<b>24</b>	<b>48</b>	<b>175</b>	<b>200</b>	<b>375</b>	<b>-</b>	<b>250</b>	<b>-</b>	<b>1000</b>	<b>30</b>

# General Proficiency will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS and cultural activities and discipline etc.

+ Industrial visit compulsory at minimum 2 Industries or Department.

**Note:** 1- Each period will be 50 minutes. 2- Each session will be of 16 weeks. 3- Effective teaching will be at least 12.5 weeks. + Industrial visit.

**Branch Code - 37**



**THIRD SEMESTER  
ELECTRONICS & COMMUNICATION  
ENGINEERING (INDUSTRY INTEGRATED)**





# BASICS OF ELECTRICAL ENGINEERING AND MACHINERY

Subject Code : 093004

L	T	P
3	1	4

## RATIONALE

This subject provides a proper understanding of working principles, construction operation and applications of various electrical equipment and machines.

For a diploma holder, it becomes imperative to know the fundamentals of the electrical engg. in order to grasp the knowledge of the field. So, while completing diploma programme, student have to understand working principle, construction, operations and application of various electrical equipments, machines and instruments. Learning of this course will help students to understand basics of electrical engg. and by the completion of the course, student will be able to fully acquaint with various terms, knowledge of fundamental concepts of electricity and various motors and machines.

### 1. Over view of DC Circuits

(08 period)

- Applications of Kirchoff's Laws in solving electrical network problems.
- Networks theorem such as: Superposition, Thevenin theorem, Norton theorem and maximum power transfer theorem.

### 2. AC fundamentals

(10 period)

- Concept of alternating current, and voltage , equation of instantaneous values.
- Representation of alternating sinusoidal quantities by phasors
- Power in pure Resistance, Inductance, Capacitance. RL, RC, RLC circuits
- Active and reactive components of current and their significance
- Power factor and its practical significance
- Resonance in series and parallel circuits
- Active power, reactive power, apparent power

### 3. Three phase supply

(10period)

- Advantage of three phase system over single phase system
- Star–delta connection and transformation.
- Relation between phase voltage and line voltage, also between phase current and line current in a 3 phase system
- Power and power factor in 3 phase system

#### 4. Transformer

(10 period)

Working principle of a Transformer, constructional features, voltage and current transformation, auto transformer and its uses, instruments transformer, voltage regulation and its significance, need for isolation, Losses in a transformer, cooling of transformer

#### 5. Electrical Machines

(16 Period)

##### Construction & Working Principle of:

- DC Machines: DC motor.
- Single Phase Induction Motor.
- Three Phase Induction Motor.
- Three Phase Synchronous Machines: Alternator and synchronous motor.

#### 6. Batteries

(10Period)

##### Basic idea about primary and secondary cells,

- Construction, working and application of Lead-Acid, Nickel-Cadmium Battery.
- Capacity and efficiency of lead acid battery.
- Charging methods used for lead-acid battery(accumulator).
- Care and maintenance of lead-acid battery.
- Series and parallel connections of batteries.

#### LIST OF PRACTICALS

1. Familiarization of measuring instruments viz. voltmeter, ammeter, wattmeter.
2. To verify KVL in DC circuits.
3. To verify KCL in DC circuits.
4. To verify Thevenin's theorem in D.C. circuits.
5. To verify Norton's theorem in D.C. circuits.
6. To verify Super position theorem in D.C. circuits.
7. To verify Maximum power transfer theorem in D.C. circuits.
8. To determine effect of a single phase transformer from the data obtained through open circuit and short circuit test.
9. To test a lead – acid storage battery for charged & discharged condition.

## RECOMMENDED BOOKS

1. Basic Electrical and Electronics Engineering by SK Sahdev ,Dhanpat Rai and CO, New Delhi.
2. Electrical Science by Choudhury S.; Narosa Publishing House Pvt. Ltd. Daryaganj New Delhi.
3. Basic Electrical and Electronics Engineering by Kumar KM , Vikas Publishing House Pvt Ltd. Jangpura, New Delhi.
4. Basic Electrical Engineering by Mool Singh, Galgotia Publication Pvt. Ltd. New Delhi.
5. Electrical Technology by B.L. Theraja, S. Chand and Co, New Delhi.
6. Principles of Electrical Engineering by B.R. Gupta , S Chand and Co, New delhi.
7. Basic Electrical Engineering by P.S. Dhogal , Tata McGraw Hill , New Delhi.
5. Electrical Technology by B.L. Theraja, S. Chand and Co, New Delhi.
6. Principles of Electrical Engineering by B.R. Gupta , S Chand and Co, New delhi.
7. Basic Electrical Engineering by P.S. Dhogal , Tata McGraw Hill , New Delhi.
8. Basic Electrical Engineering by JB Gupta ; SK Kataria and Sons , New Delhi.
9. Electrical Machine by SK Bhattacharya , Tata McGraw Hill, New Delhi.
10. Electrical Machine by SK Sahdev , Unique International Publications, Jalandhar.
11. Electrical Machine by Nagrath and Kothari, Tata McGraw Hill, New Delhi.
12. Electrical Engineering by JB Gupta , SK Kataria & Sons , New Delhi.
13. Electrical Machines by P. S. Bhimbra.

## SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (period)	Marks Allocation(%)
1	8	12
2	10	16
3	10	16
4	10	16
5	16	24
6	10	16
<b>Total</b>	<b>64</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>
<b>4</b>	<b>1</b>	<b>4</b>

**Subject Code : 093001**

## **RATIONALE**

This subject helps to analyze various analog electronic circuits using discrete components.

The subject will enable the students to have conceptual understanding of various semiconductor devices such as PN diodes, Zener diodes, transistors, amplifiers, FET, etc.

Through this course, the students will develop the ability to analyze various analog electronics circuits using discrete components. Practical exercises will reinforce various concepts. like observation of the amplitude and frequency responses.

### **1. Semi Conductor Diode**

**(16 period) + (04 T)**

- P and N type semiconductors and their conductivity, Effect of temperature on conductivity of intrinsic semi conductor.
- PN junction diode, mechanism of current flow in PN junction, Drift and diffusion current, depletion layer, forward and reverse biased PN junction, potential barrier, concept of junction capacitance in forward and reverse bias condition.
- V-I characteristics, static and dynamic resistance.
- Diode as half wave, full wave and bridge rectifier, PIV, rectification efficiencies and ripple factor.
- Zener and avalanche breakdown, Working of Zener diode, Zener diode as a voltage regulator.

### **2. Introduction to Bipolar Transistor**

**(16 period) + (04 T)**

Concept of bipolar transistor, structure, PNP and NPN transistor, their symbols and mechanism of current flow; current relations in transistor; concept of leakage current; CB, CE, CC configuration of the transistor, input and output characteristics in CB and CE configurations, transistor as a switch.

### **3. Transistor Biasing Circuits**

**(08 period) + (02 T)**

Concept of transistor biasing and selection of operating point, Need for stabilization of operating point, Different types of biasing circuits.

### **4. Single Stage Transistor Amplifier**

**(08 period) + (02 T)**

Classification of Amplifier, Single stage transistor amplifier circuits.

## 5. FET & MOSFET

(16 period) + (04 T)

- Construction, operation and characteristics of JFET and its applications.
- Construction, operation and characteristics of MOSFET in depletion and enhancement modes and its applications.
- C-MOS advantages and applications.

### LIST OF PRACTICALS

1. Familiarization, identification and testing of active and passive components.
2. Familiarization with operations of different Electronics instruments like analog & digital Multi-meter, CRO, Signal generator, Regulated Power Supply.
3. To plot V-I characteristics of PN Junction diode.
4. To plot V-I characteristics of a Zener diode & observe its use as voltage regulator.
5. To observe the wave shape of following rectifier circuits.
  - Half wave rectifier
  - Full wave rectifier
  - Bridge rectifier
6. To plot the wave shape of full wave rectifier with
  - Shunt capacitor filter
  - Series capacitor filter
7. To plot input and output characteristics and calculate parameter of transistor in CE configuration.
8. To plot input and output characteristics and calculate parameter of transistor in CB configuration.
9. To plot V-I characteristics of FET Transistor.

### RECOMMENDED BOOKS

1. Basic Electronics and Linear circuit by N.N. Bhargava and Kulshreshtha, Tata McGraw Hill, New Delhi.
2. Electronics Devices and circuits by D.C. Kulshreshtha; New Age Publishers, New Delhi.
3. Principle of Electrical and Electronics Engineering by VK Mehta; S Chand and Co. New Delhi.
4. Electronics Components and Materials by S.M. Dhi, Tata McGraw Hill, New Delhi.



5. Electronics Device and circuits by Millman and Halkias; McGraw Hill.
6. Principle of Electronics by Albert Paul Malvino; Tata McGraw Hill.
7. Electronics Devices and circuits-I by Naresh Gupta, Jyotesh Malhotra and Harish C. Saini, Eagle Prakashan, Jalandhar.
8. Electronics Devices .and circuits by Rama Reddy, Narosa Publishing House Pvt.Ltd. New Delhi.

### SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (period)+ Tutorial	Marks Allocation
1.	20	25
2.	20	25
3.	10	12
4.	10	13
5.	20	25
<b>Total</b>	<b>80</b>	<b>100</b>

Subject Code : 093002

L	T	P
4	1	4

**RATIONALE**

This syllabus has been designed to make the students know about the fundamental principles of digital electronics and gain familiarity with the available IC chips. This subject aims to give a background in the broad field of digital systems design and microprocessors.

**DETAILED CONTENTS**

- 1. Number System And Codes (12 period) + (04T)**
  - Introduction and advantages of Digital Signal over Analog Signals.
  - Binary, octal, Decimal and hexadecimal number system & their conversion from one system to another.
  - Binary addition, subtraction, 1's and 2's complement method of addition/subtraction.
  - Codes : 8421,BCD, excess-3 and gray codes,ASCII code.
  - Signed representation of Binary numbers.
  
- 2. Logic Gates and Families (12 period) + (02 T)**
  - a) Concept of negative and positive logic.
  - b) Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates, NAND and NOR as universal gates.
  - c) Logic family classification
    - Definition of SSI, MSI, LSI, VLSI.
    - Classification of IC's on the basis of Technology (Unipolar, Bipolar etc.)
    - TTL and CMOS families
    - Characteristics of TTL and CMOS digital gates. Delay, speed, noise margin, logic levels, power dissipation, fan-in, fan-out, power supply requirement.
    - Comparison between TTL and CMOS families
  
- 3. Logic Simplification (10 period) + (02 T)**
  - Postulates of Boolean algebra, De Morgan's Theorems. Formulation of truth table and Boolean equation for simple problem. Implementation of Boolean (logic) equation with gates.

- Concept of POS & SOP.
- Karnaugh map (upto 4 variables) including Don't care conditions.

#### **4. Combinational Logic Circuits (10 period) + (02 T)**

- Half adder and Full adder circuit, design and implementation.
- Half and Full subtractor circuit, design and implementation.
- 3-to-8 line decoder circuits.
- Introduction and Basic Functions of Multiplexer and De-Multiplexer.

#### **5. Sequential Logic Circuits (12 period) + (04 T)**

- Concept of Flip flop and Latch.
- Operation and truth tables of RS, T, D, JK flip flops.
- Introduction to Counter (Asynchronous and Synchronous counters).
- 4 Bit Ripple Counter, Divide by N counter, Decade counter.
- Up/down counter.
- Introduction and basic concepts of Shift Registers (shift left and shift right).
- Basic Idea of Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out Shift Register.

#### **6. Memories And Converters (08 period) + (02 T)**

- Memory organization, Classification of semi conductor memories. ROM, PROM, DROM, EPROM, EEPROM, RAM, CCD memories.

### **LIST OF PRACTICALS**

- 1) Verification and interpretation of truth tables for AND, OR, NOT, NAND, NOR and Exclusive OR (EX-OR) gates.
- 2) Realisation of logic functions with the help of NAND or NOR gates
- 3) To design a half adder & full adder using XOR and NAND gates and verification of its Truth Table.
- 4) To construct 3 bit binary to gray code and gray to binary converter Circuit.
- 5) Verification of truth table of D flip-flop, JK flip-flops.
- 6) Verification of truth table of decoder ICs.
- 7) Verification of truth table of Mux & DeMux.
- 8) Verification of truth table for BCD to seven segment display.

- 9) To design 4 bit SISO, SIPO using D Flip Flop.
- 10) Verification of truth table of 4 bit Binary Counter.
- 11) Verify the operations of A/D and D/A convertor.

Note: Above experiments may preferably be done on Bread Boards.

### RECOMMENDED BOOKS:

1. Digital logic designs by Morris Mano, Prentice Hall of India, New Delhi
2. Digital Electronics by R.P. Jain, Tata McGraw Hill Education Pvt. Ltd., New Delhi
3. Digital Electronics and applications by Malvino Leach, Tata McGraw Hill Education Pvt. Ltd., New Delhi
4. Digital Electronics by B.R. Guta , Dhanpat Rai & Co., New Delhi.

### SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (period)+ Tutorial	Marks Allocation
1	16	20
2	14	18
3	12	15
4	12	15
5	16	20
6	10	12
<b>Total</b>	<b>80</b>	<b>100</b>

Subject Code : 093005

L	T	P
4	1	4

**RATIONALE**

The study of principles of communication systems leads to further specialized study of audio and video systems, line communications and microwave communication systems. Thus the diploma-holder in Electronics and Communication Engineering shall find employment in areas of R and D, production, servicing and maintenance of various communication systems. The students should understand the advantage and limitations of various analog and digital modulation systems, transmitters, receivers and antennas relate to them while studying practical communication systems.

**DETAILED CONTENTS****1. Introduction****(03 period)**

- Need of modulation in communication systems
- Basic block diagram of communication system

**2. Amplitude modulation****(05period) + (03 T)**

- Derivation of expression for an amplitude modulated wave. Carrier and side band components. Modulation index. Spectrum and BW of AM Wave. Relative power distribution in carrier and side bands
- Elementary idea of DSB-SC, SSB-SC and VSB modulations, their comparison, and areas of applications

**3. Frequency & Phase Modulation****(07period) + (02 T)**

- Expression for frequency modulated wave and its frequency spectrum (without Proof and analysis of Bessel function), Modulation index, maximum frequency deviation and deviation ratio, BW of FM.
- Need for pre-emphasis and de-emphasis.
- Expression for phase modulated wave, modulation index.

**4. Modulators****(10period) + (02 T)**

- Concept of low level and high level modulation.

(a) AM Modulators

Circuit Diagram and working operation of :

- Collector and Base Modulator
- Balanced Modulator
- Square Law Modulator

(b) FM Modulators

Circuit Diagram and working of reactance modulator, varactor diode modulator, VCO and Armstrong phase modulator.

**5- Demodulators**

**(07 period)+(02 T)**

(a) AM Demodulators

- Principles of demodulation of AM wave using diode detector circuit.

(b) FM Demodulators

- Principle of working of the following FM demodulators:
- Foster-Seeley discriminator
- Phase locked Loop (PLL) FM demodulators

**6- Pulse Modulation**

**(12 periods) + (03 T)**

- Statement of sampling theorem and elementary idea of sampling frequency for pulse modulation.
- Types of pulse modulation-PAM, PPM, PWM (Generation & Detection) and their comparison.
- Pulse code Modulation (PCM): Basic scheme of PCM system, Quantization, quantization error, companding Advantages of PCM systems.
- Introduction to ASK, FSK, PSK.

**7. AM/FM Transmitters**

**(08 period)+(02 T)**

- Classification of transmitters
- Block diagram and working principles of AM transmitters Reactance transmitter & Armstrong FM Transmitters.

**8. AM/FM Radio Receivers**

**(12 Period) + (02 T)**

- Block Diagram and working principle of super heterodyne AM receiver, Advantages of super heterodyne reception.

- Performance characteristics of a radio receiver-sensitivity, selectivity, fidelity, S/N ratio
- Selection criteria of intermediate frequency (IF), Concepts of Simple and delayed AGC.
- Basic Block diagram of an FM receiver

## **LIST OF PRACTICALS**

1. To observe an AM wave on CRO to measure the modulation index of the wave obtained
2. To obtain an AM wave from a square law modulator circuit and observe waveforms and to measure the modulation index
3. To obtain an FM wave and measure the frequency deviation for different modulating signal
4. To obtain modulating signal from an AM detector circuit and observe the waveform
5. To obtain modulating signal from a FM detector
6. To observe PAM, PPM and PWM signal and compare it with the analog input signal
7. To feed an analog signal to a PCM modulator and compare the demodulated signal with the analog input.
8. To plot the sensitivity & selectivity characteristics of a radio receiver and determine the frequency of maximum sensitivity.
9. To Study different faults in radio receiver & measure the Voltage at the different points of a radio receiver.

## **RECOMMENDED BOOKS**

1. Electronics Communication System by Kennedy, Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Fundamentals of Communication System by Fitz, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Principles of Communication Engineering by Taub, Tata McGraw Hill Education Pvt Ltd,
4. Electronics Communication by KS Jamwal, Dhanpat Rai and Co, New Delhi
5. Radio Engineering by GK Mittal, Khanna Publishers, New Delhi
6. Principles of Communication Engineering by DR Arora, Ishan Publications, Ambala
7. Communication Engineering by A Kumar

8. Principles of Communication Engineering by Manoj Kumar, SatyaPrakashan, New Delhi
9. Principles of Communication Engineering by Anokh Singh, S.Chand and Co., New Delhi
10. Principles of Communication Engineering by Roody , Coolin

### SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (period) + Tutorial	Marks Allocation
1	3	4
2	8	10
3	9	11
4	12	15
5	9	11
6	15	19
7	10	13
8	14	17
<b>Total</b>	<b>80</b>	<b>100</b>



# BASICS OF C PROGRAMMING

Subject Code : 093003

L	T	P
4	1	4

## RATIONALE

Computer plays a very vital role in present day life, more so, in the professional life of Diploma engineers. In order to enable the students to use the computers effectively in problem solving, this course offers the modern programming language C along with exposure to various engineering applications of computers. The knowledge of C language will be reinforced by the practical exercises and demonstration of application software in the field of Electrical Engineering during the course of study. Introduction to data base management system is also a very significant field with vast employment potential.

## DETAILED CONTENTS

- 1. Algorithm and Program Development (12 period))+(04 T)**
  - Steps in development of a program.
  - Flow-charts, algorithm development.
  - Introduction to various computer languages.
  - Concept of interpreter, compiler, high level language(HLL), machine language (ML) and Assembly Language.
- 2. Program Structure (C Programming) (40 period))+(24 T)**
  - History of 'C', data types, input output statements, arithmetic and logical operations, data assignments, precedence and associativity.
  - I/O statements - Assignment, Variables, arithmetic operation- their precedence, data types standard I/O function, formulated I/O.
  - Control Statements - Logical and relational operators; if-else, while, do-while, for loops, breaks, switch statements.
  - Functions - Function declaration, parameter passing- by value, storage classes (Local, Global and Static variables), standard library functions.
  - Arrays - Single and multi dimensional arrays, character arrays.
  - Pointers - To various data types, pointers in parameters passing, pointers to function.
  - Structures - Definition of a structure, pointer to structure, union and array of structure.

- Strings - String processing, functions and standard library function
- Data files - File handling and manipulation, file reading and writing, Binary and ASCII files, file records using standard function type mouse

## **LIST OF PRACTICALS**

1. Programming exercise on executing a C Program.
2. Programming exercise on editing a C program.
3. Programming exercise on defining variables and assigning values to variables.
4. Programming exercise on arithmetic and relation operators.
5. Programming exercise on arithmetic expressions and their evaluation.
6. Programming exercise on reading a character.
7. Programming exercise on writing a character.
8. Programming exercise on formatting input using print.
9. Programming exercise on formatting output using scan.
10. Programming exercise on simple IF statement.
11. Programming exercise on IF... ELSE statement.
12. Programming exercise on SWITCH statement.
13. Programming exercise on GOTO statement.
14. Programming exercise on DO-WHILE statement.
15. Programming exercise on FOR statement.
16. Programming exercise on one dimensional arrays.
17. Programming exercise on two dimensional arrays.

## **RECOMMENDED BOOKS**

1. Programming in C by Balagurusamy, Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Programming in C by Gottfried, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Programming in C by Kerning Lan and Richie; Prentice Hall of India, New Delhi
4. Let us C- Yashwant Kanetkar, BPB Publications, New Delhi
5. Vijay Mukhi Series for C and C++
6. Programming in C by R Subburaj, Vikas Publishing House Pvt. Ltd., Jangpura, New Delhi
7. Programming in C by Kris A Jansa, Galgotia Publications Pvt. Ltd., Daryaganj, New Delhi
8. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi
9. Elements of C by MH Lewin, Khanna Publishers, New Delhi

10. The Complete Reference to Visual Basic 6, by Noel Jerke, Tata McGraw Hill Education Pvt Ltd, New Delhi
11. Web site [www.Beyondlogic.org](http://www.Beyondlogic.org)
12. Pointers in C by Yashwant Kanetkar, BPB Publishers New Delhi
13. Programming in Applications by Chandershekhar, Unique International Publications, Jalandhar
14. The essentials of Computer Organizing and Architecture by Linda Null and Julia Labur, Narosa Publishing House Pvt. Ltd., New

### SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (period) + Tutorial	Marks Allocation (%)
1	16	25
2	64	75
<b>Total</b>	<b>80</b>	<b>100</b>