



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

**BRANCH NAME – ELECTRONICS & COMMUNICATION ENGINEERING (TECH ELEX RADIO)**

**SEMESTER – V**

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				
095004	Rf Communication	4	1	5	10	25	25	75	2.5	50	3.0	175	7
095003	Electronics Applications in Industry	4	1	5	10	25	25	75	2.5	50	3.0	175	7
385001	Digital Switching and Telephony	4	1	5	10	25	25	75	2.5	50	3.0	175	7
095001	Entrepreneurship Management	4	-	-	4	50	-	75	2.5	-	-	125	3
385002	Major Project-I	-	-	10	10	-	50	-	-	200	3.0	250	6
385052	Industrial Exposure (assessment At Inst. Level) +	-	-	-	-	-	25	-	-	-	-	25	1
385053	Industrial Training	4 week				-	25	-	-	25	3.0	50	3
015054	General Proficiency	-	-	4	4	-	25	-	-	-	-	25	1
<b>Total</b>		<b>16</b>	<b>3</b>	<b>29</b>	<b>48</b>	<b>125</b>	<b>200</b>	<b>300</b>	<b>-</b>	<b>375</b>	<b>-</b>	<b>1000</b>	<b>35</b>

# Student Centered Activities 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.

**Branch Code - 38**

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**FIFTH SEMESTER  
ELECTRONICS & COMMUNICATION  
ENGINEERING (TECH ELEX RADIO)**



L	T	P
4	1	5

**Subject Code : 095004****RATIONALE**

This subject provides knowledge about microwave devices, radar and satellite communication.

This subject provides exposure to microwave engineering, Radar systems and satellite communication. At the end of the course, student will be able to-

1. Know about the microwave frequencies and the waveguides used in communication.
2. Understand the operation and working of various microwave devices like klystron, TWT, magnetron, gun diode, IMPATT diode etc.
3. Demonstrate the knowledge of antennas in communication systems and discriminate between antennas on the basis of their electrical performance.
4. Analyze different radars; find applications and use of its supporting systems.
5. Explain the basis of Satellite Communication.

**DETAILED CONTENTS****Unit:- I (04 Periods)****INTRODUCTION**

- Introduction of Electromagnetic waves, their applications.
- Frequency spectrum.
- Types of wave propagation.

**Unit:- II (30 Periods)****MICROWAVE DEVICES**

- Limitation of Vacuum Tube at microwave frequency.
- Inter electrode capacitance & its effect.
- Lead Inductance and Transit time.

Construction, characteristics, operating principles and typical applications of the following devices (No mathematical treatment):

- Multi cavity klystron
- Reflex klystron
- Multi-cavity magnetron
- Traveling wave tube
- Gunn diode
- Impatt diode
- Tunnel diode

**Unit:- III****(10 Periods)****WAVE GUIDE**

- Wave guides: Rectangular and circular wave guides and their applications.
- Propagation Mode of wave guide.
- Propagation constant of a rectangular wave guide.
- Cut off wavelength.
- Guide wavelength and their relationship with free space wavelength (no mathematical derivation).

**Unit:- IV****(16 Periods)****MICROWAVE COMPONENTS & ANTENNA**

- Brief introduction of S parameter.
- Tees, Bends, matched termination, twists, detector mount, directional coupler, fixed and variable attenuator, isolator, circulator and duplexer.
- Horn, Dish Antenna, Patch antenna.

**Unit:- V****(10 Periods)****RADAR**

- Introduction to radar, radar range equation (no derivation), RADAR applications.
- Block diagram and operating principles of Basic pulse radar.
- Block diagram and operating principles of CW (Doppler) and FMCW radars.
- Block diagram and operating principles of MTI radar.

**Unit :- VI****(10 Period)****SATELLITE COMMUNICATION**

- Satellite Communication
- Basic Idea of passive and active satellite. Meaning of the term orbit, apogee, perigee.
- Geo Stationary satellite. Block diagram and explanation of a satellite communication link, Link losses.
- Transponders, VSAT and its features.

**LIST OF PRACTICALS**

1. To identify the microwave components – Directional Coupler, Tees,

3. To measure VSWR of a given load.
4. To measure the Klystron frequency by slotted section method.
5. To measure the directivity and coupling of a directional coupler.
6. To verify the properties of tee.

**NOTE:** Visit to the appropriate sites of microwave industries, radar installations and communication stations should be made to understand their working. A comprehensive report must be prepared by all the students on these visits, especially indicating the dates and locations of their visits.

### **INSTRUCTIONAL STRATEGY**

Microwave and radar is a very important subject and requires both theoretical as well as practical exposure. The teaching should be supplemented by visits to the microwave stations and using suitable audio visual aids.

### **RECOMMENDED BOOKS**

1. Microwave and Radar Engg by A.K. Gautam, Katson Publication.
2. Microwave Devices and Components by Samuel Y. Liao, Prentice Hall of India, New Delhi
3. Electronics Communication by Roddy and Coolen
4. Electronics Communication System by KS Jamwal, Dhanpat Rai and Sons, Delhi
5. Microwave Engineering by Das, Tata McGraw Hill Education Pvt Ltd, New Delhi
6. Satellite communications by D. C. Aggarwal, Khanna Publication.

### **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic</b>	<b>Time Allotted (L+T)</b>	<b>Marks Allotted (%)</b>
1	4	5
2	30	35
3	10	15
4	16	20
5	10	12
6	10	13
<b>Total</b>	<b>80</b>	<b>100</b>

L	T	P
4	1	5

Subject Code : 095003

## RATIONALE

This subject provides knowledge about audio TV and Thyristor family.

## DETAILED CONTENTS

### Unit:- I

(20 Periods)

#### AUDIO SYSTEM

- Basic working Principle, Construction, Polar pattern, frequency Response & application of Carbon, moving coil, & cordless microphones. Brief idea of velocity, crystal and condenser microphone.
- Basic working Principle, Construction, Polar pattern, frequency Response & application of direct radiating & horn Loud Speaker.
- Basic idea of woofer, tweeter, baffles and enclosures and crossover networks.

### Unit:- II

(20 Periods)

#### T.V. FUNDAMENTALS

- Brief idea of V.S.B. (Vestigial sideband) modulation.
- Concept of Scanning and its types.
- Aspect ratio, Resolution.
- Importance of Synchronizing and Blanking pulses.
- Composite video signal (CVS) at the end of even and odd fields.
- Concept of Camera- Vidicon Camera.
- An Introduction to Latest trends of T.V. Technology: LCD, LED & HDTV.

### Unit:- III

(24 Periods)

#### THYRISTOR & OTHER POWER ELECTRONICS DEVICES

- Principle of Operation of an SCR.
- Two-Transistor Analogy of SCR.
- DIAC.
- TRIAC.
- Basic Triggering circuits for Thyristors.

**POWER ELECTRONICS CIRCUITS**

- SCR Commutation Circuits.
- Introduction to Series and Parallel Inverters.
- Choppers: Step up, Step down, Morgan's.
- Study of SCR controlled applications viz: Illumination control & Speed control.

**LIST OF PRACTICALS**

- Familiarization & testing of components- SCR, DIAC, TRIAC .
- To plot the V-I characteristics of SCR.
- To plot V-I characteristics of DIAC.
- To plot and verify Characteristic of TRIAC.
- Assembly and testing of Half-wave Gate-controlled Rectifier using One SCR.
- Assembly and testing of Single-phase Half-controlled Full-wave Rectifier using two SCRs and two Diodes.
- Assembly and testing of Illumination/ Fan Control circuit using SCR.
- Assembly and testing of SCR Controlled Emergency light.
- Familiarization with different sections of monochrome TV Receiver.
- Fault finding and troubleshooting of colour T.V Receiver.
- Familiarization with different section of LCD & LED TV.
- Installation steps of DTH.

**RECOMMENDED BOOKS**

- Industrial Electronics: S.K. Bhattacharya/S Chatterjee, Tata McGraw-Hill Publishing
- Industrial Electronics for Technicians: J.A.Sam Wilson Joseph Rissi, Prompt Publications
- Thyristors and its Application by Ramamurthy, East West New Delhi
- Power Electronics by P.C. Sen, Tata McGraw-Hill Publishing, New Delhi



## SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (L+T)	Marks Allocation %
I	20	20
II	20	20
III	24	40
IV	16	20
<b>TOTAL</b>	<b>80</b>	<b>100</b>



L	T	P
4	1	5

**Subject Code : 385001****RATIONALE**

This course deals with the advanced digital and data communication techniques beyond the conventional communication. It involves the use of modems in synchronous and asynchronous data transmission. It encompasses the modern communication network and integrated services like FAX, electronic exchanges etc. so vital for present day communication.

**DETAILED CONTENTS****1. Introduction Of Digital Modulation Techniques (12 Periods) +(02T)**

Basic block diagram and principle of working of the following:

- Amplitude shift keying (ASK)
- Frequency Shift keying (FSK)
- Phase shift keying (PSK),
- Quadrature Amplitude modulation (QAM)

**2. Coding (10 Periods) +(02T)**

a) Introduction to various common codes 5 bit Baudot code, 7 bit ASCII, EBCDIC.

b) Code error detection and correction techniques - Redundancy, parity, block check character (BCC), Vertical Redundancy check (VRC), Cyclic Redundancy check (CRC), Hamming code.

**3. Traffic Engineering (14 Periods) +(04T)**

- Network Traffic load and parameters (Grade of service, Peak Hours).
- Switching Hierarchy and Routing.
- Transmission system of Telephone network (PSTN).
- Signaling techniques for telephone networks ( In channel signaling, common channel signaling.).

**4. UART, USART: (06 Periods) +(02T)**

Need and function in communication systems.

## 5. Modems:

(08 Periods) +(02T)

Need and function of modems, Mode of operation (low speed, medium speed and high speed modems). Modem interconnection, Modem data transmission speed, Modem modulation method, Modem interfacing (RS 232 Interface, other interfaces).

## 6. Electronic Exchange and Data Networks

(14 Periods) +(04T)

- Typical telephone network. Various switching offices (Regional Centre, District Centre, Toll Centre, Local Office) and their hierarchy.
- Principles of space division switches. Basic block diagram of a digital exchange and its working.
- Introduction to EPABX.
- Basic idea of FAX system and its applications.

### LIST OF PRACTICALS

1. Observe wave forms at input and output of ASK and FSK modulators
2. To Investigate the traffic capacity of the system.
3. To transmit parallel data on a serial link using USART
4. Transmission of data using MODEM.
5. Observe wave forms at input and output of a PSK and QAM circuit
6. To understand procedure required to connect an analog phone to packet switched network.
7. To study the working principle of a telephone handset
8. To study the working principle of a FAX machine.
9. To study the working principle of an EPABX.

### NOTE:

Visits to the sites of all types of telephone exchanges (including mobile and WLL), FAX should be made with a view to understand their working. A comprehensive report must be prepared by all the students on these visits, especially indicating the dates and locations of their visits.

### INSTRUCTIONAL STRATEGY

This subject provides information to the students regarding the various techniques used in Digitals and Data Communication. Emphasize be made in the laboratory during the conduct of experiments. For the better awareness taking around the world, visit must be arranged to the industries. Like telephone exchange, various cellular industries etc.

## RECOMMENDED BOOKS

1. Electronic Communication Systems By George Kennedy Tata McGraw Hill Education Pvt Ltd, Delhi.
2. Communication system By A.K. Gautam S.K. Kataria Sons, Delhi.
3. Electronics communication by K.S. Jamwal, Dhanpat Rai and Sons, Delhi .
4. Telecommunication switching system and networks by Thaigarajan Viswanthan.

## SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (period) + Tutorial	Marks Allocation
1	14	17
2	12	15
3	18	23
4	8	10
5	10	12
6	18	23
<b>Total</b>	<b>80</b>	<b>100</b>

Subject Code : 095001

L	T	P
4	-	-

**RATIONALE**

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

**DETAILED CONTENTS****SECTION – A ENTREPRENEURSHIP****1. Introduction (15 periods)**

- Concept /Meaning and its need.
- Qualities and functions of entrepreneur and barriers in entrepreneurship.
- Sole proprietorship and partnership forms of business organisations.
- Schemes of assistance by entrepreneurial support agencies at National, State, District level: NSIC, NRDC, DC, MSME, SIDBI, NABARD, Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubator (TBI) and Science and Technology Entrepreneur Parks (STEP).

**2. Market Survey and Opportunity Identification (15 periods)**

- Scanning of business environment.
- Salient features of National and State industrial policies and resultant business opportunities.
- Assessment of demand and supply in potential areas of growth.
- Identifying business opportunity.
- Considerations in product selection.

**3. Project report Preparation (6 periods)**

- Preliminary project report.
- Detailed project report including technical, economic and market feasibility.
- Common errors in project report preparations.

## SECTION –B MANAGEMENT

### 4. Introduction to Management

(8 periods)

- Definitions and importance of management.
- Functions of management: Importance and Process of planning, organising, staffing, directing and controlling.
- Principles of management (F.W. Taylor).
- Concept and structure of an organisation.
- Types of industrial organisations.
  - a) Line organisation.
  - b) Line and staff organisation.
  - c) Functional Organisation.

### 5. Leadership and Motivation

(05 periods)

- a) Leadership
  - Definition and Need.
  - Qualities and functions of a leader.
  - Manager Vs leader.
- b) Motivation
  - Definitions.
  - Factors affecting motivation.

### 6. Management Scope in Different Areas

(10 periods)

- a) Human Resource Management:
  - Introduction and objective.
  - Introduction to Man power planning, recruitment and selection.
- b) Material and Store Management
  - Introduction, functions, and objectives.
- c) Marketing and sales
  - Introduction, importance, and its functions.
  - Physical distribution.
- d) Financial Management
  - Introductions, importance and its functions.

### 7. Miscellaneous Topics

(05 periods)

- a) Customer Relation Management (CRM)
  - Definition and need.
  - Types of CRM.

b) Intellectual Property Right (IPR)

- Introduction, definition and its importance.
- Infringement related to patents, copy right, trade mark.

**Note:** In addition, different activities like conduct of entrepreneurship awareness camp extension lecturers by outside experts, interactions sessions with entrepreneurs and industrial visits may also be organised.

### RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development published by Tata McGraw Hill Publishing Company Ltd., New Delhi
3. Entrepreneurship Development in India by CB Gupta and P Srinivasan; Sultan Chand and Sons, New Delhi
4. Entrepreneurship Development - Small Business Enterprises by Poornima M Charantimath; Pearson Education, New Delhi
5. Entrepreneurship : New Venture Creation by David H Holt; Prentice Hall of India Pvt. Ltd., New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Principles and Practice of Management by L M Prasad; Sultan Chand & Sons, New Delhi.

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Pds)	Marks Allotted (%)
1	15	23
2	15	23
3	6	10
4	8	12
5	5	8
6	10	16
7	5	8
<b>Total</b>	<b>64</b>	<b>100</b>

L	T	P
-	-	10

**Subject Code : 385002****DETAILED CONTENTS****Steps To make a Project**

- 1) Study of different Projects.
- 2) Selection of Project.
- 3) Search component data sheet.
- 3) Component Availability of project and market search.
- 4) Identification and Testing of component.
- 5) PCB Design. PCB Layout, develop an image of PCB layout, pasting of PCB layout image on PCB, Etching, Drilling, Mounting of components.

**1. Laboratory Experiences (14 period)**

- Identification of components.
- Understand the use of data book for transistors, Diodes, SCR and Triac.
- Understand the use of data book for TTL and CMOS ICs.
- Testing of different components using multi-meter.

**2. Designing the PCB layout using computer software (26 period)**

- Understanding the use of printed circuit board in electronics.
- Use of software --Work bench and PSPICE.

**3. Soldering the PCB (20 period)**

- Soldering practice for PCB.
- Soldering the PCB design in layout topic.
- De-soldering practice.

**4. Testing of PCB (20 period)**

- After soldering the component on given PCB, testing the continuity and input / output result of given circuit.

**5. Fault finding of electronic circuit (20 period)**

- Basic idea of fault finding procedure.



6. This Major Project-I Work is the part of major project part - II in sixth semester. So the student have to complete one third portion of the major project (predecessor of Major Project). Student must present seminar and submit Synopsis related to their work. **(60 period)**

### RECOMMENDED BOOKS

1. Data hand books for transistors Diodes & SCR
2. Data hand book for TTL and CMOS ICs
3. PCB designing Books

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted(%)
1	14	10
2	26	18
3	20	9
4	20	9
5	20	10
6	60	44
<b>Total</b>	<b>160</b>	<b>100</b>





## LEARNING OUT COMES AND MEANS OF ASSESSMENT

**BRANCH NAME: ELECTRONICS AND COMMUNICATION ENGINEERING (TECH ELEX RADIO)**

**SEMESTER – V**

S.No.	Title of Subject/Unit	Learning Outcomes	Means of Assessment
1	RF Communication	<p>The students should be able to:</p> <ul style="list-style-type: none"> <li>• understand electromagnetic waves and wave propagation.</li> <li>• identify and demonstrate operating principles and typical applications of various microwave devices.</li> <li>• understand the various types and propagation modes of wave guides</li> <li>• describe the various types of microwave components and antennas.</li> <li>• know the basic principle of radar and interpret the various types of RADAR.</li> <li>• measure VSWR of a given load</li> <li>• describe the working principles of different types of satellite.</li> </ul>	<ul style="list-style-type: none"> <li>• Assignments and quiz/class tests, mid-semester and end-semester written tests.</li> <li>• Actual laboratory and practical work.</li> <li>• Assembly and disassembly exercises.</li> <li>• Presentation and Viva-Voce.</li> </ul>
2	Electronics Applications In Industry	<p>The students will be able to:</p> <ul style="list-style-type: none"> <li>• understand the fundamental of audio system.</li> <li>• gain the basic knowledge of TV fundamentals.</li> <li>• understand the thyristor family such as SCR, DIAC, TRIAC, IGBT, and UJT</li> <li>• describe the application of thyristor as commutator, inverter, chopper circuits.</li> </ul>	<ul style="list-style-type: none"> <li>• Assignments and quiz/class tests, mid-semester and end-semester written tests.</li> <li>• Ability to implement different thyristor-based circuits.</li> <li>• Seminars and Viva-Voce.</li> </ul>
3	Digital Switching and Telephony	<p>The students will be able to:</p> <ul style="list-style-type: none"> <li>• understand different communication systems.</li> <li>• achieve knowledge of analog and digital modulation techniques.</li> <li>• encrypt and decrypt the data with the help of various codes.</li> <li>• Understand the phenomena of traffic engineering.</li> <li>• attain knowledge of communication hardware like UART and USART</li> <li>• understand the concept of modems, its working and interfacing with Rs232.</li> <li>• familiarize with EPABX and FAX systems.</li> </ul>	<ul style="list-style-type: none"> <li>• Assignments and quiz/class tests, mid-semester and end-semester written tests.</li> <li>• Actual laboratory and practical work.</li> <li>• Presentation and Viva-Voce.</li> </ul>

4	Entrepreneurship Management	<ul style="list-style-type: none"> <li>• The students will be able to:</li> <li>• Know about various schemes of assistance by entrepreneurial support agencies</li> <li>• Conduct market survey</li> <li>• Prepare project report</li> <li>• Explain the principles of management including its functions in an organisation.</li> <li>• Have insight into different types of organizations and their structures.</li> <li>• Inculcate leadership qualities to motivate self and others.</li> <li>• Manage human resources at the shop-floor</li> <li>• Maintain and be a part of healthy work culture in an organisation.</li> <li>• Use marketing skills for the benefit of the organization.</li> <li>• Maintain books of accounts and take financial decisions.</li> <li>• Undertake store management.</li> </ul>	<ul style="list-style-type: none"> <li>• Assignments and quiz/class tests, mid-semester and end-semester written tests.</li> <li>• Group discussions.</li> </ul>
5	Major Project-I	<p>The student should be able to:</p> <ul style="list-style-type: none"> <li>• Search different projects based on real-life problems.</li> <li>• Select a proper project.</li> <li>• Search component and data sheet.</li> <li>• Design PCB with use of different softwares.</li> </ul>	<p>Based on:</p> <ul style="list-style-type: none"> <li>• Selection of project.</li> <li>• Formation of PCB using minimum covered area.</li> <li>• Proper component mounting on PCB.</li> </ul>