



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

BRANCH NAME– INSTRUMENTATION CONTROL ENGINEERING

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.		
325001	Consumer Electronics and Troubleshooting	5	1	4	10	35	30	75	2.5	50	3.0	190	7
325002	Electronics in Industry	5	1	4	10	35	30	75	2.5	50	3.0	190	7
325003	Process Control Engineering	5	1	4	10	35	30	75	2.5	50	3.0	190	7
095001	Entrepreneurship Management	4	-	-	4	50	-	75	2.5	-	3.0	125	3
325004	Transducer & Analyzers	5	1	4	10	50	30	75	2.5	50	3.0	205	8
325052	Industrial Exposure (assessment at Inst. Level) +	-	-	-	-	-	25	-	-	-	-	25	1
015054	General Proficiency#	-	-	4	4	-	25	-	-	-	-	25	1
325053	Industrial Training	4 week				-	25	-	-	25	3.0	50	1
Total		24	4	20	48	205	195	375	-	225	-	1000	35

General Proficiency will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS and cultural activities, elementary mathematics, G.S. & G.K. 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 - 32



**FIFTH SEMESTER
INSTRUMENTATION & CONTROL ENGINEERING**



L	T	P
5	1	4

Subject Code : 325001

RATIONALE

The objective of teaching this subject is to give students an in depth knowledge of various electronic audio and video devices and systems. Further this subject will introduce the students with working principles block diagram main features of consumer electronics gadgets goods/devices like audio systems CD systems. TV and other items like microwave ovens Photostat machines etc. Which in turn will develop in them capabilities of assembling fault diagnosis and rectification in a systematic way.

DETAILED CONTENTS

1. AUDIO SYSTEM

(12 periods)

1.1 Microphones and Loudspeakers

- Carbon moving coil cordless microphone
- Direct radiating and horn loudspeaker
- Multispeaker system

1.2 Sound Recording

- Magnetic Recording
- Digital Recording
- Optical Recording (CD system and DVD)

1.3 Study of VCD and DVD Player systems.

2. Television

(20 Periods)

Monochrome TV

- Basic components of monochromatic TV
- TV Receiver: Block diagram function of each block waveform at input and output of each block.

Colour Television:

- Primary secondary colours
- Concept of Colour Mixing Colour Triangle
- Camera tube
- PAL TV Receiver
- Concept of Compatibility with Monochrome Receiver NTSC PAL SECAM system (brief comparison)

3. LCD and LED Television: (10 Period)

Basic principle and working of LCD & LED TV Plasma screens HDTV.3DTV

4. Cable Television (10 Periods)

Concept and Working of Cable TV DTH SetUp Box

5. Consumer Appliances (14 Periods)

Principle Working and troubleshooting with special emphasis on control panel

- a) Microwave Oven
- b) Washing Machine
- c) Photostat Machine
- d) DTH System
- e) Digital Camera
- f) Induction plate
- g) Refrigerator

6. a) Repair Servicing and Maintenance Concepts (14 Periods)

Reliability aspects Mean time between failures (MTBF) Mean time to repair (MTR) Maintenance policy potential problems preventive maintenance and corrective maintenance.

b) Fundamental Trouble Shooting Procedures

- i) Fault location
- ii) Fault finding aids
 - Service manuals
 - Test and measuring instruments
 - Special tools
- iii) Trouble Shooting Techniques
 - Troubleshooting Digital Circuits
 - Troubleshooting MicroprocessorBased Systems
 - Functional Areas Approach
 - Split half method
 - Divergent convergent and feedback path circuit

LIST OF PRACTICALS

1. To plot the directivity pattern and frequency response of a microphone.
2. To plot the directivity pattern and frequency response of a loudspeaker.
3. Demonstration of VCD/DVD player and study of its transport mechanism
4. Familiarization with the different sections of Black and White TV Receiver.

5. To observe the wave forms and voltage of Color TV Receiver.
6. Fault finding of Color T.V Receiver.
7. Familiarization with different section of LCD & LED TV
8. Study of cable TV network system.
9. Demonstration and Operation of Control Panel
 - (a) Microwave Oven
 - (b) DTH System
 - (c) Photostat Machine
 - (d) Washing Machine

RECOMMENDED BOOKS

1. Audio and Video Systems by RG Gupta Tata Mc Graw Hill Education Pvt Ltd New Delhi
2. Colour Television Principles & Practice by R.R Gulati Wiley Eastem Limited New Delhi
3. Complete Satellite & cable Television R.R Gulati New age Intemational Publisher New Delhi
4. Colour Television Servicing by RC Vijay BPB Publication New Delhi
5. Colour Television & Video Technology by A.K. Maini CSB Publishers
6. Colour TV by A. Dhake
7. Service Manuals BPB Publication New Delhi
8. Modem Electronic Equipment Trouble shooting Repair and Maintenance by RS Khandpur Tata Mccraw Hill Education Prt Ltd New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allocation (%)
1	12	15
2	20	25
3	10	10
4	10	10
5	14	20
6	14	20
Total	80	100

L	T	P
5	1	4

Subject Code : 325002**Unit:- I****(20 Periods)****Silicon Controlled Rectifiers & Thyristor family**

Introduction, Construction and working principles of an SCR, two transistor analogy and characteristics, specifications and rating, Methods of triggering a Thyristor, Commutation of Thyristors (Concept), Series and parallel operation of Thyristors, Protection of SCR, Snubber Circuit

Construction, working principles and V-I characteristics of DIAC, TRIAC, Basic idea about the selection of heat sinks for SCR and TRIACS. UJT, its Construction, working principles and V-I characteristics, UJT relaxation oscillator

Applications of SCR, TRIAC such as light intensity control, speed control of DC and universal motor, fan regulator, battery charger, temperature control

Unit:- II**(20 Periods)****Controlled Rectifiers**

Single phase half wave controlled rectifier with resistive load and inductive load, concept of freewheeling diode, Single phase half controlled full wave rectifier (No mathematical derivation), Single phase fully controlled full wave rectifier bridge, Single phase full wave centre tapped rectifier, Three phase full wave half controlled bridge rectifier, Three phase full wave fully controlled bridge rectifier

Unit:- III**(10 Periods)****Choppers**

Choppers-introduction, types of choppers and their working principles, Quadrant operation and applications

Unit:- IV**(15 Periods)****Dual Converters and Cyclo Converters**

Dual converters-introduction, working principles and applications

Cyclo-converters- introduction, types, working principles of simultaneous and non simultaneous control and applications.

Unit:- V**(15 Periods)****Inverters & Uninterrupted Power Supplies**

Inverter-introduction, working principles, voltage and current driven series and parallel inverters and applications

UPS, Stabilizers, SMPS, UPS online, off line, Storage devices (batteries)

Power Conditioners

LIST OF PRACTICALS

1. To draw V-I characteristics of an SCR
2. To draw V-I characteristics of a TRIAC
3. To draw V-I characteristics of a DIAC
4. To draw uni-junction transistor characteristics
5. Observe the output wave of an UJT relaxation oscillator
6. Observe the wave shape across SCR and load of an illumination control circuit
7. Fan speed regulator using TRIAC
8. To observe the output wave shape on CRO of a Single phase half controlled full wave rectifier
9. Single phase controlled rectifier

RECOMMENDED BOOKS

- Industrial Control Electronics. John Webb, Kevin Greshock, Maxwell, Macmillan International editions
- Fundamentals of Power Electronics by S Rama Reddi, Narosa Publishing House Pvt. Ltd, New Delhi
- Power Electronics, Circuits Devices and Applications by Mohammad H. Rashid
- Power Electronics by PC Sen
- Power Electronics by Dr. PS Bhimbra, Khanna Publishers, New Delhi
- Industrial Electronics & Control by SK Bhattacharya & S Chatterji, New Age international Publications(P) Ltd, New Delhi
- Industrial Electronics and Control of Drives by SK Sahdev, Uneek Publication, Jalandhar
- Industrial Power Electronics by JC Karhava, King India Publication,
- Fundamentals of Electrical Drives by Gopal K Dubey, Narosa Publishing House Pvt. Ltd, New Delhi
- Power Electronics and Controls by Samir K Datta, Prentice Hall of India, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (Periods)	Marks Allocation %
I	20	25
II	20	25
III	10	10
IV	15	20
V	15	20
TOTAL	80	100

L	T	P
5	1	4

Subject Code : 325003**Unit:- I****(10 Periods)****Basic Control Loops and Characteristics**

Basic of process control, process variables, single and multi capacity processes, single capacity level, pressure, temperature and flow loop systems. Process lag, measurement lag, transmission lag and dead time.

Unit:- II**(10 Periods)****Controller modes and characteristics**

Concept of on-off, proportional, integral, derivative, P, PI and PID controls, their examples, merits and demerits.

Unit:- III**(12 Periods)****Electrical Control Elements**

Construction and principle of operation of solenoids, stepper motor, limit switches, relays, auto transformer and magnetic amplifier.

Unit:- IV**(14 Periods)****Pneumatic and Hydraulic Control Elements**

Pneumatic pressure supply, pneumatic actuator, pneumatic relay, pneumatic amplifiers, electro-pneumatic actuators, flapper-nozzle system and bellows, air filter and regulator. Hydraulic actuators and valves, electro hydraulic actuators.

Unit:- V**(18 Periods)****Control Valves & Switches**

Principle of operation and constructional details of solenoid valve, diaphragm operated valve, globe valve, ball valve, butterfly valve, valve positioners. Control valve characteristics, their sizing and selection of valves. Temperature switches, Flow switches, Pressure switches, interlocking and sequencing circuits, need of interlocks, annunciators.

LIST OF PRACTICALS

1. To find the differential gap of on-off control system.
2. To rig up an electronic PID controller and verify its working.

3. To rig up an electronic proportional controller unit.
4. To rig up an electronic proportional integrated controller unit.
5. To study the characteristics and controller specifications of different types of control valves and their repair and maintenance.
6. To study and obtain the input output relationship of a pneumatic relay.
7. To determine the characteristics of a control valve with positioned and without positioner.
8. To study a control loop of tank level control using on-off control.
9. To study the control loop of a system for a flow control.
10. To study the control loop of a system for pressure control.
11. To study the construction and working of a pressure switch.
12. To study the construction and working of a temperature switch.
13. To study the construction and working of a float type level switch.

RECOMMENDED BOOKS

- Process control by Peter Harrot, Tata McGraw Hill Publishers, New Delhi.
- Automatic process control by Erchman DP; John Wiley and Sons, New Delhi
- Instrument Engineers Handbook by Liptik BG.
- Process Control Instrumentation Technology by Johnson Curtis D. John Willey and Sons, New Delhi.
- Process Measurement and Analysis by Liptik BG.
- Handbook of Applied Instrumentation by DM Considine.
- Mechanical and Industrial and Industrial Measurements by RK Jain, Khanna Publishers, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (Periods)	Marks Allocation %
I	10	16
II	10	16
III	12	22
IV	14	22
V	18	24
TOTAL	64	100

L	T	P
4	-	-

Subject Code : 095001

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

A. ENTREPRENEURSHIP (30 Periods)

1. Introduction

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

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

3. Project report Preparation

- Preliminary project report
- Detailed project report including technical, economic and market feasibility
- Common errors in project report preparations
- Exercises on preparation of project report

4. Introduction to Management

Definitions and importance of management

- Functions of management: Importance and Process of planning, organising, staffing, directing and controlling Principles of management (Henri Fayol, 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

a) Leadership Definition and Need

- Qualities and functions of a leader
- Manager Vs leader
- Types of leadership

b) Motivation Definitions and characteristics

- Factors affecting motivation
- Theories of motivation (Maslow, Herzberg, McGregor)

6. Management Scope in Different Areas

a) Human Resource Management Introduction and objective

- Introduction to Man power planning, recruitment and selection
- Introduction to performance appraisal methods

b) Material and Store Management Introduction functions, and objectives

- ABC Analysis and EOQ

c) Marketing and sales Introduction, importance, and its functions

- Physical distribution
- Introduction to promotion mix
- Sales promotion

d) Financial Management Introductions, importance and its functions

- Elementary knowledge of income tax, sales tax, excise duty, custom duty and VAT

7. Miscellaneous Topics

a) Customer Relation Management (CRM) Definition and need

- Types of CRM

- b) Total Quality Management (TQM) Statistical process control
 - Total employees Involvement
 - Just in time (JIT)
- c) Intellectual Property Right (IPR) Introductions, definition and its importance, Infringement related to patents, copy right, trade mark.

C EMPLOYABLE SKILLS

(20 Periods)

8. Industrial Scenario Engineering Education and expectations of competencies from an engineer by employer, Personality types, characteristic and features for a successful engineer. Professional Engineer desirable values and ethics and their development. Relation between engineering profession, society and environment.

9. Preparing for Employment

Searching for job/job hunting

- Resume Writing
- Interview technique in personal interview telephonic interview, panel interview, group interview, video conference. Effective Communication
- Listening
- Speaking
- Writing
- Presentation Technique/Seminar
- Group discussion

Managing Self: Managers body, mind, emotion and spirit

- Stress Management
- Conflict resolution

10. Creativity, Innovation and Intellectual property right, Concept and need in present time for an engineer, Basic rules, laws and norms to be adhered by engineers during their working .

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment or seminar method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organisations on visit. Approach extracted reading and handouts may be provided.

RECOMMENDED BOOKS

- A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
- Entrepreneurship Development published by Tata McGraw Hill Publishing Company Ltd., New Delhi
- Entrepreneurship Development in India by CB Gupta and P Srinivasan; Sultan Chand and Sons, New Delhi
- Entrepreneurship Development - Small Business Enterprises by Poornima M Charantimath; Pearson Education, New Delhi
- Entrepreneurship : New Venture Creation by David H Holt; Prentice Hall of India Pvt. Ltd., New Delhi
- Handbook of Small Scale Industry by PM Bhandari
- Principles and Practice of Management by L M Prasad; Sultan Chand & Sons, New Delhi. Entrepreneurship by Alpana Trehan; Dream Tech. Press.
- Entrepreneurship by Manimali; Viz Tantra Publications.
- Patterns of Entrepreneurship by Kalpana; Wiley India Publications.

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (Periods)	Marks Allocation (%)
A	30	37
B	30	37
C	20	26
Total	80	100

L	T	P
5	1	4

Subject Code : 325004

Unit:- I**(10 Periods)****Introduction: Definition of transducers**

- Classification of Transducers:
- Primary and secondary, mechanical devices as primary detectors.
- Electrical transducer: Advantages, classification of electrical transducer, active and passive, analog and digital, electrical phenomena used in transducers.

Unit:- II**(20 Periods)****Resistance, Variable Inductance & Capacitive transducers****Principle of variable resistance transducers.**

- Potentiometers - Principle of working, construction, linearity and sensitivity, types, advantages and disadvantages of potentiometer, its applications. Strain gauges - Theory of strain gauges, gauge factor, types of strain gauges, material for strain gauges, temperature compensation in strain gauge, applications. Thermistors - Construction, characteristics and applications of Thermistors

Variable Inductance Type Transducers

- Principle of variable inductive transducers by variation of self inductance, mutual inductance and eddy current. Different types of transducers, working on above principles. L.V.D.T. : Construction, theory, linearity and sensitivity, advantages, disadvantages and uses.

Capacitive Transducers

- Principle of capacitive transducers, capacitive transducers using change in distance between plates, differential arrangement for improving sensitivity, capacitive transducers constant, application for capacitive transducers.

Unit:- III**(20 Periods)****Optical Transducers & Piezo Electric Transducers**

- Theory of photo emission, classification of photo electric devices, vacuum photo tube, gas photo tube, photo multiplier tube, photo conductive cell, photo diode, photo transistor and their applications.
- Theory of piezoelectric effect, mode of operation and properties of piezoelectric crystal, equivalent circuit of piezoelectric transducer and applications of piezo electric transducers.

Unit:- IV**(15 Periods)****Viscosity Measurement, PH & Conductivity Analyzer**

- Definition of viscosity, measurement of viscosity by capillary type and rotational type
- Definition and importance of PH value, buffer solution, reference and standard electrodes for PH measurement.
- Definition of conductivity, conductance, Sp-conductance and equivalent conductance-Alternating current conduction. Measurement of conductivity, conductivity cell, cell constant applications.

Unit:- V**(15 Periods)****Spectrophotometry & Gas Analyzer**

- Principle of Filter photometer, direct reading type and double beam spectrophotometer for visible infrared and ultraviolet regions, advantages of double beam spectrophotometer. Principle of colorimetry, photometry and use of various types of colorimeter photometers and flame photometers.
- Basic function of analyzer, types of analyzers, working principle and construction of gas analyzer.

LIST OF PRACTICALS

1. Study of strain gauge and measurement of strain for given sample.
2. Study of piezoelectric pressure transducer.
3. Study of RTD.
4. Study of Thermistor.
5. Study of LVDT.
6. Study of angular displacement using capacitive transducer.
7. Study of thermocouple.
8. To study and draw characteristics of LDR, Photo diode, Photo transistor.

RECOMMENDED BOOKS

- Mechanical and industrial measurements by RK Jain, Khanna Publishers, New Delhi.
- Modern Control Engineering by OGATA.
- Fundamentals of Instrumentation by AE Fribance.
- Transducers by Peter Norton.

- Mechatronics by Bolton, Prentice Hall of India, New Delhi.
- Electronic Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Co, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (Periods)	Marks Allocation %
I	10	10
II	20	25
III	20	25
IV	15	20
V	15	20
TOTAL	80	100



LEARNING OUT COMES AND MEANS OF ASSESSMENT

BRANCH NAME – INSTRUMENTATION AND CONTROL ENGINEERING

SEMESTER – V

S.NO.	Title of Subject/Unit	Learning Outcomes	Means of Assessment
1	Industrial Training	Industrial Training provides an opportunity to students to explore their skills and knowledge in electrical industries & field and enables them to integrate theory with practice.	Assignments, Quizzes, Seminars, Class Test, Power Point Presentation, Mid Term Examination & Semester examination.
2	Consumer Electronics & Troubleshooting	At the end of the course the student will be able to get the knowledge and understanding of electrical and electronics appliances like audio system, television ,LADLED, microwave, washing machine etc.	Assignments, Quizzes, Seminars, Class Test, Power Point Presentation, Mid Term Examination & Semester examination. Practical assessment is done through practical test results, practical files and Viva voice.
3	Electronics in Industry	At the end of the course, the student will have the understanding of SCR, Cyclo- converters, choppers ,inverters ,controlled rectifiers and UPS used in various electronics applications in industries.	Assignments, Quizzes, Seminars, Class Test, Power Point Presentation, Mid Term Examination & Semester examination.
4	Process Control Engineering	At the end of the course, the student will be able to develop basic control loops and characteristics control, pneumatic and hydraulic elements etc.	Assignments, Quizzes, Seminars, Class Test, Power Point Presentation, Mid Term Examination & Semester examination.
5	Entrepreneurship Management	This subject helps in developing managerial and entrepreneurial qualities in students.	Assignments, Quizzes, Seminars, Class Test, Power Point Presentation, Mid Term Examination & Semester examination. Practical assessment is done through practical test results, practical files and Viva voice.
6	Transducer & Analyzer	At the end of the course, the student will have the understanding of various types of transducers both electrical and non electrical, spectrophotometer and gas analyzer.	Assignments, Seminars, Power Point Presentation, Report, Viva voice & Practical examination.