

CURRICULUM
FOR
DIPLOMA PROGRAMME
IN
**ELECTRONICS & COMMUNICATION
ENGINEERING**
(5th & 6th Semester)
FOR THE STATE OF HIMACHAL PRADESH



(Implemented w.e.f. Session 2014-15)

Prepared by:-

Composite Curriculum Development Centre
Directorate of Technical Education,
Vocational & Industrial Training, Sundernagar(H.P.)

July, 2014

CONTENTS

SR.NO.	PARTICULARS	PAGE NO.
-	Contents	1
-	Preface	2
1.	Salient Features of the Diploma Programme	3
2.	Guidelines <i>(for Assessment of Student Centered Activities and Sessional assessment)</i>	4
3.	Study and Evaluation Scheme	5-6

FIFTH SEMESTER		
5.1	Consumer Electronics	7-9
5.2	Generic Skills and Entrepreneurship Development	10-12
5.3	Communication System-II	13-15
5.4	Microcontroller and Embedded System	16-17
5.5	Microwave and Radar Engineering	18-19
5.6	Elective-I 5.6.1 Personal Computer Organization 5.6.2 Medical Electronics 5.6.3 Digital Signal Processing	20-21 22-23 24-25
5.7	Minor Project	26
SIXTH SEMESTER		
6.1	Basics of Management	27-29
6.2	Optical Fiber Communication	30-31
6.3	Wireless and Mobile Communication	32-33
6.4	Instrumentation and Programme Logic Controller	34-37
6.5	<u>Elective –II</u> 6.5.1 Computer Networks 6.5.2 Advanced Microprocessor 6.5.3 VLSI System Design	38-39 40-41 42-43
6.6	Major Project	44-45
6.7	Practices in Communication Skills	46

PREFACE

India, in last two decades, has made significant progress in all major spheres of activity. Since 1947, the Technical Education System has grown into fairly large sized system, offering opportunities for education and training in wide variety of trades / disciplines at different levels. Needless to say that well trained technical manpower is the backbone of any growing economy in the era of fast industrialization. It has been the endeavor of the Technical Education Department to take decisive steps to enhance the capacities of technical institutions with major emphasis on quality and excellence in technical education .Our country is the only country in the world which has 50% population below the age of 25 years whereas America has 30% and China 40%.Working Age Population (WAP) is increasing in India whereas it is decreasing in other parts in the world. Challenge before us is to train this WAP for the world of work .Updated curriculum is one of the most powerful tools to improve the quality of training.

Curriculum Document is a comprehensive plan or a blue print for developing various curriculum materials and implementing given educational programme to achieve desired and formally pre-stated educational objectives. Moreover it (the document) is the output of exhaustive process of curriculum planning and design, undertaken by the implementers under the expert guidance of curriculum designer.

While working out the detailed contents and study and evaluation scheme, the following important elements have been kept in mind:

- i) Major employment opportunities of the diploma holders.*
- ii) Modified competency profile of the diploma holders with a view to meet the changing needs due to technological advancement and requirements of various employment sectors.*
- iii) Vertical and horizontal mobility of diploma pass outs for their professional growth.*
- iv) Pragmatic approach in implementing all the curricula of diploma programmes in engineering and technology in the state of H.P.*

The document is an outcome of the feedback received from field organizations/ industry of different categories viz. small, medium and large scale which offer wage employment for the diploma pass outs. In every stage of planning and designing of this curriculum, suggestions and advice of experts representing industry, institutions of higher learning, research organizations etc. were sought and incorporated as per the requirement of curriculum . The document contains the study and evaluation scheme and detailed subject/course contents to enable the H.P. Polytechnics to implement revised curriculum and to achieve the desired objectives.

Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which Communication Lab has been introduced during the first year itself.

We hope that this revision will prove useful in producing competent diploma holders in the state of Himachal Pradesh. The success of this curriculum depends upon its effective implementation and it is expected that the managers of polytechnic education system in Himachal Pradesh will make efforts to create better facilities, develop linkages with the world of work and foster conducive and requisite learning environment.

Er. L.R. Rana
Head(CCDC)
Directorate of Technical Education,
Vocational & Industrial Training,
Sundernagar, Himachal Pradesh.

3rd YEAR OF THREE YEAR DIPLOMA PROGRAMME IN ELECTRONICS & COMMUNICATION ENGINEERING

1. SALIENT FEATURES

- | | |
|-------------------------------|--|
| 1) Name of the Programme : | Three year Diploma Programme
Electronics & Communication Engineering |
| 2) Duration of the Programme: | Three years (06 Semesters) |
| 3) Entry Qualification : | As prescribed by H.P. Takniki
Shiksha Board |
| 4) Intake : | As approved by H.P. Takniki
Shiksha Board |
| 5) Pattern of the Programme : | Semester Pattern |
| 6) Curriculum for : | 3 rd year of Three year Diploma
Programme (Technical Stream) |

7) Student Centred Activities:

A provision of 2-4 hrs per week has been made for organizing Student Centred Activities for overall personality development of students. These activities will comprise of co-curricular & other activities such as expert lectures, games, seminars, declamation contests, educational field visits, NCC, NSS and cultural activities & hobby classes like photography, painting, singing etc.

2. GUIDELINES

2.1 GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

Distribution of 25 marks for SCA will be as follows:

- i. 5 Marks shall be given for general behaviour
- ii. 5 Marks for attendance shall be based on the following distribution:
 1. Less than 75% Nil
 2. 75-79.9% 3 Marks
 3. 80-84.9% 4 Marks
 4. Above 85% 5 Marks
- iii. 15 Marks shall be given for the Sports/NCC/Cultural and Co-curricular activities/other activities after due consideration to the following points:
 1. For participation in sports/NCC/Cultural/Co-curricular activities at National or above level, shall be rewarded with minimum of 10 marks
 2. For participation in sports/NCC/Cultural/Co-curricular activities at Inter-polytechnic level, shall be rewarded with minimum of 08 marks
 3. For participation in two or more of the listed activities, 5 extra marks should be rewarded

Note: *Head of Department shall ensure that these marks are conveyed to the H.P. Takniki Shiksha Board, Dharamshala at the end of semester along with sessional record.*

2.2 GUIDELINES FOR SESSIONAL ASSESSMENT

- The distribution of marks for Internal Assessment in theory subjects and drawing shall be made as per the following guidelines:
 - i. 60% of internal assessment shall be based on the performance in the tests. At least three tests shall be conducted during the semester out of which at least one should be house test. 30% weightage shall be given to house test and 30% to class test(One best out of two).
 - ii. 20% marks shall be given to home assignments, class assignments, seminars etc.
 - iii. 20% marks shall be given for attendance/punctuality in the subject concerned.
- The distribution of marks for Internal/External Assessment in practical subjects shall be made as per the following guidelines:
 - i. 60% marks shall be awarded for performance in practical.
 - ii. 20% marks shall be given for Report/Practical book and punctuality in equal proportion.
 - iii. 20% marks shall be for Viva-voce conducted during the practicals.
- The distribution of mark for internal assessment in drawing subjects shall be as per following guidelines:-
 - (i) 60% marks for sheets
 - (ii) 40% for test.

**STUDY AND EVALUATION SCHEME
(ELECTRONICS & COMMUNICATION ENGINEERING)**

FIFTH SEMESTER

SR. NO	SUBJECTS	STUDY SCHEME Hrs/Week		MARKS IN EVALUATION SCHEME								Total Marks Int. & Ext.
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr	Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
5.1	Consumer Electronics	4	2	30	20	50	100	3	50	3	150	200
5.2	*Generic Skills and Entrepreneurship Development	2	1	50	50	100	50	2	-	-	50	150
5.3	Communication System-II	4	2	30	20	50	100	3	50	3	150	200
5.4	Microcontroller and Embedded System	4	2	30	20	50	100	3	50	3	150	200
5.5	Microwave and Radar Engineering	4	2	30	20	50	100	3	50	3	150	200
5.6	Elective-I 5.6.1 Personal Computer Organization 5.6.2 Medical Electronics 5.6.3 Digital Signal Processing	4	-	50	-	50	100	3	-	-	100	150
5.7	Minor Project Work	-	4	-	50	50	-	-	50	3	50	100
5.8	Industrial Training	-		-	25	25	-	-		-	-	25
	Student Centered Activities	-	4	-	50	50	-	-	50	-	50	100
	Total	22	17	220	255	475	550	-	300	-	850	1325

* Common with other diploma programmes.

**STUDY AND EVALUATION SCHEME
(ELECTRONICS & COMMUNICATION ENGINEERING)
SIXTH SEMESTER**

SR. NO.	SUBJECTS	STUDY SCHEME <i>Hrs/Week</i>		MARKS IN EVALUATION SCHEME								Total Marks of Int. & Ext.
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr	Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
6.1	*Basics of Management	3	-	50	-	50	100	3	-	-	100	150
6.2	Optical Fiber Communication	4	2	30	20	50	100	3	50	3	150	200
6.3	Wireless and Mobile Communication	4	2	30	20	50	100	3	50	3	150	200
6.4	Instrumentation and Programmable Logic Controller	5	2	30	20	50	100	3	50	3	150	200
6.5	<u>Elective –II</u> 6.5.1 Computer Networks 6.5.2 Advanced Microprocessor 6.5.3 VLSI System Design	4	-	50	-	50	100	3	-	-	100	150
6.6	Major Project Work	-	8	-	100	100	-	-	100	3	100	200
6.7	Practices in Communication Skills	-	2	-	50	50	-	-	50	3	50	100
6.8	Student Centred Activities	-	4	-	25	25	-	-	-	-	-	25
<i>Total</i>		20	20	190	235	425	500	-	300	-	800	1225

* Common with other diploma programmes.

5.1 CONSUMER ELECTRONICS

L T P
4 - 2

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, VCR and other items like digital clocks, calculators 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:** (13hrs)
 - 1.1 **Microphones:** construction, working principles and applications of microphones, their types viz:
 - a) Carbon
 - b) moving coil
 - c) velocity
 - d) crystal
 - e) condenser
 - f) cordless etc.
 - 1.2 Loud Speaker: Direct radiating, horn loaded woofer, tweeter, mid range, multi-speaker system, baffles and enclosures.
 - 1.3 CD System. - Working Principle of VCD and DVD recording and playback
 - 1.4 Hi-Fi system - pre-amplifier, amplifier and equalizer system, stereo amplifier.

- 2. Monochrome TV:-** (16hrs)
 - Elements of TV communication system.
 - Scanning- its need for picture transmission.
 - Need for synchronizing and blanking pulses.
 - Progressive scanning- Gross structure, interlaced scanning, resolution and band width requirement, tonal gradation.
 - Composite Video Signal (CVS) at the end of even and odd fields. Equalizing pulses and their need.
 - Monochrome picture tube – construction and working, comparison of magnetic and electric deflection of beam.
 - Block diagram of a TV receiver: function of each block and waveform at the input and output of each block.

- 3. COLOUR TV** (13hrs)
 - 3.1 Primary colours, tristimulus values, trichromatic coefficients, concepts of additive and subtracting mixing of colours, concepts of luminance, Hue and Saturation, Representation of a colour in colour triangle, visibility curve

- 3.2 Compatibility of colour TV system with monochrome system.
- Introduction to PAL, NTSC,
- Block diagram of PAL TV receiver, explanation and working

4. Advanced Color Television System (06hrs)
LCD TV, LED TV, Plasma Screens, HDTV, 3DTV

5. Cable Television:- (04 hrs)
Block diagram and principles of working of cable TV and DTH, Set top box based smart card TV System

6. Basic Block Diagram, Working Principle and Application of: (4hrs)
6.1 Cordless Telephone
6.2 Photostat M/C.
6.3 Electronic Ignition System for Automobiles.
6.4 Microwave Oven

LIST OF PRACTICALS

1. *To plot the frequency response of a microphone*
2. *To plot the frequency response of a loud speaker*
3. *Demonstration of DVD Player.*
4. *Troubleshooting of CD/DVD Player.*
5. *Observe the wave forms and voltage of B/W and colour T.V receiver at different stages/locations.*
6. *Fault finding of colour T.V*
7. *Demonstration of LCD / LED TV.*
8. *Demonstration of Microwave oven*
9. *Study of a TV cable network system.*
10. *Demonstration of Photostat M/c*

LIST OF RECOMMENDED BOOKS

- 1) *Colour Television-principles & practice R.R Gulati by Wiley Eastern Limited, New Delhi*
- 2) *Complete Satellite & cable Television R.R Gulati New age International Publisher, New Delhi*
- 3) *Colour Television Servicing by RC Vijay BPB Publication, New Delhi*
- 4) *Colour Television & Video Technology by A.K. Maini CSB Publishers Colour TV by A.Dhake*
- 5) *Service Manuals, BPB Publication, New Delhi.*

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted	Marks Allotted (%age)
1	13	25
2	16	30
3	13	25
4	06	08
5	04	06
6	04	06
Total	56	100

5.2 GENERIC SKILLS & ENTREPRENEURSHIP DEVELOPMENT

LTP
201

RATIONALE

In present scenario, there is an urgent need to develop right kind of attitude, knowledge and skills amongst the Diploma engineers leading them to achieve gainful wage/ self employment. There is a huge gap in perceptions of employers and employees regarding meeting the job requirements. Also the dual challenges of competing in global working environment and keeping pace with the rapid technological advancements call for re-design of curricula and thus enabling the importance of employability or generic skills. Entrepreneurship development aim at developing conceptual understanding for setting up owns' business/enterprise to cope up with the problem of unemployment and also to promote the socio- economic development of our country.

Both the subject areas, "generic skills and entrepreneurship development" are supplementary to each other. Knowledge and skills of these must be imparted to diploma engineering students for enhancing their employability and confidence in their personal and professional life.

DETAILED CONTENTS

- 1. Introduction to Generic Skills (02 Hrs)**
 - 1.1 Concept and importance
 - 1.2 Local and global scenario
 - 1.3 Concept of life-long learning (LLL)

- 2. Self- Management and Development (07 Hrs)**
 - 2.1 Concept of Personality Development, Ethics and Moral values
 - 2.2 Concept of Intelligence and Multiple intelligence Types viz, linguistic, mathematical & Logical reasoning, emotional, and social intelligence (interpersonal & intrapersonal).
 - 2.3 Concept of Physical Development; significance of health, hygiene, body gestures & kinesics.
 - 2.4 Time Management concept and its importance
 - 2.5 Intellectual Development; reading skills (systematic reading, types and SQ5R), speaking, listening skills, writing skills (Note taking, rough draft, revision, editing and final drafting), concept of critical Thinking and problem solving (approaches, steps and cases).
 - 2.6 Psychological Management; stress, emotions, anxiety and techniques to manage these.
 - 2.7 ICT & Presentation skills; use of IT tools for good and impressive presentations.

- 3. Team Management (03 Hrs)**
 - 3.1 Concept of Team Dynamics. Team related skills such as; sympathy, empathy, leading, coordination, negotiating and synergy. Managing cultural, social and ethnic diversity.
 - 3.2 Effective group communication and conversations.

- 3.3 Team building and its various stages like forming, storming, norming, performing and adjourning (Bruce Tuckman's five stage Model)
- 4. Project Management (02 Hrs)**
- 4.1 Concept of Management and features
- 4.2 Stages of Project Management; initiation, planning, execution, closing and review (through case studies)
- 4.3 SWOT analysis concept.
- 5. Introduction to Entrepreneurship (02 Hrs)**
- 5.1 Entrepreneurship, Need of entrepreneurship, and its concept, Qualities of a good entrepreneur
- 5.2 Business ownerships and its features; sole proprietorship, partnership, joint stock companies, cooperative, private limited, limited, public limited, PPP mode.
- 5.3 Types of industries viz, micro, small, medium and large
- 6. Entrepreneurial Support System (features and roles in brief)(03 Hrs)**
District Industry Centres (DIC's), State Financial Corporation's (SFC's), Small Industries Service Institutes(SISI), Commercial Banks, Micro Financing Institutions, SIDBI, NABARD, National Small Industry Corporations (NSIC), Cooperative Societies and Venture Capitalists. Various Consultancy Organizations; HIMCON, Khadi and Gramodyog Board (H.P.) etc.
- 7. Market Study and Opportunity Identification (04 Hrs)**
Types of study; primary and secondary, product or service identification, assessment of demand and supply, type of surveys and important features; qualitative, empirical, schedules, questionnaire, interview.
- 8. Project Report Preparation (05 Hrs)**
- 8.1 Preliminary Report, Techno-Economic Feasibility Report, Detailed Project Report (DPR) and illustration of these through examples.
- 8.2 Exercises on writing project reports of micro and small projects.

List of Practical Exercises

1. *Understanding Self-Management and Development (Related to Chapter 02); through examples, cases, exercises, panel discussions, seminars, meditation and yoga techniques.*
2. *Team Management (Related to chapter 03); through examples, cases, role plays, group discussions and panel discussions.*
3. *Market Study and Opportunity Identification (Related to Chapter 07); through literature reviewing, making questionnaires, conducting mock interviews and analysing data for product/service identification and demand assessment.*
4. *Project Management and Project Report Preparation (Related to chapter 04 and 08); through exercises on making project reports on micro and small enterprises. Case studies and SWOT analysis of projects can be taken.*

Instructional Strategy

Since the emphasis of present training need and work requirements is on budding entrepreneurs as well as intelligent and multi skilled work force. Therefore skill development and knowledge imparting should be focussed on generic and entrepreneurial skill development. Thus instructional strategy of the subject should be more practical oriented and theories must be taught up to conceptual or informal levels. Different methodologies may be used with inclusive approach and must be supported with different training tools such as group and panel discussions , role plays, case studies, field surveys through questionnaires, schedules and interviews, presentations, seminars and expert talks in practical lectures and through student centred activities. Students may also be provided with extracted study material and handouts too.

Recommended Books:

1. *Generic Skill Development Manual, MSBTE, Mumbai*
2. *Lifelong Learning, Policy Brief (www.oecd.org)*
3. *Towards Knowledge Society, UNESCO Publication, Paris*
4. *Human Learning, Ormrod*
5. *What Work Requires of Schools? SCANS Report: U.S. Department of Labour*
6. *Entrepreneurship Development by CB Gupta and P Srinivasan: Sultan Chand and sons: New Delhi*
7. *Entrepreneurship Development by S. L. Gupta and Arun Mittal: IBH Publication*
8. *A Handbook of Entrepreneurship, Edited by B S Rathore and Dr. J S Saini*
9. *Entrepreneurship Development and Small Business Enterprises by Poornima M: Pearson Education India*
10. *Handbook of Small Scale Industry by P M Bhandari*

Inspirational Books

1. *Stay Hungry stay Foolish by Rashmi Bansal*
2. *An Autobiography by Lee Iacocca*
3. *Steve Jobs: The Biography by Walter Isaacson*

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs.)	Marks Allotted %
1	2	7
2	7	26
3	3	10
4	2	7
5	2	10
6	3	10
7	4	15
8	5	15
Total	28	100

5.3 COMMUNICATION SYSTEM – II

L T P
4 - 2

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 ISDN and Radio paging along with cellular mobile telephones, FAX, electronic exchanges etc. so vital for present day communication.

DETAILED CONTENTS

- 1. Introduction:** (02hrs)
Basic block diagram of digital and data communication systems. Their comparison with analog communication systems.
- 2. Coding** (06hrs)
 - a) Introduction to various common codes 5 bit Baudot code, 7 bit ASCII, ARQ, EBCDIC
 - b) Code error detection and correction techniques - Redundancy, parity, block check character (BCC), Vertical Redundancy check (VRC), Longitudinal Redundancy Check (LRC), Cyclic Redundancy check (CRC), Hamming code
- 3. Digital Modulation Techniques:** (08hrs)
 - a) Basic block diagram and principle of working of the following:
 - Amplitude shift keying (ASK): Interrupted continuous wave (ICW), two tone modulation
 - Frequency Shift keying (FSK)
 - Phase shift keying (PSK)
- 4. Data Transmission:** - Characteristics/working of data transmission circuits; band width requirements, data transmission speeds, noise, cross talk, echo suppressors, distortion, equalizers. (06 hrs)
- 5. UART, USART:-**
 - Principle of operation of UART, USART
 - Need and function in communication systems (06 hrs)
- 6. Modems:** (06hrs)
Need and function of modems, Mode of modems operation (low speed, medium speed and high speed modems). Modem interconnection, Modem data transmission speed, Modem modulation method, Mode minter facing (RS 232 Interface, other interfaces).

- 7. Telemetry:** (06 hrs)
Radio-telemetry, and its application. Block diagram of TDM and FDM telemetry system.
- 8. Electronic Exchange:** (08hrs)
- 8.1 Typical telephone network. Various switching offices (Regional Centre, District Centre, Toll Centre, Local Office) and their hierarchy.
 - 8.2 Principles of space division switches. Basic block diagram of a digital exchange and its working.
 - 8.3 Combined space and time switching: Working principle of STS and TST switches.
 - 8.4 Functions of the control system of an automatic exchange. Stored programme Control (SPC) processor and its application in electronic exchange and rural telephone exchange.
 - 8.5 Introduction to PBX, PABX and EPABX. Function of PBX. PABX relation with central office. Modern PABX capabilities
- 9. Operation of Cellular Mobile Telephone System.** (06hrs)
Concept of cells and frequency reuse. Special features of cellular mobile telephone. Block diagram of Mobile phone and its working.
- 10. Facsimile (FAX)** (02hrs)
Basic idea of FAX system and its applications. Principle of operation and block diagram of modern FAX system. Important features of modern FAX machines.

LIST OF PRACTICALS

1. *Transmission of Hamming code on a serial link and its reconversion at the receiving end.*
2. *Observe wave forms at input and output of ASK , FSK and PSK modulators.*
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 TDM circuit*
6. *To study the construction and working of a telephone handset*
7. *To study the construction and working of a FAX machine.*
8. *To study the construction and working of an EPABX.*
9. *To study the working of a cellular mobile system*

Recommended Books:-

1. *Electronic communication systems By George Kennedy TMH Delhi.*
2. *Communication system By A.K. Gautam S.K. KatariaSons,Delhi.*
3. *Electronics communication by K.S. Jamwal, DhanpatRai and Sons, Delhi.*

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted	Marks Allotted (%age)
1	2	5
2	6	10
3	8	15
4	6	10
5	6	10
6	6	10
7	6	10
8	8	15
9	6	10
10	2	5
Total	56	100

5.4 MICROCONTROLLERS AND EMBEDDED SYSTEM

L T P

4 – 2

RATIONALE

Embedded systems and Micro-controllers have also assumed a great significance in the electronic and consumer goods industry and are a very vital field. The subject aims expose students to the embedded systems besides giving them adequate knowledge of Micro controllers.

DETAILED CONTENTS

- 1. Microcontroller series (MCS) – 51 Overview** (11hrs)
 - 1.1 Architecture of 8051Microcontroller
 - 1.2 Pin details
 - 1.3 I/O Port structure
 - 1.4 Memory Organization
 - 1.5 Special Function Registers (SFRs)
 - 1.6 External Memory

- 2. Instruction Set:-**
 - 2.1 Instruction Set of 8051
 - 2.2 Addressing Modes, Instruction types
 - 2.3 Timer operation
 - 2.4 Serial Port operation
 - 2.5 Interrupts(20hrs)

- 3. Assembly/C programming for Micro controller** (12hrs)
 - 3.1 Assembler directives
 - 3.2 Assembler operation
 - 3.3 Compiler operations
 - 3.4 De bugger
 - 3.5 Simulator

- 4. Design and Interface** (7hrs)

Keypad interface, 7- segment interface, LCD, stepper motor.
A/D, D/A, RTC interface with programming.

- 5. Introduction of PIC Micro controllers** (02 hrs)

- 6. Application of Micro controllers**
 - 6.1 Communication System
 - 6.2 Application of Micro controllers such as washing machines, photocopier, cars etc. (04hrs)

LIST OF PRACTICALS

1. Familiarization with Micro-controller Kit
2. Familiarization with Assembly Language Programming (PC Based)
3. C Language Programming- (PC Based)
4. Programming for LCD interface.
5. Programming for A/D converter, result on LCD.
6. Programming for D/A converter, result on LCD.
7. Programming for serial data transmission from PC to Kit or Vice versa.
8. Programming to Interface Sensors.

Recommended Books:-

1. Microcontrollers by Ayala
2. Microcontrollers by Mazidi
3. Microcontrollers by Neil Makanzie
4. Microcontrollers by Deshmukh
5. Embedded GSM Applications

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted	Marks Allotted (%age)
1	11	20
2	20	30
3	12	20
4	07	15
5	02	5
6	04	10
Total	56	100

5.5 MICROWAVE AND RADAR ENGINEERING

L T P
4 - 2

RATIONALE

This subject includes an exposure to microwaves engineering, radar systems, fibre optics and satellite communication. In microwaves industry, job opportunities are available in of assembly, production, installation, repair and maintenance of microwave transmitters and receivers. The knowledge of radar systems allows opportunities with civil and defence organizations dealing with aircraft and shipping. Fibre optics is the latest thrust area in communication with vast opportunities in the private sector.

1. Introduction to Microwaves (2hrs)

Introduction to microwaves and its applications, Classification on the basis of its frequency bands (HF, VHF, UHF, L, S, C, X, KU, KA, mm, SUB, mm)

2. Microwave Devices (14hrs)

Basic concepts of thermionic emission and vacuum tubes, Effects of inter electrode capacitance Lead Inductance and Transit time on the high frequency performance of conventional vacuum tubes, and steps to extend their high frequency operations. 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 and
- Impatt diode

3. Wave guides (06hrs)

Rectangular and circular wave guides and their applications. Mode of waveguide; Propagation constant of a rectangular wave guide, cut off wavelength, guide wavelength and their relationship with free space wave length (no mathematical derivation). Impossibility of TEM mode in a wave guide.

4. Microwave Components (8hrs)

Constructional features, characteristics and application of tees, bends, matched termination, twists, detector, mount, slotted section, directional coupler, fixed and variable attenuator, isolator, circulator and duplex, coaxial wave guide adapter

5. Microwave antennas (4hrs)

Structural characteristics and typical applications of Horn and Dish antennas

6. Microwave Communication systems : (8hrs)

- a) Block diagram and working principles of microwave communication link.

b) Troposcatter Communication: Troposphere and its properties, Tropospheric duct formation and propagation, troposcatter propagation.

7. Radar Systems (12hrs)

7.1 Introduction to radar, its various applications, radar range equation (noderivation) and its applications.

7.2 Block diagram and operating principles of basic pulse radar. Concepts of ambiguous range, radar area of cross-section and its dependence on frequency.

7.3 Block diagram and operating principles of CW (Doppler) and FMCW radars, and their applications.

7.4 Block diagram and operating principles of MTI radar.

7.5 Radar display- PPI

8. VSAT

Introduction to VSAT its features and applications. (2 hrs)

LIST OF PRACTICALS

1. To measure electronics and mechanical tuning range of a reflex klystron
2. To measure VSWR of a given load.
3. To measure the Klystron frequency by slotted section method
4. To measure the directivity and coupling of a directional coupler.
5. To plot radiation pattern of a horn antenna in horizontal and vertical planes.
6. To verify the properties of magic tee.
7. To carry out installation of a dish antenna.

RECOMMENDED BOOKS

1. *Microwave Devices and Components* by Sylio, Prentice Hall of India, New Delhi
2. *Electronics Communication* by Roddy and Coolen
3. *Electronics Communication System* by KS Jamwal, Dhanpat Rai & Sons, Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted	Marks Allotted (%age)
1	2	5
2	14	20
3	6	10
4	8	15
5	4	10
6	8	13
7	12	20
8	2	7
Total	56	100

5.6.1 PERSONAL COMPUTER ORGANIZATION (PCO)

L T P
4 - -

RATIONALE

Personal Computers have become a necessity in Industry, offices and becoming popular in homes too. This course gives organization structure and principles of working of various other components like visual display, keyboard drives and printers etc. Diploma holders will find employment in computer industry, Repair and maintenance field.

DETAILED CONTENTS

- 1. Mother Board** (10 hrs)
Introduction to Computer, Overview of different type of mother boards, Logic diagram of motherboard. Steps for Installation of different modules of Computer system(Assembly)
- 2. Buses and Ports** (10 hrs)
Different type of Buses PCland Serial and Parallel ports(COM ports) Ports COM 1, HDMI, USB.RS 232 C.
- 3. Memory** (09hrs)
Principle and Construction of CD/DVD Disk Drive and hard disk device(HDD).Hard disk controller. Pen Drives, Flash Memory. Introduction to various HDD interface(ATA/SATA), USB – HDD. common faults with hard disk drive and CD/DVD disk drive, RAM Module (SDRAM / DDR).
- 4. Keyboard and Mouse** (09hrs)
Block Diagram of keyboard Controller, keyboard switches, keyboard faults, mouse, common faults with mouse. Introduction to scanner, digital Camera.
- 5.Display Devices:** (09hrs)
Block Diagram, Principle of operation of Computer Monitor, Concept of CRT monitor, Introduction to LCD/LED monitor, Interactive Touch Screen Display Monitor. Difference between TV & Computer Monitor. Video display Adaptors (monochrome and Colour), introduction to solid state displays.
- 6. Printers** (09hrs)
Printing Mechanism, Construction and working principles of Dot Matrix Printer, Inkjet Printer, Laser Printer, Printer Controller, USB Interface, Signals from PC to Printer and Printer to PC.

INSTRUCTIONAL STRATEGY

This subject gives complete knowledge regarding the Computer Hardware. Teacher must give hands on practice related to operation, maintenance, installation etc. Teacher should encourage the students to do assembly of PC.

RECOMMENDED BOOKS

1. *PC Organisation* by S. Chowdhury, Dhanpat Rai & Sons, Delhi
2. *Repairing & Maintenance of PC* by Scott Muller, Que Publication
3. *IBM PC Colons* by Govinda Rajalu, Tata McGraw Hill Publishers, New Delhi.
4. *Text Book* by Mark Minasi
5. *Computers* by P. Norton
6. *The Complete PC up gradation & maintenance* by Mark Minasi, Willey Dreamtech Publication.
7. *Troubleshooting of PC* By Microsoft Press.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted	Marks Allotted (%age)
Mother Board	10	18
Buses and Ports	10	18
Memory	09	16
Keyboard and Mouse	09	16
Display Devices	09	16
Printers	09	16
TOTAL	56	100

5.6.2 MEDICAL ELECTRONICS

L T P
4 - -

RATIONALE

A large number of electronic equipments are being used in hospitals for patient care and diagnosis or carry out advanced surgeries. This subject will enable the students to learn the basic principles of different instruments used in medical science.

DETAILED CONTENTS

- 1. Anatomy and physiology (12hrs)**
 - 1.1 Elementary ideas of cell structure
 - 1.2 Heart and circulatory system.
 - 1.3 Central nervous system
 - 1.4 Muscle action
 - 1.5 Respiratory system
 - 1.6 Body temperature

- 2. Medical Electronics Equipment:- classification, application and method of operation of following instruments (12hrs)**

Diagnostic Equipment's- X-Ray, CT Scan, Ultrasound,
Therapeutic Equipment's – Defibrillator, Pacemaker, Heart Lung Machine, Nebulizer
Clinical laboratory equipment – Flame Photometer, Colorimeter, Blood Gas Analyzer

- 3. Electrodes (06hrs)**

Bioelectric signals, Bio electrodes, Electrode, Electrode tissue interface, contact impedance, Types of Electrodes, Electrodes used for ECG , EEG

- 4 Transducers (08hrs)**

Typical signals from physiological parameters, pressure transducer, flow transducer, temperature transducer, pulse sensor, respiration sensor,

- 5 Bio Medical Recorders (06hrs)**

Block diagram description and application of following instruments

 - 5.1 ECG Machine
 - 5.2 EEG Machine
 - 5.3 EMG Machine

- 6. Patient Monitoring Systems (08hrs)**
 - 6.1 Heart rate measurement
 - 6.2 Pulse rate measurement
 - 6.3 Respiration rate measurement
 - 6.4 Blood pressure measurement

7. Safety Aspects of Medical Instruments

(4hrs)

- Gross current shock
- Micro current shock
- Special design from safety considerations.
- Safety standards.

RECOMMENDED BOOKS

1. *Handbook of biomedical Instrumentation* by RS Khandpur
2. *Biomedical Instrumentation* by Cromwell,
3. *Modern Electronics Equipment* by RS Khandpur, TMH, New Delhi
4. *Introduction to Biomedical Electronics* by Edward J. Perkstein; Howard Bj, USA

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted	Marks Allotted (%age)
1	12	17
2	12	17
3	06	13
4	08	16
5	06	13
6	08	16
7	04	8
Total	56	100

5.6.3 DIGITAL SIGNAL PROCESSING

L T P
4 - -

RATIONALE

Digital signal processing (DSP) is an emerging area, which has a great scope and a lot of job potential in the industry. DSP chips are being widely used in communication industry, consumer electronics etc.

DETAILED CONTENTS

1. **Introduction** (6hrs)
Signals systems, basic elements of a digital signal processing system. Classification of signals, continuous time versus discrete time signals
Concept of frequency in continuous time and discrete time signals
2. Discrete time signals and systems: Block diagram representation of discrete time systems, Linearity, Stability and Causality. Convolution and correlation of signals. (8hrs)
3. Implementation of discrete time systems, Recursive and non-recursive FIR systems. (6hrs)
4. Z-transform and its application to LTI systems: Direct and inverse Z transform, properties of Z transform. (08hrs)
5. Design of Filter structures-Direct Form I, II, cascade and Parallel form (08 hrs)
6. Introduction to Fourier Transform. Discrete Fourier transform, properties of DFT (No proof), Multiplication of time DPTS and circular convolution, use of DFT in linear filtering (8 hrs)
7. Fast Fourier transforms: Efficient computation of DFT; FFT, DIT algorithm (8 hrs)
8. Introduction to IIR and FIR filters, Application of DSP Processors (4 hrs)

RECOMMENDED BOOKS

- 1) *Digital Signal Processing (Principles, Algorithms and Applications) by John GProakis and G Monolakis; Prentice Hall of India*
- 2) *Digital Signal Processing by AV Oppenheim and RW Ronald W Schafer; Prenticehall of India*
- 3) *DSP a computer based approach MitraSanjit TMH Publication*

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted	Marks Allotted (%age)
1	6	10
2	8	15
3	6	10
4	8	15
5	8	15
6	8	15
7	8	15
8	4	5
Total	56	100

5.7 MINOR PROJECT

L T P

- - 4

RATIONALE

The project may be small in size but should include only those components which he has studied in earlier classes, with a clear idea of signals processing. It would enable first-hand experience of components, their purchase, assembly, testing and trouble shooting. It would boost up confidence of the students to repair and preparation of electronics gadgets. There should not be more than 2-3 students for each project. A report must be prepared with a hard and soft copy. The following contents will be discussed in lab classes.

Some of the projects are listed below which is just a guideline for selecting the minor project. Students can also select any other project with the advice of his teacher.

LIST OF PROJECTS:-

1. Regulated power supply
2. Timers using 555 and other oscillators
3. Touch plate switches – transistorized or 555 based
4. Door bell/cordless bell
5. Clapping switch and IR switch
6. Blinkers
7. Sirens and hooters
8. Single hand AM or FM
9. Electronic toy gun, walker, blinkers
10. Electronic dice
11. Cell charger, battery charger, mobile charger
12. Fire/smoke/intruder alarm
13. Liquid level controller
14. Counters
15. Combination locks
16. Electronics musical instruments
17. Telephone handset
18. Electronic Ballasts
19. Audio amplifiers
20. Tape recorders
21. Automatic stabilizer/CVT
22. Emergency light
23. Design and manufacture of transformer
24. Fan regulator
25. Dish Antenna

6.1 BASICS OF MANAGEMENT

L T P
3 - -

RATIONALE:

Diploma holders are expected to take up middle level managerial positions, their exposure to basic management principles is very essential. Some topics like Structure and ownership of Organization, Leadership, Motivation, Customer Relationship Management (CRM), Legal Environment of Business, Environmental Management, Accident and Safety: Total Quality Management (TQM), Intellectual Property Rights (IPR) etc. have been included in the subject.

DETAILED CONTENTS

- 1. Introduction:** (12 hrs)
Definition and concept of management, functions of management- planning, organizing, staffing, coordinating and controlling. Various areas of management-
 - (a) Human Resource Management(HRM)-Manpower recruitment and selection, induction , training and development and performance appraisal.
 - (b) Financial Management- Meaning of financial management, its importance, various sources of finance- long term and short term. Concept of Internal Rate of Return(IRR), Net Present Value (NPV) and Average Rate of Return.
 - (c) Marketing Management- Product life cycle, concept of pricing, promotion strategies- advertising, sales promotion and market research.
 - (d) Material Management – Inventory management, concept of economic order quantity and waste management.

- 2. Structure and Ownership of Organization:** (04 hrs)
Concept and structure of an organization, hierarchical management structure (top, middle and lower level management), functional management structure and matrix organizational structure. Types of business ownership (salient features)- Sole Proprietorship, Partnership, Joint Stock Companies and Cooperative Ownership.

- 3. Leadership:** (02 hrs)
Meaning, importance , types of leadership and qualities of a good leader.

- 4. Motivation:** (04 hrs)
Concept and importance of motivation-drives and incentives, types of motivation and theories of motivation- Abharam Maslow Theory and Herzberg Two Factor Theory.

- 5. Customer Relationship Management:** (04hrs)
Need, various types of customers, customer satisfaction, Customer Satisfaction Index(CSI) and its significance in playing effective role of engineers in changing scenario.

- 6. Legal Environment and Business:** (08 hrs)

- a) Various labour laws and its necessity. Salient features of Income Tax Act – computation of income tax on salary income, Sales and Excise Tax Act-VAT & Excise duty and Factory Act. 1948.
- b) Labour Welfare Schemes including wage payment-types, system of wage payment and incentives.
- c) Intellectual Property Rights(IPR)- Concepts, infringements and remedies related to patents, copy rights, trademarks and designs.
- d) Accident and Safety- Meaning and concept of accident and safety, causes, safety precautions and various measures after accidents.

7. Total Quality Management: (04 hrs)

Meaning and concept of Total Quality Management(TQM), various factors/measures to achieve TQM in an organization. Standards and Codes-National & International.

8. Environmental Management: (04 hrs)

Concept of ecology and environment, factors contributing to air pollution, water pollution and noise pollution. Different measures to control pollution. Disaster management-features and measures.

INSTRUCTIONAL STRATEGY:

Generally the diploma holders occupy middle level managerial positions in an organization, therefore, their exposure to basic management principles is very essential. Accordingly students may be given conceptual understanding of different topics related to management. Some of the topics may be taught using question answer, assignment or seminar. The teacher will discuss success stories and case studies with students, which in turn, will develop appropriate managerial qualities in the students. In addition, expert lectures may also be arranged from within the institutions or from management organisations. Appropriate extracted reading material and handouts may be provided.

RECOMMENDED BOOKS:

1. *Principles of Management by Philip Kotler TEE Publication*
2. *Principles and Practice of Management by ShyamalBannerjee: Oxford and IBM Publishing Co, New Delhi.*
3. *Financial Management by MY Khan and PK Jain, Tata McGraw Hill Publishing Co.: 7, West Patel Nagar , New Delhi.*
4. *Modern Management Techniques by SL Goel: Deep and Deep Publications PvtLimited , Rajouri Garden, New Delhi.*
5. *Management by James AF Stoner, R Edward Freeman and Daniel R Gilbert Jr. : Prentice Hall of India Pvt Ltd, New Delhi.*
6. *Essentials of Management by H Koontz, C O' Daniel , Mc Graw Hill Book Company, New Delhi.*
7. *Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi*
8. *Total Quality Management by Dr DD Sharma, Sultan Chand and Sons, New Delhi.*
9. *Intellectual Property Rights and the Law by Dr. GB Reddy.*
10. *Service Quality Standards, Sales & Marketing Department, MarutiUdyog Ltd.*
11. *Customer Relationship Management: A step-by-step approach, Mohamed &Sagadevan Oscar Publication, Delhi*

12. *Customer Relation Management, Sugandhi RK, Oscar Publication, Delhi*
13. *Environment Engineering by GN Pandey & GC Pandey, Tata McGraw Hill Publication.*

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	20
2	4	10
3	2	08
4	4	12
5	4	10
6	8	18
7	4	10
8	4	12
TOTAL	42	100

6.2 OPTICAL FIBER COMMUNICATION

L T P
4 - 2

RATIONALE

Progressing from communication over copper wire to today's fibre optic communication, we have increased our ability to transmit more information, more quickly and over longer distances. This has expanded our boundaries and is finding a good slot in communication system. Optical fibers has replaced existing transmission media due to its advantages. As a result the technicians are supposed to have knowledge of optical communication. This subject will provide basic concepts and requisite knowledge and skill required.

DETAILED CONTENTS

1. **Introduction:** (8 hrs)
 - 1.1 Historical perspective, basic communication systems, optical frequency range, advantages of optical fibre communication, application of fibre optic communication
 - 1.2 Electromagnetic spectrum used, Advantages and disadvantages of optical communication.
 - 1.3 Principle of light penetration, reflection, critical angle.
2. **Optical Fibers and Cables:-** (10hrs)

Constructional details of various optical fibers, multimode and monomode fibers, step index and graded index fibers, acceptance angle and types of optical fiber cables.
3. **Losses in Optical Fiber Cable:** (08hrs)
 - 3.1 Absorption Losses, Scattering Losses, Radiation losses, Compelling losses, Bending loses.
 - 3.2 Dispersion, Material dispersion, wave guide dispersion, intermodal
4. **Optical Sources** (08hrs)

Characteristics of light used in optical communication, principle of operation of LED, different types of LED structures used and their brief description, LED using circuitry, injection laser diode(ILD), principle of operation, comparison of LED and ILD, non-semiconductor laser.
5. **Optical Detectors** (08hrs)

Characteristics of photo detectors used in optical communication; PIN diode and avalanche photo diode (APD), their brief description.

6. Optical Amplifiers (8hrs)
 Types of optical amplifiers, semiconductor & fiber optical amplifiers
 Functional types, principle of operation of SOA, types of SOA.SOA
 applications, advantages and Drawbacks, EDFAS and its application.

7. Optical Fiber System (6hrs)
 Optical transmitter circuit, optical receiver circuit, multiplexing methods used.
 Modulation methods used and applications.

List Of Practical

1. Familiarization and identification of fiber optic components such as fiber Optical light source, detector, connector assembly etc
2. To assemble the fiber optic communication set up (using teaching module)and compare the transmitted signal with the output of the receiver
3. To measure the light attenuation of the optic fibers
4. To assemble and observe the Laser set up and find of frequency and wavelength of laser beam using single and double slit methods.
5. Set up optical splicing methods to join two optical fiber cables.
6. Measurement and use of Optical time domain reflectometer (OTDR)

RECOMMENDED BOOKS

1. *Optical fiber Communication by John M Senior, Prentice Hall of India, New Delhi*
2. *Optical fiber Communication by ‘ Gerd Keiser, McGraw Hill International Editions*
3. *Optical fiber Communication Systems by, North Publications*

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted	Marks Allotted (%age)
1	08	14
2	10	20
3	08	14
4	08	14
5	08	14
6	08	14
7	06	10
Total	56	100

6.3 WIRELESS AND MOBILE COMMUNICATION

L T P
4 - 2

RATIONALE

The wireless/mobile communication technology though complex but is spreading at a very fastrate. People use more of mobile phones in comparison to land line phones. It is expected that within very short period almost everybody will be using mobile communication. Technology is also changing very fast. Therefore, the students should know the functioning of wireless/mobile system/equipment to keep themselves abreast of this latest application of communication.

DETAILED CONTENTS

- 1. Wireless Communication** (12hrs)
 - 1.1 Basics
 - 1.2 Advantages of wireless communication
 - 1.3 Electromagnetic waves.
 - 1.4 Frequency Spectrum used.
 - 1.5 Paging system.
 - 1.6 Cordless Telephone System.
 - 1.7 Cellular Telephone System
 - 1.8 Comparison of above wireless communication systems.
 - 1.9 Propagation considerations
 - a) Range
 - b) Atmospheric Effect
 - c) Geographic Effect
 - d) Fading
 - e) Doppler Effect

- 2. Cellular Concept** (12hrs)
 - 2.1 Cell area
 - 2.2 Capacity of cell
 - 2.3 Frequency Response
 - 2.4 Co-channel Interference
 - 2.5 Adjacent channel Interference
 - 2.6 Power Control for reducing Interference
 - 2.7 Improving coverage and capacity in cellular system
 - a) Cell Splitting.
 - b) Sectoring
 - c) Repeater for Range Extension.

- 3. Multiple Access Techniques for Wireless Communication** (14hrs)
 - 3.1 Introduction to Multiple Access.

- 3.2 Frequency Division Multiple Access (FDMA)
- 3.3 Time Division Multiple Access (TDMA)
- 3.4 Code Division Multiple Access (CDMA)
- 3.5 Spread Spectrum Multiple Access (SSMA)
- 3.6 Frequency Hopping spread Spectrum (FHSS).
- 3.7 Comparison of FDMA/TDMA/CDMA

4. Mobile Communication Systems (18hrs)

- 4.1 Advanced Mobile Phone System (AMPS)
 - a) Operation of AMPS
 - b) Working of AMPS Phone System
- 4.2 Introduction of Global Systems for Mobile Communication (GSM) and its architecture, Introduction of CDMA System, comparison of CDMA and GSM Systems
- 4.3 Introduction of GPRS and GPS System.
- 4.4 Introduction to DTH, Blue tooth, Wi-Fi and RFID.
- 4.5 Introduction to 3G/4G mobile technology.

LIST OF PRACTICALS

1. Study the features of cellular mobile
2. Signal strength measurement at various points from a transmitting antenna/cordless phone
3. Measurement of range for a cordless phone.
4. Visit to a Mobile Switching Centre(MSC)/ Base Station Controller (BSC) / Base Trans Receiver (BTS) to the nearest M.S. facility provider
5. Observing call processing of GSM trainer Kit.
6. Observing call processing of CDMA trainer Kit.
7. Signal wave shapes on a CRO for AM, FM, MSK, PSK etc. modulated wave shapes

RECOMMENDED BOOKS

1. *Wireless Communications (Principles and Practice)*, by Theodore S. Rappaport.
2. *Introduction to Wireless and Mobile Systems*, by Dharma Prakash Agarwal, Qing-Anzeng.
3. *Wireless Communications and Networking*, by William Stallings.
4. *Mobile and Personal Communication Systems and Services*, by Raj Pandya, Prentice Hall of India, New Delhi
5. *Mobile Communication* by John Schiller, Prentice Hall of India, New Delhi
6. *Wireless Communications* by Pahalwan, Pearson Publishers

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted	Marks Allotted (%age)
1	12	22
2	12	23
3	14	25
4	18	30

Total	56	100
--------------	-----------	------------

6.4 INSTRUMENTATION AND PROGRAMMABLE LOGIC CONTROLLERS

L T P
5 - 2

RATIONALE

This subject deals with the various instruments, their construction and working which control the various parameters and operations in any industry. A diploma holder in the field of Electronics employed for maintenance of electronic equipment/ gadgets is required to diagnose faults, rectify them and test the total system for good performance. Thus there is a need of introducing diploma holders to the basics of Instrumentation. In industry, many manufacturing processes demand a sequence of operation, which are to be performed repetitively. Early automation systems were mechanical in design, timing and sequencing being effected by gears and cams. Slowly these design concepts were replaced by electrical drives which were controlled by relays and now by programmable logic controllers (PLCs). A PLC is a solid state device, designed to operate in noisy industrial environments and can perform all logic functions. PLCs are widely used in all industries for efficient control operations. A diploma holder in industry is called upon to design , modify and troubleshoot such control circuits. Looking at the industrial applications /of PLCs in the modern industry, this subject finds its usefulness in the present curriculum.

DETAILED CONTENTS

- 1 Introduction to instrumentation** (4 hrs)
Basic Measurement System, functions of its elements namely the Transducer, signal conditioner, display or read-out and power supply.
- 2. Transducers** (18hrs)
- a) Distinction between active and passive transducers with examples. Basic requirements of a transducer
 - b) Types of Transducers:- Construction, Principle of operation of the following transducers and their applications in measuring the physical quantities listed against each one of them.
 - (1) Variable Resistance Type
 - Potentiometric Displacement and force, resistance device, Strain gauge Torque and displacement, Thermistor Temperature, Resistance hygrometer Humidity
 - (2) Variable capacitance type
 - Variable capacitance Displacement and pressure
 - Pressure gauge, Dielectric gauge Liquid Level and thickness
 - (3) Variable inductance type
 - LVDT Pressure force, displacement and position, Burdon pressure gauge Pressure force, displacement pressure, Strain gauge force, displacement
 - (4) Other Types

-Solid State Sensor Temperature, Thermocouple Temperature, Piezoelectric device, Force, Photoelectric devices Light, Proximity probes r.p.m, Digital transducer displacement, Bimetallic thermometer Temperature, Basic principles of Magnetic Flow and ultrasonic flow meters

3.Signal Conditioners (08 hrs)

Characteristics of instrumentation amplifiers in aspect of input impedance, output impedance, drift, dc offset, noise, gain, common mode rejection ration, frequency response, relating to suitability of these characteristics for amplifying signals from various transducers. Need and working of a typical isolation amplifier

4.Output Devices and Displays (04 hrs)

Basic principles of operation, constructional features and application of the following:

- a) Graphic Recorder
- b) X-Y Recorder

5.Introduction to PLCs (06hrs)

What is PLC, limitations of relays. Advantages of PLCs over electromagnetic relays, Different programming languages, PLC manufacturer etc.

6. Working of PLC (06hrs)

- Basic operation and principle of PLC,
- Architectural details – Processor
- Memory structure, I/O Structure
- Programming terminal, Power Supply

7.Instruction Set (12hrs)

- Basic instructions like latch, master control self-holding relays.
- Timer instructions like on-delay timers, off-delay timers, retentive timers, resetting of timers.
- Counter instructions like up-counter, down counter, resetting of counters.
- Sequencers, output sequencers, input sequencers time driven and event driven sequencers masking etc.
- Comparison instruction like equal, not equal, greater, greater than equal, lesshan, less than equal mask equal, limit etc.

8. Ladder diagram programming (08hrs)

Programming based on Basic instructions, timer counter, sequencer to comparison instruction using ladder diagrams.

9. Applications of PLCs (04hrs)

- Process controls

- Car parking
- Doorbell operation
- Traffic light control
- Microwave Oven
- Washing machine

LIST OF PRACTICALS

1. *Measurement and plot the characteristics of optical devices like photodiodes, photocells.*
2. *Characteristics of light operated switch using photo-transistor and LDR*
3. *Measurement of strain using strain gauge.*
4. *Measurement of temperature using thermistor and thermocouple.*
5. *Measurement of humidity using humidity meter*
6. *Measurement of linear and angular displacement*
7. *To assemble and test an instrumentation amplifier measure its gain, input and output impedance.*
8. *Study an X-Y records and graphic recorder*
9. *Measurement of pressure using Bourdon Tube.*

PLCs

1. *Familiarization with the working of PLC*
2. *Components/sub-components of a PLC, learning functions of different modules of a PLC system*
3. *Introduction to step 5 programming language, ladder diagram concepts ,instruction list syntax*
4. *Basic logic operations, AND, OR, NOT, functions*
5. *Logic control systems with time response as applied to process operation*
6. *PLC based traffic light control (two ways)*

RECOMMENDED BOOKS

1. *Electrical and Electronic Instrumentation and Measurements by A.K. Sawhney, Dhanpat Rai and Co, New Delhi.*
2. *Electronic Instrumentation by Cooper, Prentice Hall of India, New Delhi*
3. *Programmable Logic Controller by Job Dan Otter; P.H. International, Inc, USA*
4. *Introduction to PLCs by Gary Dunning. McGraw Hill*
5. *Introduction of Microcontroller and PLCs by Sanjay Attri (Added New)*
6. *Instrumentation and PLC by UmeshRathore Kat Sons,(Added New)*

SUGGESTED DISTRIBUTION OF MARKS

Sr. No.	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Introduction to instrumentation	04	05
2	Transducers	18	30
3	Signal Conditioners	08	10
4	Output Devices and Displays	04	05
5	Introduction to PLCs	06	10
6	Working of PLC	06	10
7	Instruction Set	12	15
8	Ladder diagram programming	08	10
9	Applications	04	05
Total		70	100

6.5.1 Computer Networks

L T P

4 - -

RATIONALE

The Course provides the student with the basic of Computer Network. Awareness of various protocols and routing algorithms. Knowledge of various devices used in networking. Network Security & Its issues.

DETAILED CONTENTS

- 1. Networks Basics** (10Hrs)
What is Network, Uses of Computer Networks, Networking Models (Client Server, peer to peer, Distributed processing), Network Topologies, Types of network (PAN, LAN, MAN, WAN), Network Terminologies (Broadcast, Multicast, Unicast, Layer, Protocols, Interface), Design issues for Layer, Network Services, Services primitives, Wireless Networks – Wi-Fi, WiMax, Features of Wireless Networks.
- 2. Reference Models** (08Hrs)
OSI Reference Model, Functions of layers in OSI Reference Model, TCP/IP reference Model, TCP/IP Network Model.
- 3. Internetworking Basics** (08 Hrs)
Internet, Intranet, Communication over internet, IP Addressing, Classes of IP Addressing, sub-netting, super-netting, IPv4 header format, CDIR, NAT, Mobile IP, IPv6, Need for IPv6, IPv6 header format.
- 4. Network Channel Allocation** (08Hrs)
Static Channel allocation in LANs and MANs, Dynamic Channel allocation in LANs and MANs, Multiple Access protocols (ALOHA - Pure ALOHA & Slotted ALOHA, CSMA, CSMA/CD, Collision Free protocols), Ethernet Cabling, Fast Ethernet, Gigabit Ethernet.
- 5. Routing.** (06 Hrs)
Adaptive & Non adaptive routing, Optimality principle, shortest path routing, flooding.
- 6. Network Connectivity** (08 Hrs)
Network Connectivity Devices, NIC, Repeater, Hub, Switch, Router, Bridge, Gateway, VOIP, Wireless NIC, Access Point, Modem, Print Server, Bluetooth.
- 7. Network Security** (08 Hrs)

Security Issues, Cryptography, Encryption Model, Encryption Methods, IPSec, Firewall, VPN, WEP.

RECOMMENDED BOOKS

1. *Computer Network by Andrew S. Tanenbaum (PHI)*
2. *Computer Communication and Networking by John Freer*
3. *Data Communications and Networking by Foronzan, Tata McGraw Hill, NewDelhi.*

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted	Marks Allotted (%age)
1	10	20
2	08	12
3	08	16
4	08	16
5	06	12
6	08	12
7	08	12
Total	56	100

6.5.2 ADVANCED MICROPROCESSORS

L T P
4 - -

RATIONALE

The complex systems require high through put that at times is not met with 8-bit microprocessor system. So, 16 bit up based system become suitable. They provide better facilities to personal computers and other automatic process control systems. Microcontroller based system design provides facilities for economical & less complicated small process control system.

DETAILED CONTENTS

- 1. The 8086 Microprocessor** (08 hrs)
 - 1.1 Internal Architecture of 8086.
 - 1.2 Concept of memory segmentation and physical address generation.
 - 1.3 Memory and data addressing mode
 - 1.4 Minimum and Maximum mode of 8086.

- 2. System Design using 8086** (08hrs)
 - 2.1 Pins and Signals.
 - 2.2 CLK circuitry
 - 2.3 8086 Address and Data bus Concept
 - 2.4 Memory and I/o Interface block diagram
 - 2.5 Math coprocessor 8087

- 3. Programming of 8086** (20hrs)
 - 3.1 Instruction Format
 - 3.2 Data transfer, Arithmetic, Bit and Logical manipulation, String, Program transfer and processor control instructions.
 - 3.3 Programming using manual assembly on exercises like
 - (i) Addition & Subtraction of two 16 bit numbers.
 - (ii) Multiplication's & Division of two numbers
 - (iii) Moving a block of data (intra and inter segment)
 - (iv) To arrange a block of data in ascending/descending order.
 - 3.4 Use of assembler and assembler directives.

- 4. 8086 Interrupts System** (6hrs)

Concept

 - 8.1 Interrupt Vector table and Interrupt type code.
 - 8.2 Types of interrupts and interrupt priority.
 - 8.3 Predefined Interrupts (0 to 4).
 - 8.4 User defined software/hardware interrupts.

- 5. Application of Microprocessors** (08hrs)

Use of microprocessor (with block diagram, main devices used and operation) for applications like:

- (i) A microprocessor based weighing scale
- (ii) Temperature measurement and control system
- (iii) Data Acquisition system.
- (iv) Speed control of DC motor.

6. Introduction to 32 bit Microprocessors (04hrs)

Main features of 80386, 80486, Pentium microprocessor with core 2 duo.

7. Latest Computer specification (02 hrs)

Desktop PC, Server PC, Laptop and note pad pcs of various mfg and comparisons.

Recommended books:

1. *Microprocessor and Application by D.V. Hall.*
2. *Microprocessor 8086/88 by B.B. Brey*
3. *Microprocessors & Micro controllers by Dr. B.P. Singh*
4. *Microprocessor by Rajiv Sapra, Ishan Publications, Ambala*
5. *Microprocessor by Naresh Grover*
6. *Microprocessors and Microcomputers and their Applications by AK Mukhopadhyay*
7. *Microprocessors and Applications by Uffenback*
8. *Introduction to Microprocessor by AdithyaMathur, Tata McGraw Hill PublishingCo, New Delhi*
9. *Microprocessor Architecture, Programming and Applications with 8085 by RSGaonkar, Wiley Eastern Ltd, New Delhi*
10. *Microprocessor and Applications by B Ram*
11. *Microprocessor by SK Goel*

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted	Marks Allotted (%age)
1	08	16
2	08	14
3	20	25
4	06	16
6	08	15
7	04	10
8	02	4
Total	56	100

6.5.4 VLSI System design

L T P
4 - -

RATIONALE

In Now-a-days thousands of Digital ICs are embedded on one Single chip with the help of VLSI technology with the help of this technology the Power Consumption of ICs can be reduced (as some devices even workson IV).The size of the overall circuit reduced due to embedding of thousands of Digital IC on one VLSI chip. The VLSI chips are 100 times faster than microprocessors. And so every Industry is using this technology so every student should have some knowledge about this technology

Detailed Contents

1. **Overview of VLSI:** (10 hrs)
Introduction to Computer-aided design tools for digital systems. Hardware description languages, Introduction to VHDL, Data objects, Classes and data types, Operators, Overloading, Logical operators. Types of delays, Entity and Architecture declaration. Introduction to behavioural, dataflow and structural models.
2. **VHDL Statements:** (12 hrs)
Assignment statements, sequential Statements and process, Conditional statements, Case statements, concept and use of Concurrent statements.
3. **Combinational Circuit Design:** (14 hrs)
VHDL models and simulation of combinational circuits such as Multiplexers, Encoders, Decoders, Code converters, Comparators, Implementation of Boolean functions etc.
4. **Sequential Circuit Design:** (10hrs)
VHDL Models and simulation of sequential circuits, Shift registers, Counters etc.
5. **Introduction to CPLDs and FPGAs:** (10 hrs)
Programmable logic devices : ROM, PLAs, GAL, PEEL, CPLDs and FPGA.FPAA (Field Programmes Analog Array)

RECOMMENDED TEXT BOOKS:

1. *IEEE Standard VHDL Language reference Manual(1993)*
2. *“Digital System Design using VHDL”:Charles. H. Roth; PWS(1998)*
3. *VHDL-IV Edition: Perry; TMH(2002)*

Recommended Software:

*Xilinx Synthesis Software (web pack) freely available on internet. On Xilinx.com
VLSI System Design is wind software for designing (System Designing).
VLSI Learning Resource like Ex-VLSI*

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted	Marks Allotted (%age)
1	10	20
2	12	20
3	14	20
4	10	20
5	10	20
Total	56	100

6.6 MAJOR PROJECT

RATIONALE

Major Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place students for project oriented practical training in actual work situation for the stipulated period with a view to:

- i) Develop understanding regarding the size and scale of operations and nature of field-work in which students are going to play their role after completing the courses of study.*
- ii) Develop understanding of subject based knowledge given in the class room in the context of its application at work places.*
- iii) Develop first hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems related to the world of work.*
- iv) Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc.*

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interest to him/her as a major project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

This practical training cum project work **should not be considered** as merely conventional industrial training in which students are sent at work places with either minimal or no supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial/ field organizations. Each teacher is expected to supervise and guide 5-6 students.

Some of the projects based on above areas are listed below for the benefit of students:

- 1) Microprocessor/Microcontroller based rolling display/bell and calendar
- 2) Microprocessor based stepper motor control.
- 3) Speed control of DC Machines by Microprocessor/Microcontrollers
- 4) Temperature monitoring using Microprocessor/Microcontroller based systems.
- 5) Microprocessor/Microcontroller based liquid level indicator and control
- 6) Fabrication and assembling of digital clock.
- 7) Fabrication of PCB circuits using ORCAD/ EAGLE Software.
- 8) Fabrication of ON line/OFF line UPS of different ratings and inverters
- 9) Design, fabrication and testing of different types of experimental boards as per the curriculum of Electronics and Communication Engineering.
- 10) Repair of oscilloscope, function generator
- 11) Design and developing web sites of organizations
- 12) Installation of computer network (LANS).
- 13) Microprocessor/Microcontroller based solar tracking system
- 14) GSM based car or home security system
- 15) Bank token display using microcontroller
- 16) Printer sharing unit
- 17) Microprocessor/Microcontroller Based A/D converter
- 18) Microprocessor/Microcontroller Based D/A converter
- 19) Simulation of half wave and full wave rectifiers using Simulation Software
- 20) Simulation of class A, Class B, Class AB and Class C amplifiers
- 21) Simulation of different wave forms like sine, square, triangular waves etc.
- 22) GPS based vehicle tracking system
- 23) Calculate BER(Bit Error Rate) of various modulation techniques
- 24) Design ALU using CPLD/FPGA
- 25) Design display system using CPLD/FPGA
- 26) Fiber Optic based controller for data transfer.
- 27) Optical switch to be used in Computer networking

6.7 PRACTICE IN COMMUNICATION SKILLS

L T P
-- 2

RATIONALE

For successful completion of diploma programme, the students should possess adequate command on language and communication skills so that they are able to express themselves with ease and felicity. The language used by the students should be appropriate to objectives and occasion. The contents of this subject shall provide them practical training through language laboratory.

LIST OF PRACTICAL EXERCISES

1. Exercises on phonetics
2. Group Discussion
3. Exercises on self-assessment using tools like SWOT analysis.
4. Internet communication
5. Correspondence
 - 5.1 Resume writing
 - 5.2 Covering letter
 - 5.3 Follow-up correspondence
 - 5.4 Business Correspondence
6. Practice on listening skills.
7. Speaking exercises with emphasis on voice modulation (reading and extempore)
8. Demonstration and practice on Body language and Dress sense.
9. Exercises on etiquettes and mannerism in difficult situations like business meetings, table manners, telephone etiquette and manners related to opposite gender.
10. Mock interviews (telephonic/personal)
11. Cross-cultural Communication
12. Role play for effective Communication.
13. Exercises on wit and humour in conversations and creating lively environment.