

REVISED CURRICULUM FOR DIPLOMA PROGRAMME IN ELECTRONICS & COMMUNICATION ENGINEERING

FOR THE STATE OF HIMACHAL PRADESH



Prepared by:-

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

In Consultation with :

National Institute of Technical Teachers' Training and
Research, Sector 26, Chandigarh 160 019

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FOREWORD

Globalization, liberalization and privatization have been sweeping the developing world over the last few decades. They have removed barriers of distances, state boundaries, culture, language etc. for trade and commerce, so that a person or a firm with superior quality product and services can reach any where in the world, trade and prosper. Emergence of Indian multinationals viz. Infosys, Tata etc. is evidence to this phenomenon. This has resulted into an era where the motto of “survival of the fittest” works. We as a country have been exposed to the competition of ever lasting nature, affecting our society, industry as well as individuals. Moreover it has broken monopolistic trade practices that industries use to enjoy before.

Coupled with globalization are advancements in science and technology affecting economical and socio-political systems at various levels viz. international, continental, national and regional. The emergence of new bodies of knowledge has been posing a great threat to existing manufacturing and related trade practices. There is a visible growth drift from manufacturing sector to service sector giving rise to knowledge economy.

The knowledge economy, a recently known term uses knowledge as a major resource for national growth in production and services, and in increasing its Gross Domestic Product. The economy where emphasis is laid on new ideas instead of exploiting labour, where life-long learning is preferred over traditional learning, where inter-disciplinary research is promoted resulting into short product development cycle.

Under such circumstances the importance and requirement of technical manpower that is well-qualified and equipped with higher order competencies has increased manifold. Such a manpower is being considered as “Human Capital” globally and the countries based on knowledge economy are treating it (Human Capital) as a prime resource to compete at international level and for keeping an edge over the others.

Under prevailing situation where India is emerging as a global economy, technical education of our country has a great role to play. The polytechnics in the country are supposed to cater to national need of human capital at middle level managers by way of developing diploma graduates having requisite technical as well as generic skill sets. This is the only way through which we can realize our dream of becoming knowledge society by 2020.

Composite Curriculum Development Centre (CCDC) of our State has been extending expert services to polytechnic education system of the states in northern region. It has track record of precisely sensing contemporary techno-socio-politico-economical context, and deriving aims and objectives of a given programme and finally design its curriculum for its implementation for satisfying societal need.

This curriculum document is the result of the judicious/exhaustive exercise undertaken by CCDC considering the prevailing context as stated above. In order to meet the present day need of our national human capital, a course on Generic Skill Development is appropriately introduced in this curriculum of diploma programme along with other requisite changes in various technical courses.

It is now upto the managers of the technical education system to transform this scheme into reality by planning, developing and implementing learning experiences at various levels.

The attention of all concerned educational managers is solicited to strive hard and convert this plan into reality. I wish them good luck.

S. S. Guleria HAS
Director
Technical Education, Vocational & Industrial Training,
Sundernagar, Himachal Pradesh.

PREFACE

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.

Technical Education Department of Himachal Pradesh has undertaken restructuring of the diploma programmes offered by the polytechnics in the State. Consequently H.P. State Board of Technical Education assigned the project for revision of six existing diploma programmes to this institute in the month of April 2007 with a view to update the courses and their contents as per employment needs of the world of work. A series of workshops were held in the months of April-May, 2007 and 1st Year curriculum of diploma programmes was handed over to the H.P. State Board of Technical Education for its implementation from July, 2007. Subsequently another series of workshops were held for the revision of 2nd and 3rd Year curriculum of all these courses during September – December 2007.

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 passouts 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 industry/field organizations of different categories viz. small, medium and large scale which offer wage employment for the diploma passouts. 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. Moreover, the representative sample of polytechnic faculty from H.P. state, who are the actual implementors of these programmes were drawn for the revision to ensure seamless curriculum implementation. The document contains the study and evaluation scheme and detailed subject/course contents for all the three years to enable the H.P. Polytechnics to implement revised curriculum to achieve the desired objectives.

We have taken cognizance of recommendation of experts both from industry and academic institutions and have adequately incorporated segments of Entrepreneurship Development, Environment and Safety Awareness, Industry Oriented Practice Based Minor and Major Projects, Industrial Training etc. 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 as prescribed in the curriculum document.

Er. P.P. Sharma
Head(CCDC)

Recommendations for Effective Curriculum Implementation

This curriculum document is a Plan of Action (POA) and has been prepared based on exhaustive exercise of curriculum planning and design. The representative sample comprising selected senior personnel (lecturers and HODs) from various institutions and experts from industry/field have been involved in curriculum design process.

The document so prepared is now ready for its implementation. It is the faculty of polytechnics who have to play a vital role in planning instructional experiences for the courses in four different environments viz. classroom, laboratory, library and field and execute them in right perspective. As it is emphasized that a proper mix of different teaching methods in all these places of instruction only can bring the desired changes in stipulated students behaviour as in curriculum document. It is important for the teachers to understand curriculum document holistically and further be aware of intricacies of teaching-learning process (T-L) for achieving curriculum objectives. Given below are certain suggestions, which may help the teachers in planning and designing learning experiences effectively. These are indicative in nature and teachers using their creativity can further develop/refine them. The designers of the programme suggest every course teacher to read them carefully, comprehend and start using them.

(A) **Broad Suggestions:**

1. Curriculum implementation takes place at programme, course and classroom level respectively and synchronization among them is required for its success. The first step towards achieving synchronization is to read curriculum document holistically and understand its rationale and philosophy.
2. H.P. State Board of Technical Education (HPSBTE) may make the academic plan available to all polytechnics well in advance. The Principals have a great role to play in its dissemination and, percolation upto grass-root level. Polytechnics in turn are supposed to prepare institutional academic plan by referring state level HPSBTE plan.
3. HOD of every Programme Department along with HODs and incharges of other departments viz. English, Mathematics, Physics, Chemistry etc. are required to prepare academic plan at department level referring institutional academic plan.
4. All lecturers/Senior lecturers are required to prepare course level and class level lesson plans referring departmental academic plan.

(B) **Course Level Suggestions**

Teachers are educational managers at classroom level and their success in achieving course level objectives using course plan and their judicious execution, which is very important for the success of programme, by achieving its objectives.

Polytechnic teachers are required to plan various instructional experiences viz. theory lecture, expert lectures, lab/ workshop practicals, guided library exercises, field visits, study tours, camps etc. In addition, they have to carry out progressive assessment of theory, assignments, library, practicals and field experiences. Teachers are also required to do all these activities within a stipulated period of 16 weeks, which is made available to them in the academic plan at HPSBTE level. With the amount of time to their credit, it is essential for them to use it efficiently by planning all above activities properly and ensure execution of the plan effectively.

Following is the gist of suggestions for subject teachers to carry out T-L process effectively:

1. Teachers are required to prepare a course plan, taking into account departmental academic plan, number of weeks available, course to be taught, different learning experiences required to be developed etc.
2. Teachers are required to prepare lesson plan for every theory class. This plan may comprise of content to be covered, learning material (transparencies, VCDs, Models etc.) for execution of a lesson plan. They may follow steps for preparing lesson plan e.g. drawing attention, state instructional objectives, help in recalling pre-requisite knowledge, deliver subject content to be taught, check desired learning outcome and reinforce learning etc.
3. Teachers are required to plan for expert lectures from field/industry. Necessary steps are to plan in advance, identify field experts, make correspondence to invite them, take necessary budgetary approval etc.
4. Teachers are required to plan for library guided exercises by identification of course specific experience requirement, setting time, assessment, etc. The tutorial, assignment and seminar can be thought of as terminal outcome of library experiences.
5. Concept and content based field visits with appropriate releases (day-block) may be planned and executed for such content of course which otherwise is abstract in nature and no other requisite resources are readily available in institute to impart them effectively.
6. There is a dire need for planning practical experiences in right perspective. These slots in a course are the avenues to use problem based learning/activity learning/ experiential learning approach effectively.. The development of lab instruction sheets for the course is a good beginning to provide lab experiences effectively.
7. Planning of progressive assessment encompasses periodical assessment in a semester, preparation of proper quality question paper, assessment of answer sheets immediately and giving constructive explicit feed back to every student. It has to be planned properly; otherwise very purpose of the same is lost.
8. The co-curricular activities like camp, social gathering, study tour, hobby club etc may be used to develop generic skills viz. problem solving task management, managing self, collaborating with others etc.
9. Where ever possible, it is essential to use activity based learning rather than relying on delivery based conventional teaching all the time.

10. While imparting instructions, emphasis may be laid on the development of cognitive, psychomotor, reactive and interactive skills in the students.
11. Teachers may take working drawings from the industry/ field and provide practices in reading these drawings.
12. Considerable emphasis should be laid in discipline specific contracting and repair and maintenance of machines, tools and installations.
13. Teachers may take initiative in establishing liaison with industries and field organizations for imparting field experiences to their students.
14. Case studies and assignments may be given to students for understanding of Enterprise Resource Management (ERM).
15. Students be made aware about issues related to environment and ecology, safety, concern for wastage of energy and other resources etc.
16. Students may be given relevant and well thought out minor and major project assignments, which are purposeful and develop practical skills. This will help students in developing creativity and confidence for their gainful employment (wage and self)
17. A Project bank may be developed by the concerned department of the polytechnics in consultation with related Industry, Research Institutes and other important field organizations in the state.

Diploma Programme In
ELECTRONICS AND COMMUNICATION ENGINEERING
(For the State of Himachal Pradesh)

SALIENT FEATURES OF THE PROGRAMME

1. Name of the Programme : Diploma Programme in **Electronics and Communication Engineering**
2. Duration of the Programme : Three years (6 semester)
3. Entry Qualification by : Matriculation or equivalent as prescribed by State Board of Technical Education, HP
4. Intake : 60
5. Pattern of the Programme : Semester Pattern
6. Ratio between theory and Practical : 50 : 50(Approx)
7. **Industrial Training:**
A minimum duration of six weeks of industrial training is included after 4th semester during summer vacation. An Internal assessment out of 50 marks and an external assessment out of another 50 marks have been added in 5th semester. Total 100 marks are allotted to industrial training.
Distribution of Marks:
 - Daily diary and reports of training - 50 Marks
 - Viva Voce - 50 Marks
8. **Ecology and Environment :**
As per directives of Government of India directives, an awareness camp on Ecology and Environment has been incorporated during second semester.
9. **Entrepreneurship Development:**
An Entrepreneurial Awareness Camp and a full subject on Generic Skills and Entrepreneurship Development has been incorporated in the scheme.
10. **Student Centred Activities:**
A provision of 3-4 hrs per week has been made for organizing Student Centred Activities for overall personality development of students. These activities will comprise of co-curricular activities such as expert lectures, games, hobby classes like photography, painting, singing etc. seminars, declamation contests, educational field visits, NCC, NSS and other cultural activities 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

2.2 GUIDELINES FOR INTERNAL 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 house tests. At least three such tests shall be conducted during the semester out of which at least one house test should be conducted. 30% weight age will 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 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 practical.

3. EMPLOYMENT OPPORTUNITIES AND ACTIVITY PROFILE OF DIPLOMA HOLDERS IN ELECTRONICS AND COMMUNICATION ENGINEERING

An exercise, to have first hand information about employment opportunities and activity profile of diploma engineers in the field of electronics, was done by Curriculum Development Centre of National Institute of Technical Teachers' Training and Research, Chandigarh. The feedback from industries and other organizations has revealed that diploma holders in Electronics and Communication Engineering find employment in the following organizations:

Employment Opportunities

Various Departments/ organizations/boards and corporations

- 1) Tele-Communication Engineering and related Departments
- 2) AIR, Doordarshan,
- 3) Overseas Communication,
- 4) Mine Communication,
- 5) Radar and Wireless,
- 6) Railways,
- 7) Defence Services, Para-military Forces
- 8) Civil Aviation
- 9) Defence Research and Development Organizations
- 10) Electricity Boards and Corporations etc.
- 11) Engineering Institutions
- 12) Research and Development Deptt.
- 13) Maintenance Deptt.
- 14) Airport Authority of India (Airports)

Industry

- 15) Communication Industry manufacturing wireless mobile equipment for defence and Paramilitary forces
- 16) PCB Design and Fabrication Industry
- 17) Consumer Electronics Industry
- 18) Electronic Components and Devices Manufacturing and Installation Organizations
- 19) Computer Assembling and Computer Peripheral Industry;
- 20) Computer Software Areas for Electronic Design and Semi Conductor Manufacturing Industry
- 21) Instrumentation and Control Industries
- 22) Internet Server Provides
- 23) Food Product Industries
- 24) Construction Industries
- 25) Agro and dairy Industry
- 26) Public Sector Undertakings (like BHEL,BEL, HAL, etc)
- 27) D.T.H component and Fabrication factory
- 28) Mobile Phone assembly Industries
- 29) Medical Electronics Industry
- 30) EPBX/ Telephone Exchange Manufacturing Industries
- 31) Computer Software Areas for Electronic Design and Semi Conductor Manufacturing Industry
- 32) Computer Assembling and Computer Peripheral Industry;
- 33) Automobile Industry

Development/Testing Laboratories/Organizations

- 34) Electronics Service Centres
- 35) Opto Electronics (Medical & Comm.)
- 36) Computer Networking
- 37) Hospitals
- 38) Educational Institutions (ITIs, Vocational Schools etc)
- 39) Sales and Services of Electronic Gadgets from Small Scale Industries
- 40) Call Centres

Self Employment

- Marketing and Sales (Distributors - whole sale and retailers)
- Service Sector(repair and Maintenance; job work)
- Cable laying and jointing DBs etc.
- Preparing Simulated Models
- Manufacturing Unit (e.g.- Bulb manufacturing, chalk manufacturing, circuit manufacturing units etc)

Activity Profile

The diploma holders in Electronics and Communication Engineering (ECE) generally get employed in manufacturing, assembly industries of consumer electronics, process control and instrumentation, Doordarshan and All India Radio (AIR), defence organizations, marketing and servicing organizations. The activities they perform are listed below:

- 1) Reading, interpreting and preparing drawings and circuits in electronics and related fields
- 2) Preparing estimates of men and material required for different jobs of installation and maintenance
- 3) Making/preparing and interpreting layout of printed circuit boards and chassis
- 4) Selecting instrument and devices for simple applications
- 5) Testing the materials used in assembly work.
- 6) Supervising the fabrication and assembly work at sub-assembly and final assembly
- 7) Assisting the engineer in quality control of the product being assembled or manufactured
- 8) Operating, recording and display equipment in AIR/Doordarshan, satellite stations and studios
- 9) Operating, testing and maintenance of the communication receiver, transmitter and control room equipment in AIR/Doordarshan/Overseas communication sections, power plant and process industry
- 10) Operates tests and maintains the telephone exchanges in Tele-communication department
- 11) Installation of the PBX or PABX exchanges/telex for organizations including Tele-communication department and defence stations

- 12) Supervises of the fabrication and assembly work of trans-receivers and walkie-talkie used for police wireless, mines communication and defence services
- 13) Operation, testing and maintenance of radar equipment used in defence services
- 14) Assistance to the engineers/scientist doing research/development work by fabricating and testing different electronic circuits
- 15) Operates, maintains and tests computer and computer peripheral equipment
- 16) Supervising the assembly and testing work in computer industry
- 17) Operates wireless/ radar in defence services
- 18) Assists in firing and maintenance of guided weapons and launching equipment
- 19) As a self employed person he has to use multifarious activities such as designing PCBs, procuring raw material and components, assemble, manufacture, repair and maintenance, testing and fault diagnosis, sale and service, marketing etc.
- 20) As Internet service providers for LAN, WAN, VPN, Internet. Configuration of Routers, Firewall, ATMs, L-3- switches Voip etc.
- 21) BTS, MTSO, maintenance of Telecom Networks.
- 22) As a caller in Call Centers and industries
- 23) Maintenance of Telecom Networks, BTS, MTSO, MSC

4. **COMPETENCY PROFILE DIPLOMA HOLDER IN ELECTRONICS AND COMMUNICATION ENGINEERING**

Keeping in view the employment scenario and requirement of four domains of learning i.e professional development domain, continued learning domain, human relations domain and personal development domain, a diploma holder in the field of Electronics and Communication Engineering should have the:

1. ability to select, test and use different electronic devices, components, and instruments for manufacturing and testing consumer electronics products.
2. competency to fabricate, test and maintain different electronic circuits and instruments
3. ability to read and interpret technical drawings pertaining to electronic systems
4. competency in designing layouts of components and wiring on conventional chassis and printed circuit boards
5. competency in repair and maintenance of consumer electronic products (Microprocessor based Systems) and instruments
6. ability to pick up know-how of installation and maintenance of telephone and telegraph exchanges and small computers
7. ability to pick up know-how of maintenance of studio and control room equipment used in AIR/Doordarshan/Overseas communication service and other communication installation
8. competency to install and maintain (Microprocessor based Systems, and process control instruments
9. competency to install and maintain microprocessor based medical electronics equipment and systems
10. ability to pick up know-how for repair of telephone instruments, teleprinters, transreceivers and radar equipment
11. ability to gain knowledge of basic programming and software development on computers and microprocessors
12. Ability to use Information Technology and computers for various applications in the field of electronics engineering
13. Ability to gain knowledge of basic programming and software development on computers and microprocessors
14. Competencies in general, manual and machining skills for supervising shop floor/ work site operations
15. Ability to manage self for self development i.e. intellectually, physiologically, psychologically.
16. Ability to collaborate, managing different tasks and to solve unstructured problems related to various functional areas of electrical engineering may it be prototype development, diagnostic and fault finding or repair and maintenance of plant and equipment
17. competency in organising men, material and machinery on shop floors where electronic components and products are manufactured
18. understanding of industrial processes and organisations connected with the profession and relate classroom learning with real life situations
19. Proficiency in oral and written communication, technical report preparation, managing relationship with juniors, peers and seniors for effective functioning in the world of work competency to communicate (oral and written) effectively in the professional life and develop self-learning habits
20. Understanding of basic principles of managing men, material and equipment and techniques of achieving economy and quality, labour laws, Intellectual Property Rights(IPR)
21. Awareness about the environment, use of non-conventional energy sources, external financial and technical support system, adopting energy conservation techniques
22. Knowledge of latest trends in the field of communication, instrumentation
23. Knowledge of Applied and Engineering sciences for better comprehension of technologies used in electronics and related industry and service sector and to develop scientific temper, analytical skills and to facilitate continuing education

5. CURRICULUM AREAS DERIVED FROM COMPETENCY PROFILE

Sr. No.	Competency Profile	<u>Curriculum Areas/subject</u>
1	Ability to identify, select, test and use different electronic devices, components, and instruments for manufacturing and testing consumer electronics products	<ul style="list-style-type: none"> - Electronic Components and Materials - Consumer Electronics - Electronics Devices and Circuits - Network Theory
2	Competency to fabricate, test and maintain different electronic circuits and instruments	<ul style="list-style-type: none"> - Electronic Fabrication Techniques - Electronics Devices and Circuits
3	Ability to read and interpret technical drawings pertaining to electronic systems	<ul style="list-style-type: none"> - Engineering Drawing - Electronics Devices and Circuits
4	Competency in designing layouts of components and wiring on conventional chassis and printed circuit boards	<ul style="list-style-type: none"> - Electronic Fabrication Techniques - Minor Project Work
5	competency in repair and maintenance of consumer electronic products (Microprocessor based Systems) and instruments	<ul style="list-style-type: none"> - Troubleshooting of Electronic Equipment - Electronic Instruments and Measurements
6	Ability to pick up know-how of installation and maintenance of telephone and telegraph exchanges and small computers	<ul style="list-style-type: none"> - Line Communication - Principles of Comm. engineering - Networks and Transmission Lines - Digital electronics
7	Ability to pick up know-how of maintenance of studio and control room equipment used in AIR/Doordarshan Overseas communication service and other communication installation	<ul style="list-style-type: none"> - Communication Systems - Optical Fibre Communication - Television - Microwave and Radar Engineering
8	Competency to install and maintain industrial electronic equipment, systems and process control instruments	<ul style="list-style-type: none"> - Workshop Practice - Power Electronics - Micro controllers and PLCs
9	Competency to install and maintain microprocessor based medical electronics equipment and systems	<ul style="list-style-type: none"> - Advanced Microprocessor - Medical Electronics
10	Ability to pick up know-how for repair of telephone instruments, tele-printers, trans-receivers and radar equipment	<ul style="list-style-type: none"> - Microwave and Radar Engineering - Wireless and Mobile Communication
11	Understanding the principles of basic and digital electronics, microprocessors and micro-controller based systems and their applications in electrical/electronic control circuits	<ul style="list-style-type: none"> - Digital Electronics - Microcontrollers and Programmable Logic Controllers (PLCs)
12	Ability to use Information Technology and computers for various applications in the field of electronics engineering	<ul style="list-style-type: none"> - Basics of Information Technology - Computer Programming and Applications - Wireless and Mobile Communication
13	Ability to gain knowledge of basic programming and software development on computers and microprocessors	<ul style="list-style-type: none"> - Computer Programming and Applications - Personal Computer Organisation

Sr. No.	Competency Profile	<u>Curriculum Areas</u>
14	Competencies in general, manual and machining skills for supervising shop floor/ work site operations	<ul style="list-style-type: none"> - Workshop Practice - Electrical/Electronics Workshop Practice - Industrial Training
15	Ability to manage self for self development i.e intellectually, physiologically, psychologically.	<ul style="list-style-type: none"> - Generic Skills Development
16	Ability to collaborate, managing different tasks and to solve unstructured problems related to various functional areas of electrical engineering may it be prototype development, diagnostic and fault finding or repair and maintenance of plant and equipment	<ul style="list-style-type: none"> - Repair and Maintenance of Electronic Installations - Electronics Circuits and Engineering Drawing,
17	Competency in organizing men, material and machinery on shop floors where electronic components. And products are manufactured	<ul style="list-style-type: none"> - Entrepreneurship Development and Management
18	Understanding of industrial processes and organisations connected with the profession and relate classroom learning with real life situations	<ul style="list-style-type: none"> - Minor and Major Project Work
19	Proficiency in oral and written communication, technical report preparation, managing relationship with juniors, peers and seniors for effective functioning in the world of work competency to communicate (oral and written) effectively in the professional life and develop self-learning habits	<ul style="list-style-type: none"> - Communication Techniques/ Skills - Project Work - Exposure to World of Work - Basics of Management - Generic Skills Development
20	Understanding of basic principles of managing men, material and equipment and techniques of achieving economy and quality, labour laws, Intellectual Property Rights(IPR)	<ul style="list-style-type: none"> - Entrepreneurship Development - Basics of Management
21	Awareness about the environment, use of non-conventional energy sources, external financial and technical support system, adopting energy conservation techniques	<ul style="list-style-type: none"> - Environmental and Entrepreneurial Awareness - Non-Conventional Sources of Energy - Energy Management
22	Knowledge of latest trends in the field of communication, instrumentation	<ul style="list-style-type: none"> - Communication Systems - Optical Fibre Communication
23	Knowledge of Applied and Engineering sciences for better comprehension of technologies used in electronics and related industry and service sector and to develop scientific temper, analytical skills and to facilitate continuing education	<ul style="list-style-type: none"> - Applied Physics - Applied Chemistry - Applied Mathematics - Engineering Drawing - Workshop Practice

6. ABSTRACT OF CURRICULUM AREAS/ SUBJECTS

The subjects have been divided in four different categories:

1. Basic Sciences

- (1) English and Communication Skills - 1 & II
- (2) Practice in Communication Skills
- (3) Generic Skills and Entrepreneurship Development
- (4) Basics of Management

2. Applied Sciences

- (5) Applied Physics - I & II
- (6) Applied Chemistry - I
- (7) Applied Mathematics - I and II

3. Basic Courses in Engineering/ Technology

- (8) Engineering Drawing-I
- (9) General Workshop Practice - I & II
- (10) Basics of Information Technology

4. Area Specific Engineering/ Technology Subjects

- (11) Basic Electrical Engineering
- (12) Basic Electronics
- (13) Electronic Components and Materials
- (14) Principles of Communication Engineering
- (15) Digital Electronics
- (16) Electronic Devices and Circuits
- (17) Electrical Machines
- (18) Computer Programming and Applications
- (19) Network, Filters and Transmission Lines
- (20) Communication System-I
- (21) Electronic Instruments and Measurement
- (22) Power Electronics
- (23) Microprocessors and Interfacing Devices
- (24) Minor Project Work (Fabrication techniques using CAD)
- (25) Consumer Electronics
- (26) Trouble Shooting of Electronic Equipment
- (27) Communication System-II
- (28) Micro controllers and Embedded System
- (29) Microwave and Radar Engineering
- (30) Computer Networks
- (31) Wireless and Mobile Communication
- (32) Instrumentation and PLCs
- (33) Major Project Work

5. Specialized Courses in Engineering/ Technology

Elective-I to choose any one from the following:

- (34) Personal Computer Organisation(PCO)
- (35) Digital Signal Processing
- (36) Medical Electronics

Elective-II to choose any one from the following:

- (37) Optical Fibre Communications
- (38) Advanced Microprocessors
- (39) VLSI System Design

In addition,

- a) Ecology and Environmental Awareness Camp will be organized in First Year and
- b) Entrepreneurial Awareness Camp will be organized in Second Year .

c) Industrial Training:

There will be industrial training during summer vacation after 4th semesters. An Internal assessment out of 25 marks and an external assessment out of another 25 marks have been added in 5th semester. Total marks allotted to industrial training will be 50.

7. HORIZONTAL AND VERTICAL ORGANISATION OF THE SUBJECTS

Sr. No.	Subjects	Distribution in Hours Per Week in Various Semesters					
		I	II	III	IV	V	VI
1.	English and Communication Skills	5	5	-	-	-	-
2.	Applied Mathematics	5	5	-	-	-	-
3.	Applied Physics	6	6	-	-	-	-
4.	Applied Chemistry	6	-	-	-	-	-
5.	Basic Electrical Engineering	-	6	-	-	-	-
6.	Basics of Information Technology	-	4	-	-	-	-
7.	Engineering Drawing	7	-	-	-	-	-
8.	General Workshop Practice	7	6	-	-	-	-
9.	Basic Electronics	-	6	-	-	-	-
10.	Electronic Components and Materials (ECM)	-	-	4	-	-	-
11	Principle of communication Engineering	-	-	6	-	-	-
12	Digital Electronics	-	-	7	-	-	-
13	Electronic Devices and Circuits	-	-	7	-	-	-
14.	Electrical Machines	-	-	7	-	-	-
15	Computer programming and Applications	-	-	6	-	-	-
16	Network, Filters and Transmission Lines	-	-	-	5	-	-
17	Communication Systems -I	-	-	-	6	-	-
18	Electronic Instruments and Measurement	-	-	-	6	-	-
19	Power Electronics	-	-	-	6	-	-
20	Microprocessors	-	-	-	6	-	-
21	Minor Project Work(Fabrication Techniques using CAD)	-	-	-	4	-	-
22	Generic Skills and Entrepreneurship Development	-	-	-	3	-	-
23	Consumer Electronics	-	-	-	-	6	-
24	Elective I	-	-	-	-	6	-
25	Trouble Shooting of Electronic Equipment	-	-	-	-	6	-
26	Communication System-II	-	-	-	-	6	-
27	Micro Controllers and Embedded System	-	-	-	-	6	-
28	Microwave and Radar Engineering	-	-	-	-	6	-
29	Computer Networks	-	-	-	-	-	6
30	Elective II	-	-	-	-	-	5
31	Wireless and Mobile Communication	-	-	-	-	-	6
32	Instrumentation and PLCs	-	-	-	-	-	7
33	Basics of Management	-	-	-	-	-	3
34	Major Project Work	-	-	-	-	-	8
35	Practice in Communication Skills	-	-	-	-	-	2
	Student Centred Activities	4	2	4	4	4	3
Total		40	40	40	40	40	40

Study and Evaluation Scheme
ELECTRONICS & COMMUNICATION
ENGINEERING

**1. STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN
ELECTRONICS & COMMUNICATION ENGINEERING
(HIMACHAL PRADESH)**

FIRST SEMESTER (ELECTRONICS & COMMUNICATION ENGINEERING)

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	
1.1	*English and Communication Skills – I	3	2	30	20	50	100	3	50	3	150	200
1.2	*Applied Mathematics - I	5	-	50	-	50	100	3	-	-	100	150
1.3	*Applied Physics – I	4	2	30	20	50	100	3	50	3	150	200
1.4	*Applied Chemistry – I	4	2	30	20	50	100	3	50	3	150	200
1.5	*Engineering Drawing – I	-	7	-	50	50	100	4	-	-	100	150
1.6	*General Workshop Practice – I	-	7	-	100	100	-	-	50	4	50	150
#Student Centred Activities		-	4	-	-	-	-	-	-	-	-	-
Total		16	24	140	210	350	500	16	200	-	700	1050

* Common with other diploma programmes

Will comprise of co-curricular activities like games, hobby clubs, including photography, seminars, declamation contests, extension lectures, educational field visits, N.C.C., NSS, cultural activities etc.

2. STUDY AND EVALUATION SCHEME SECOND SEMESTER (ELECTRONICS & COMMUNICATION ENGINEERING)

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	
2.1	*English and Communication Skills - II	3	2	30	20	50	100	3	50	3	150	200
2.2	*Applied Mathematics – II	5	-	50	-	50	100	3	-	-	100	150
2.3	* Applied Physics-II	3	2	30	20	50	100	3	50	3	150	200
2.4	Basic Electrical Engineering	4	2	30	20	50	100	3	50	3	150	200
2.5	Basic Electronics	4	2	30	20	50	100	3	50	3	150	200
2.6	*Basics of Information Technology	-	4	-	50	50	-	-	50	3	50	100
2.7	*General Workshop Practice – II	-	6	-	100	100	-	-	50	4	50	150
#Student Centred Activities		-	3	-	-	-	-	-	-	-	-	-
<i>Total</i>		19	21	170	230	400	500	15	300	19	800	1200

- * Common with other diploma programmes
- # Will comprise of co-curricular activities like games, hobby clubs, including photography, seminars, declamation contests, extension lectures, educational field visits, N.C.C., NSS, cultural activities etc.

3. STUDY AND EVALUATION SCHEME THIRD SEMESTER (ELECTRONICS & COMMUNICATION ENGINEERING)

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	
3.1	Network Filters and Transmission Lines	4	2	30	20	50	100	3	50	3	150	200
3.2	Electronic Components and Materials	4	-	50	-	50	100	3	-	-	100	150
3.3	*Computer Programming and Applications	2	4	30	20	50	100	3	50	3	150	200
3.4	Electronic Devices and Circuits	5	2	30	20	50	100	3	50	3	150	200
3.5	+Digital Electronics	5	2	30	20	50	100	3	50	3	150	200
3.6	Principles of Communication Engineering	4	2	30	20	50	100	3	50	3	150	200
# Student Centred Activities (including Ecology and Environmental Awareness Camp)		-	4	-	25	25	-	-	-	-	-	25
Total		24	16	200	125	325	600	18	250	15	850	1175

* Common with other diploma programmes

+ Common with Computer Engineering

Will comprise of co-curricular activities like games, hobby clubs, including photography, seminars, declamation contests, extension lectures, educational field visits, N.C.C., NSS, cultural activities etc.

4. FOURTH SEMESTER (ELECTRONICS & COMMUNICATION ENGINEERING)

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	
4.1	Communication System – I	4	2	30	20	50	100	3	50	3	150	200
4.2	Electronic Instruments and Measurements	5	2	30	20	50	100	3	50	3	150	200
4.3	Power Electronics	4	2	30	20	50	100	3	50	3	150	200
4.4	**Microprocessor and Interfacing Devices	5	2	30	20	50	100	3	50	3	150	200
4.5	Minor Project Work	-	6	-	50	50	-	-	50	-	50	100
4.6	*Generic Skills and Entrepreneurship Development	3	-	50	-	50	100	3	-	-	100	150
# Student Centred Activities (including Entrepreneurial Awareness Camp)		-	5	-	25	25	-	-	-	-	-	25
Total		21	19	170	155	325	500	15	250	12	750	1075

* Common with other diploma programmes

** Common with Computer engineering

Will comprise of co-curricular activities like games, hobby clubs, including photography, seminars, declamation contests, extension lectures, educational field visits, N.C.C., NSS, cultural activities etc.

Industrial Training - After examination of 4th Semester, the students shall go for training in a relevant industry/field organisation for a minimum period of 4 weeks and shall prepare a diary. It shall be evaluated during 5th semester by his/her teacher for 50 marks. The students shall also prepare a report at the end of training and shall present it in a seminar, which will be evaluated for another 50 marks. This evaluation will be done by HOD and lecturer incharge – training at the start of 5th Semester.

FIFTH SEMESTER(ELECTRONICS & COMMUNICATION ENGINEERING)

SR. NO.	SUBJECTS	STUDY SCHEME Hrs/Week		MARKS IN EVALUATION SCHEME								Total Marks of Int. & Ext.
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr	Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
5.1	Consumer Electronics	4	4	30	20	50	100	3	50	3	150	200
5.2	Elective I	4	-	50	-	50	100	3	-	-	100	150
5.3	Trouble Shooting of Electronic Equipment	2	4	30	20	50	100	3	50	3	150	200
5.4	Communication System – II	4	2	30	20	50	100	3	50	3	150	200
5.5	Microcontrollers and Embedded System	4	2	30	20	50	100	3	50	3	150	200
5.6	Microwave and Radar Engineering	4	2	30	20	50	100	3	50	3	150	200
Industrial Training		-	-	-	50	50	-	-	50	-	50	100
# Student Centred Activities		-	4	-	25	25	-	-	-	-	-	25
Total		22	18	200	175	375	600	-	300	-	900	1275

- **There will be a compulsory industrial/educational tour for one week after the semester**

Will comprise of co-curricular activities like games, hobby clubs, including photography, seminars, declamation contests, extension lectures, educational field visits, N.C.C., NSS, cultural activities etc.

SIXTH SEMESTER(ELECTRONICS & COMMUNICATION ENGINEERING)

SR. NO.	SUBJECTS	STUDY SCHEME		MARKS IN EVALUATION SCHEME								Total Marks of Int. & Ext.
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		<i>Hrs/Week</i>		Th	Pr	Tot	Th	Hrs	Pr	Hrs	To t	
6.1	*Basics of Management	3	-	50	-	50	100	3	-	-	100	150
6.2	Elective – II	4	-	50	-	50	100	3	-	-	100	150
6.3	Wireless and Mobile Communication	4	2	30	20	50	100	3	50	3	150	200
6.4	Instrumentation and PLCs	5	2	30	20	50	100	3	50	3	150	200
6.5	**Computer Networks	4	2	30	20	50	100	3	50	3	150	200
6.6	Major Project Work	-	8	-	100	100	-	-	100	3	100	200
6.7	*Practice in Communication Skills	-	2	-	50	50	-	-	50	3	50	100
# Student Centred Activities		-	4	-	25	25	-	-	-	-	-	25
Total		20	20	190	235	425	500	-	300	-	800	1225

* Common Course with other diploma programmes

** Common with Computer Engineering

Will comprise of co-curricular activities like games, hobby clubs, including photography, seminars, declamation contests, extension lectures, educational field visits, N.C.C., NSS, cultural activities etc.

9. INDUSTRIAL TRAINING OF STUDENTS

It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. It is industrial training, which provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice. Polytechnics have been arranging industrial training of students of various durations to meet the above objectives.

This document includes guided and supervised industrial training of a minimum of 6 weeks duration to be organised during the semester break starting after second year i.e. after IV Semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. A minimum of one visit per week by the teacher is recommended. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An internal assessment of 50 and external assessment of 50 marks have been provided in the study and evaluation scheme of V Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations. The formative and summative evaluation may comprise of weightage to performance in testing, general behaviour, quality of report and presentation during viva-voce examination. It is recommended that such evaluations may be carried out by a team comprising of concerned HOD, teachers and representative from industry.

Teachers and students are requested to see the footnote below the study and evaluation scheme of IV Semester for further details.

Detailed Contents of

SEMESTERWISE SUBJECTS

**ELECTRONICS & COMMUNICATION
ENGINEERING**

1.1 ENGLISH AND COMMUNICATION SKILLS – I

L T P
3 - 2

RATIONALE

*Language is the most commonly used medium of self-expression in all spheres of human life – personal, social and professional. A student must have a fair knowledge of English language and skills to communicate effectively to handle the future jobs in industry. The objective of this course is to enable the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the course, the student will be able to develop comprehension skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English. It is expected that each polytechnic will establish a **communication skill laboratory** for conducting practicals mentioned in the curriculum.*

DETAILED CONTENTS

1. **Facets of Literature** (14 hrs)
 - 1.1 **Short Stories**
 - 1.1.1 Homecoming – R.N. Tagore
 - 1.1.2 The Selfish Giant - Oscar Wilde
 - 1.1.3 The Diamond Necklace- Guy- De Maupassant
 - 1.2 **Prose**
 - 1.2.1 I Have A Dream – Martin Luther King
 - 1.2.2 On Habits – A. G. Gardiner
 - 1.2.3 My struggle for An Education- Booker T Washington
 - 1.3 **Poems**
 - 1.3.1 Ozymandias – P.B. Shelley
 - 1.3.2 Daffodils – William Wordsworth
 - 1.3.3 Stopping by Woods on a Snowy Evening – Robert Frost
2. **Grammar and Usage** (10 hrs)
 - 2.1 Parts of speech
 - 2.1.1 Nouns
 - 2.1.2 Pronouns
 - 2.1.3 Adjectives
 - 2.1.4 Articles
 - 2.1.5 Verbs
 - 2.1.6 Adverbs
 - 2.1.7 Prepositions
 - 2.1.8 Conjunction
 - 2.1.9 Interjection
 - 2.1.10 Identifying parts of speech
 - 2.2 Pair of words (Words commonly confused and misused)
 - 2.1 Tenses
 - 2.2 Correction of incorrect sentences
 - 2.3 One word Substitution

3. **Translation** (04 hrs)
 - 3.1 Glossary of Administrative Terms (English and Hindi)
 - 3.2 Translation from Hindi into English and English to Hindi.
4. Paragraph of 100-150 words from outlines (08 hrs)
5. **Comprehension** (04 hrs)
Unseen passages of literacy, scientific, data/graph based for comprehension exercises
6. **Communication** (08 hrs)
 - 6.1 Definition, Introduction and Process of Communication
 - 6.2 Objectives of Communication

LIST OF PRACTICALS

1. Locating a Book in Library
2. How to look up words in a Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics,
3. How to Seek Information from an Encyclopedia
4. Listening pre-recorded English language learning programme
5. Paper Reading before an audience (reading unseen passages)
6. Study of spelling Rules
7. Study of essentials of a Good Speech to respond and comprehend visual, oral themes, situations or stimulus and practice before select gathering
8. Exercises on use of different abbreviations
9. Greetings for different occasions
10. Introducing oneself, others and leave taking
11. Exercises on writing sentences on a topic

Note:

1. *The Text Book on “English and Communication Skills, Book-I By Kuldip Jaidka et. al. developed by NITTTR, Chandigarh is recommended to be used for teaching and setting-up the question papers.*
2. *A communication laboratory may be set up consisting of appropriate audio-video system with facility of playing CDs/DVDs and a video camera for recording the performance of each student with play back facility. A set of CDs from any language training organization e.g. British Council etc. may be procured for use of students.*
3. *Elements of body language will be incorporated in all practicals*
4. *The practical exercises involving writing may also be included in Theory Examination.*

RECOMMENDED BOOKS

1. *English and Communication Skills, Book-I By Kuldip Jaidka, Alwainder Dhillon and Parmod Kumar Singla, Prescribed by NITTTR, Chandigarh Published By Abhishek Publication, 57-59, Sector-17, Chandigarh*
2. *Essentials of Business Communication by Pal and Rorualing; Sultan Chand and Sons*
3. *The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India*
4. *New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,*

5. *New Design English Reading and Advanced Writing Skills for Class XI and XII* by MK Kohli and AL Kohli; Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,
6. *A Practical English Grammar* by Thomson and Marlinet
7. *Spoken English* by V Sasikumar and PV Dhamija; Tata McGraw Hill
8. *English Conversation Practice* by Grount Taylor; Tata McGraw Hill
9. *Developing Communication Skills* by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi
10. *Business Correspondence and Report Writing* by RC Sharma and Krishna Mohan; Tata McGraw Hill Publishing Company Ltd. New Delhi
11. *Communication Skills* by Ms R Datta Roy and KK Dhir; Vishal Publication, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	14	40
2	10	15
3	4	10
4	8	10
5	4	10
6	8	15
Total	48	100

Glossary of Administrative Terms

1.	Senior	वरिष्ठ
2.	Cashier	खजान्ची
3.	Consent	सहमती
4.	Earned Leave	जमा छुट्टी
5.	Under Consideration	विचार अधीन
6.	Criterion	कसौटी
7.	Staff	कर्मचारी
8.	Tenure	कार्यकाल
9.	Working Committee	कार्य समिति
10.	Estate	सम्पदा
11.	Self-Sufficient	आत्मनिर्भर
12.	Emergency	आपात्तकाल
13.	General Body	आम सभा
14.	Exemption	छूट
15.	Daily wages	दिहाड़ीदार
16.	Death-Cum Retirement	मृत्यु और निवृत्ती
17.	Despatch Register	रवानगी रजिस्टर
18.	Despatch	रवानगी
19.	Stenography	आशुलिपिक
20.	Assurance	दिलासा
21.	Justify	सही साबित करना
22.	Superior	बढ़िया
23.	High Commission	उच्चायुक्त
24.	Simultaneous	साथ - साथ
25.	Precautionary	एहतियाती
26.	Commanding Office	कमांडिंग अफसर
27.	Negligence	लापरवाही
28.	Performance	पुरा करना
29.	Proof Reader	पुफ रीडर
30.	Take Over	काम सभालना
31.	Timely Compliance	समय दौरान पुरा करना
32.	Responsibility	जिमेदारी
33.	Chief Justice	मुख्य न्यायधिेश
34.	Disciplinary Action	अनुशासनिक कारवाई
35.	Efficiency Bar	दक्षता रोक
36.	Flying Squad	उड़न दस्ता
37.	Regret	खेद
38.	Inconvenience	असुविधा
39.	Ambiguous	अस्पष्ट
40.	Part Time	अशकालीन
41.	Academy	अकादमी
42.	Disparity	असमानता
43.	Extraordinary	असाधारण
44.	Provisional	अस्थायी
45.	Income Tax	आयकर
46.	Bonafide	असली
47.	Acting in Official Capacity	बतौर अधिकारिक हैसियत
48.	Contractor	ठेकेदार
49.	On probation	परिवीक्षाधीन
50.	State	राज्य

51.	Administrator	प्रशासक
52.	Admission	प्रवेश
53.	Aforesaid	पूर्वोक्त, उपरोक्त
54.	Affidavit	शपथपत्र
55.	Agenda	कार्यसूची
56.	Alma Mater	विद्यालय जहां किसी व्यक्ति ने शिक्षा प्राप्त
57.	Appointing Authority	मनोनित अधिकारी
58.	Apprentice	शिल्पकार
59.	Additional	अतिरिक्त
60.	Advertisement	विज्ञापन
61.	Assistant	सहायक
62.	Assumption of Charge	अधिकार ग्रहण करना
63.	Attested Copy	सत्यापित प्रति
64.	Chief Minister	मुख्यमन्त्री
65.	Clerical Error	लेखन सम्बन्धी भ्रम
66.	Code	कानून की किताब, गुप्त भाषा
67.	Corruption	नैतिक भ्रष्टाचार, खोटापन
68.	Craftsman	कारीगर
69.	Compensation	हरजाना
70.	Compensatory Allowance	क्षतिपूरक भत्ता
71.	Compile	संकलन करना, संग्रह करना
72.	Confidential Letter	गुप्त पत्र
73.	Chief Engineer	मुख्य अभिन्यता
74.	Data	स्वीकृत तत्त्व (आंकड़े)
75.	Dearness Allowance	संहर्गाई भत्ता
76.	Department	विभाग
77.	Dictionary	शब्द कोष
78.	Director	निदेशक, संचालन
79.	Director of Tech. Edu.	तकनीकी शिक्षा निदेशक
80.	Executive Engineer	अधिशाली अभिन्यता
81.	Employment Exchange	व्यवसाय केन्द्र
82.	Head Office	मुख्य कार्यालय
83.	Head Clerk	प्रधान लिपिक
84.	Indian Admn. Service	भारतीय प्रशासनिक सेवा
85.	Legislative Assembly	विधान सभा
86.	Officiating	स्थानापन्न
87.	Office Record	कार्यालय रिकार्ड
88.	Office Discipline	कार्यालय अनुशासन
89.	Polytechnic	बहुतकनीकी
90.	Temporary	अस्थायी
91.	Qualified	योग्यता प्राप्ति
92.	Under Investigation	जांच अधीन
93.	Sub-treasury	उप-खजाना
94.	Target Date	लक्ष्य तिथि
95.	Technical Approval	तकनीकी मान्यता
96.	Verification	जांच पड़ताल
97.	Viva-voce	मौखिक परीक्षा
98.	Write off	बटटेखाते डालना
99.	Warning	चेतावनी
100.	Yours faithfully	भवदीय

1.2 APPLIED MATHEMATICS - I

L T P
5 - -

RATIONALE

Applied Mathematics forms the backbone of engineering students. Basic elements of algebra, trigonometry, coordinate geometry have been included in the curriculum as foundation course. This course will develop analytical abilities to make exact calculations and will provide continuing educational base to the students.

DETAILED CONTENTS

1. **Algebra** (30 hrs)
 - 1.1 Complex Numbers: Complex number, representation, modulus and amplitude. De-Moivre's theorem, its application in solving algebraic equation.
 - 1.2 Geometrical progression, its n th term and sum of n terms and to infinity. Application of Arithmetic progression and Geometrical progression to Engineering problem.
 - 1.3 Partial fractions (linear factors, repeated linear factors)
 - 1.4 Permutations and Combinations: Value of ${}^n P_r$ ${}^n C_r$. Simple problems
 - 1.5 Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof) first and second binomial approximation with applications to engineering problems
2. **Trigonometry** (20 hrs)
 - 2.1 Concept of angles, measurement of angles in degrees, grades and radians and their conversions.
 - 2.2 T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T-Ratios of multiple angles, sub-multiple angles ($2A$, $3A$, $A/2$).
 - 2.3 Graphs of $\sin x$, $\cos x$, $\tan x$ and e^x

3. **Differential Calculus** (30 hrs)

3.1 Definition of function; Concept of limits.

$$\text{Lt } x \rightarrow a \frac{x^n - a^n}{x - a}$$

Four standard limits

$$\text{Lt } x \rightarrow 0 \frac{\sin x}{x}, \quad \text{Lt } x \rightarrow 0 \frac{a^x - 1}{x}, \quad \text{Lt } x \rightarrow 0 \frac{x - a}{x}$$

$$\text{Lt } x \rightarrow 0 \frac{(1+x)^{1/x} - 1}{x}$$

3.2 Differentiation by definition of x^n , $\sin x$, $\cos x$, $\tan x$, e^x , $\log_a x$

3.3 Differentiation of sum, product and quotient of functions. Differentiation of function of a function.

3.4 Differentiation of trigonometric inverse functions. Logarithmic differentiation. Exponential differentiation Successive differentiation (excluding nth order).

3.5 Applications:

(a) Errors and increments

(b) Maxima and minima

(c) Equation of tangent and normal to a curve (for explicit functions only)

RECOMMENDED BOOKS

1. *Elementary Engineering Mathematics* by BS Grewal, Khanna Publishers, New Delhi
2. *Engineering Mathematics* by Vol. I & II by S Kohli, IPH, Jalandhar
3. *Applied Mathematics* by Dr. RD Sharma
4. *Applied Mathematics, Vol. I & II* by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar
5. *Comprehensive Mathematics, Vol. I & II* by Laxmi Publications
6. *Engineering Mathematics* by Dass Gupta
7. *Engineering Mathematics* by C Dass Chawla, Asian Publishers, New Delhi
8. *Comprehensive Mathematics, Vol. I & II* by Laxmi Publications
9. *Engineering Mathematics, Vol I, II & III* by V Sundaram et al, Vikas Publishing House (P) Ltd., New Delhi
10. *Engineering Mathematics* by N.Ch.S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi
11. *Engineering Mathematics, Vol I & II* by SS Sastry, Prentice Hall of India Pvt. Ltd.,
12. *Engineering Mathematics, Vol I & II* by AK Gupta, MacMillan India Ltd., New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	30	30
2	20	30
3	30	40
Total	80	100

1.3 APPLIED PHYSICS– I

L T P
4 - 2

RATIONALE

Applied physics includes the study of a large number of diverse topics all related to things that go on in the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects will behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

DETAILED CONTENTS

1. **Units and Dimensions** (08 hrs)
 - 1.1 Physical quantities
 - 1.2 Units - fundamental and derived units, systems of units (FPS, CGS, MKS and SI units)
 - 1.3 Dimensions and dimensional formulae of physical quantities
 - 1.4 Dimensional equations and principle of homogeneity, applications to conversion from one system of units to another, checking the correctness of physical relations and derivation of simple physical relations, limitations of dimensional analysis
 - 1.5 Significant figures and error analysis

2. **Force and Motion** (12 hrs)
 - 2.1 Scalar and vector quantities – examples, addition and multiplication (scalar product and vector product) of vectors
 - 2.2 Force, resolution and composition of forces – resultant, parallelogram law of forces, equilibrium of forces, Lami's theorem
Force, type of forces, gravitational electromagnetic weak and strong force, conservative and non-conservative forces with simple examples.
 - 2.3 Newton's Laws of motion – concept of momentum, Newton's laws of motion and their applications, determination of force equation from Newton's second law of motion; Newton's third law of motion, conservation of momentum, impulse, simple numerical problems
 - 2.4 Circular motion – angular displacement, angular velocity and angular acceleration
 - 2.5 Relation between linear and angular variables (velocity and acceleration)
 - 2.6 Centripetal force (derivation) and centrifugal force
 - 2.7 Banking of roads

3. **Work, Power and Energy** (14 hrs)
 - 3.1 Work: definition and its SI units
 - 3.2 Work done in moving an object on horizontal and inclined plane (incorporating frictional forces)
 - 3.3 Power: definition and its SI units, calculation of power in simple cases

- 3.4 Energy: Definition and its SI units: Types: Kinetic energy and Potential energy with examples and their derivation
 - 3.5 Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another
 - 3.6 Relation between work, heat and energy
 - 3.7 Concept of friction, cause and types, applications of friction in daily life
4. **Rotational Motion** (06 hrs)
- 4.1 Definitions of torque, angular momentum, their relationship
 - 4.2 Conservation of angular momentum (qualitative) and its examples
 - 4.3 Moment of inertia and its physical significance, radius of gyration
 - 4.4 Theorems of parallel and perpendicular axes (statements)
 - 4.5 Moment of inertia of rod, disc, ring and sphere
5. **Properties of Matter** (10 hrs)
- 5.1 Elasticity, definition of stress and strain, different types of modulus of elasticity, stress – strain diagram, Hooke’s law
 - 5.2 Pressure – its units, gauge pressure, absolute pressure, atmospheric pressure, Pascal law and its applications.
 - 5.3 Surface tension – its units, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension
6. **Thermometry** (10 hrs)
- 6.1 Principles of measurement of temperature and different scales of temperature
 - 6.2 Difference between heat and temperature on the basis of K.E. of molecules
 - 6.3 Types of thermometers, Physical properties on which they are based
(No description of individual thermometer)
 - 6.4 Co-efficient of linear, surface and cubical expansions and relation amongst them
 - 6.5 Modes of transfer of heat (Conduction, convection and radiation with examples)
 - 6.6 Co-efficient of thermal conductivity, determination of thermal conductivity of good conductor (Searle’s method) and bad conductor (Lee’s disc method)
7. **Space Exploration and Radio-activity** (04 Hrs)
- Concept of Natural, artificial satellite, equatorial orbit, Geo-Stationary orbit, Polar orbit, Apogee, Perigee, inclination, purpose of space research, space science in India, Indian satellite, Application of space science, Useful life of satellite, Natural radioactivity, units, concept of nuclear fission, fusion and nuclear reactor. Applications of Radioisotopes in Agriculture industry and medicine.

LIST OF PRACTICALS (to perform minimum eight experiments)

1. To find the diameter of wire using a screw gauge
2. To find volume of solid cylinder and hollow cylinder using a vernier caliper
3. To determine the thickness of glass strip and radius of curvature of a concave surface using a spherometer
4. To verify the parallelogram law of forces
5. To verify conservation of energy of a rolling solid sphere/cylinder
6. To find the diameter of a capillary tube using Travelling Microscop
7. To find the time period of a simple pendulum
8. To find the time period of cantilever
9. To determine the atmospheric pressure at a place using Fortin's Barometer
10. To find the coefficient of thermal conductivity of copper using Searle's conductivity apparatus

RECOMMENDED BOOKS

1. *Test Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T /C.B.S.E.*
2. *Test Book of Physics for Class XII (Part-I, Part-II) N.C.E.R.T /C.B.S.E.*
3. *Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi*
4. *Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi*
5. *Fundamentals of Physics by Resnick and Halliday & Walker, Asian Book Pvt. Ltd., New Delhi*
6. *Berkeley Physics Course, Vol. I, II & III, Tata McGraw Hill, Delhi*
7. *The Feynman Lectures on Physics by Feynman, Leighton and Sands, Vol. I & II, Narosa Publishing House, Delhi*
8. *Fundamentals of Optics by Francis A. Jenkins & Harvey E White, McGraw Hill International Editions, Physics Series*
9. *A Text Book of Optics by Subramanian and Brij Lal, S Chand & Co., New Delhi*
10. *Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publishers*
11. *Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi*
12. *Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar*

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	10
2	12	20
3	14	25
4	06	10
5	10	15
6	10	15
7	04	05
Total	64	100

1.4 APPLIED CHEMISTRY - I

L T P
4 - 2

RATIONALE

The role of chemistry and chemical products in every branch of engineering is expanding greatly. Now a days various products of chemical industries are playing important role in the field of engineering with increasing number of such products each successive years. The strength of materials, the chemical composition of substances, their behavior when subjected to different treatment and environment, and the laws of heat and dynamic energy have entered in almost every activity of modern life. Chemistry is considered as one of the core subjects for diploma students in engineering and technology for developing in them scientific temper and appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstration and with the active involvement of students.

DETAILED CONTENTS

1. **Basic concepts of Chemistry** (10 hrs)
 - 1.1 Units and Dimensions, derived units (with special reference to pressure, volume, temperature, density, specific gravity, surface tension, viscosity and conductivity)
 - 1.2 Matter, element, compound and mixtures, atom, molecule, ion, symbols and formulae (recapitulation only)
 - 1.3 Atomic mass (A), molar mass, mole concept, molar volume of gases
 - 1.4 Solution, strength of solutions in grams per liter, molarity (M), molality (m), mass fraction and mole fraction (numerical problems)
 - 1.5 Chemical equations, thermo-chemical equations, balancing of chemical equations (using partial equation method)
 - 1.6 Numerical problems based on mole concept
 - 1.7 Brief introduction and concept of Volumetry Analysis
2. **Atomic structure and Chemical Bonding** (10 hrs)
 - 2.1 Fundamental particles i.e. electron, proton and neutron (their masses and charges)
 - 2.2 Postulates of Bohr model of atom, success and failures of Bohr model of atom
 - 2.3 Heisenberg's uncertainty principle
 - 2.4 Elementary idea of modern concept of atom, quantum numbers (significance only), definition of shells, sub shells and orbitals, concept of orbitals, shapes of s & p orbitals only. Electronic configuration of elements (atomic number 1 to 30 only) on the basis of Aufbau principle, Pauli's principle and Hund's rule
 - 2.5 Modern periodic law, introduction of periodic table, periods and groups,
 - 2.6 Division of the periodic table into s, p, d, and f blocks (details excluded)
 - 2.7 Chemical bond and cause of bonding
 - 2.8 Ionic bond, covalent bond, orbital concept of covalent bonding, valence bond theory, sigma (σ) and pi (π) bonds.
 - 2.9 Metallic bonding (electron sea model)
 - 2.10 Coordinate bond with examples of ozone, ammonium chloride, $\text{H}_3\text{N}-\text{BF}_3$ complex

3. **Water** (10 hrs)
- 3.1 Sources of water
 - 3.2 Hard water, soft water, types of hardness, action of soap on hard water
 - 3.3 Degree of hardness in terms of calcium carbonate, Units of hardness in Clark degree, French degree and ppm
 - 3.4 Estimation of hardness by EDTA method,
 - 3.5 Disadvantages of hard water in domestic and industrial uses
 - 3.6 Boiler water: causes and prevention of scale and sludge formation, corrosion, priming & foaming and caustic embitterment
 - 3.7 Softening of hard water by premitit and ion exchange processes
 - 3.8 Qualities of drinking water and purification of available water for drinking purposes
 - 3.9 Chemical analysis: Estimation of alkalinity, estimation of total dissolved solids (TDS), free chlorine, chloride, and dissolved oxygen
 - 3.10 Numerical problems
4. **Equilibrium, Acids and Bases.** (10 hrs)
- 4.1 Equilibrium state, equilibrium constant and statement of Le-chatelier's principle with illustration
 - 4.2 Ionization of electrolyte in aqueous solution, ionic equilibrium, degree of ionization, self-ionization of water and ionic product of water (K_w)
 - 4.3 Concept of pH and pH scale
 - 4.4 Arrhenius concept of acids/bases; strong acids/bases, weak acids/bases, dissociation constants of acids/bases. Neutralization, acid base titration, choice of indicators for acid base titration
 - 4.5 Hydrolysis of salts, buffer solutions (acidic and basic), buffer action of a buffer solution, applications of buffer solution
 - 4.6 Simple numerical problems
5. **Electrochemistry.** (10 hrs)
- 5.1 Electronic concept of oxidation and reduction, redox reactions
 - 5.2 Electrolytes and non electrolytes
 - 5.3 Electrolysis, Faradays laws of electrolysis
 - 5.4 Applications of electrolysis in electrometallurgy, electro-refining and electroplating (numerical)
 - 5.5 Galvanic cells (elementary idea) brief description of Daniel cell, Ni-Cd cell, dry cell and lithium iodide cell
 - 5.6 Lead storage batteries and maintenance free batteries
 - 5.7 Simple numerical problems related to Faraday's laws
6. **Organic Chemistry.** (08 hrs)
- 6.1 Tetra covalency of carbon, catenation (definition only)
 - 6.2 Structural and condensed formulae of organic compounds
 - 6.3 Homologous series, functional groups and following organic families: (a) alkanes (b) alkenes (c) alkynes (d) alcohols (e) ethers (f) aldehydes and ketones (g) Carboxylic acids (h) esters (i) amides (with structure, IUPAC names and method of preparation of first member of the series)
7. **Environmental Pollution and its control** (06 hrs)
- 7.1 Introduction
 - 7.2 Causes and control of air, water, and soil pollutions

- 7.3 Noise pollution
- 7.4 Radio active pollution and its control
- 7.5 Sewage and its treatment

LIST OF PRACTICALS

1. *Introduction to volumetric analysis, apparatus used and molarity based calculations*
2. *To determine strength of given solution of sodium hydroxide by titrating against standard solution of oxalic acid using phenolphthalein indicator.*
3. *To determine strength of given solution of sulphuric acid by titrating against standard solution of sodium carbonate using methyl orange indicator (or by conductometrically).*
4. *Estimation of hardness of water by EDTA method.*
5. *Estimation of total alkalinity in the given sample of water by titrating against standard solution of sulfuric acid.*
6. *Determination of the dosage of bleaching powder required for sterilization or disinfection of different samples of water, using standard sodium thiosulfate solution*
7. *Estimation of chloride ions in the given sample of water by titrating against standard solution of silver nitrate.*
8. *To determine %age purity of ferrous sulphate in given solution of known strength using potassium permanganate solution.*
9. *To distinguish between aldehyde and ketone by Tollen's reagent (benzaldehyde and acetone may be used)*
10. *To prepare iodoform from ethanol or acetone*

OR

11. *To prepare the Mohr's salt from ferrous sulphate and ammonium sulphate.*

RECOMMENDED BOOKS

1. *Chemistry in Engineering by J.C. Kuricose And J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.*
2. *Engineering Chemistry by P.C.Jain and Monika Jain, Dhanapat Rai Publishing Company New Delhi.*
3. *Engineering Chemistry by Shashi Chawla.*
4. *Progressive Applied Chemistry – I by Dr. G.H. Hugar Eagle Prakashan Jalandhar*

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	15
2	10	15
3	10	10
4	10	20
5	10	20
6	08	10
7	06	10
Total	64	100

1.5 ENGINEERING DRAWING - I

L T P
- - 7

RATIONALE

Drawing is the language of engineers and technicians. Reading and interpreting engineering drawing is their day to day responsibility. The subject is aimed at developing basic graphic skills in the students so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis, while imparting instructions, should be to develop conceptual skills in the students following BIS SP 46 – 1988.

Note:

- i) First angle projection is to be followed*
- ii) Minimum of 14 sheets to be prepared*
- iii) Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students*

DETAILED CONTENTS

1. **Handling, Use and Care of Drawing Instruments and Materials**
 - 1.1 Drawing Instruments
 - 1.2 Materials
 - 1.3 Layout of drawing sheets

2. **Free Hand Sketching and Lettering** (01 sheets)
 - 2.1 Different types of lines in Engineering drawing as per BIS specifications
 - 2.2 Practice of free hand sketching of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves

3. **Lettering Technique and Practice** (02 sheets)
 - 3.1 Instrumental single stroke lettering of 35 mm and 70 mm height in the ratio of 7:4
 - 3.2 Free hand lettering (Alphabet and numerals)- lower case and upper case, single stroke, vertical and inclined at 75 degree in different standards, series of 3, 5, 8 and 12 mm heights in the ratio of 7:4

4. **Dimensioning Technique** (01 sheet)
 - 4.1 Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)
 - 4.2 Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sink holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches

5. **Scales** (02 sheets)
 - 5.1 Scales - their need and importance (Theoretical instructions).
 - 5.2 Drawing of plain and diagonal scales

6. **Projection** (04 sheets)
- 6.1 Theory of projections (Elaborate theoretical instructions)
 - 6.2 Drawing 3 views of given objects (Non-symmetrical objects may be selected for this exercise)
 - 6.3 Drawing 6 views of given objects (Non-symmetrical objects may be selected for this exercise)
 - 6.4 Identification of surfaces on drawn views and objects drawn
 - 6.5 Exercises on missing surfaces and views
 - 6.6 Introduction to third angle projections
7. **Sections** (02 sheets)
- 7.1 Importance and salient features, Methods of representing sections, conventional sections of various materials, classification of sections, conventions in sectioning
 - 7.2 Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.
 - 7.3 Drawing of different conventions for materials in section, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections
 - 7.4 Exercises on sectional views of different objects.
8. **Isometric Views** (02 sheets)
- 8.1 Fundamentals of isometric projections (Theoretical instructions)
 - 8.2 Isometric views from 2 or 3 given orthographic views.
9. **Symbols and Conventions** (02 sheets)
- 9.1 Civil engineering, sanitary fitting symbols
 - 9.2 Electrical fitting symbols for domestic interior installations
 - 9.3 Building plan drawing with electrical and civil engineering symbols, Material symbols and conventions.

RECOMMENDED BOOKS

1. *A Text Book of Engineering Drawing by Surjit Singh, Dhanpat Rai & Co., Delhi*
2. *Engineering Drawing by PS Gill, SK Kataria & Sons, New Delhi*
3. *Elementary Engineering Drawing in First Angle Projection by ND Bhatt, Charactar Publishing House*
4. *Engineering Drawing I & II by JS Layall, Eagle Parkashan, Jalandhar*

1.6 GENERAL WORKSHOP PRACTICE - I

L T P

- - 7

RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hand on experience about use of different tools and basic manufacturing practices.

This course aims at developing general manual and machining skills in the students. Besides above, the development of dignity of labour, precision, safety at work place, team working and development of right attitude are the other objectives.

DETAILED CONTENTS (PRACTICALS)

The following shops are included in the syllabus:

1. Carpentry and Painting Shop-I
2. Fitting Shop -I
3. Welding Shop-I
4. Electric Shop –I
5. Smithy Shop –I or Electronic Shop-I
6. Sheet Metal Shop-I

Note:

1. *The branches e.g. Civil Engineering, Electrical Engineering, Mechanical Engineering, Automobile Engineering and Instrumentation & Control Engineering will do **Smithy Shop - I** instead of Electronic shop- I*
2. *The branches e.g. Electronics and Communication Engineering, will do **Electronic shop-I** instead of Smithy Shop-I.*

1. Carpentry and Painting Shop – I

- 1.1 Introduction to various types of wood such as Deodar, Kail, Partal, Teak, Hollack, Sheesham, Champ, etc. (Demonstration and their identification).
- 1.2 Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed.
Job I Marking, sawing and planing practice
Job II Extensive planing practice on soft wood
Job III Chiseling practice
- 1.3 Introduction to various types of wooden joints, their relative advantages and uses.
Job IV Preparation of half lap joint
Job V Preparation of Mortise and Tenon Joint
- 1.4 Demonstration of various methods of painting wooden items.
Job V Preparation of surface before painting.
Job VI Application of primer coat
Job VII Painting wooden items by brush/roller/spray

2. Fitting Shop – I

- 2.1 Introduction to fitting shop, common materials used in fitting shop, Identification of materials. (e.g. Steel, Brass, Copper, Aluminium etc.) Identification of various sections of steel such as Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section, etc.
- 2.2 Description and demonstration of various types of work benches. Holding devices and files, Precautions while filing. Different types of punches and their uses
Job I Filing practice (Production of flat surfaces) Checking by straight edge.
Job II Marking of jobs, use of marking tools and measuring instruments.
Job III Filing a dimensioned rectangular or Square piece of an accuracy of $\pm 0.25\text{mm}$.
- 2.3 Introduction to chipping, Demonstration on chipping and its applications. Demonstration and function of chipping tools.
Job IV Chipping practice
- 2.4 Care and maintenance of measuring tools like calipers, steel rule, try square, vernier calipers, micrometer, height gauge, combination set, surface plate, universal angle plate. Handling of measuring instruments, checking of zero error, finding of least count.
Job III Preparation of a job by filing on non-ferrous metal upto an accuracy of $\pm 0.1\text{mm}$
Job IV Preparation of job involving thread on GI pipe/ PVC pipe and fixing of different types of elbow, tee union, socket, stopcock, taps, etc.
- 2.5 Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade.
Job V Making a cutout from a square piece of MS Flat using Hand hacksaw.

3. Welding Shop – I

- 3.1 Introduction to welding and its importance in engineering practice; types of welding; common materials that can be welded, introduction to welding equipment e.g. a.c. welding set, d.c. rectifier, Electrode holder, electrodes and their specifications, welding screens and other welding related equipment and accessories.
- 3.2 Electric arc welding, (ac. and dc.) precautions while using electric arc welding, Practice in setting current and voltage for striking proper arc.
Job I Practice of striking arc while using electric arc welding set.
Job II Welding practice job on arc welding for making uniform and straight weld beads.
- 3.3 Various types of joints and end preparation.
Job III Preparation of butt joint by arc welding.
Job IV Preparation of lap joint by arc welding.
Job V Preparation of corner joint by using electric arc welding.
Job VI Preparation of Tee joint by arc welding.

4. Electric Shop – I

- 4.1 Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, ceiling roses, battens, cleats and allied items, tools and accessories.
- 4.2 Study of electrical safety measures and demonstration about use of protective devices.
Job I Identification of phase, neutral and earth of domestic appliances and their connection to two pin/three pin, plugs.
Job II Lay out of complete wiring of a house (i) batten wiring (ii) plastic casing and capping.
- 4.3 Study of common electrical appliances such as electric iron, electric kettle, ceiling fan/ table fan, electric mixer, electric Geyser, desert cooler etc.
Job III Testing and rectification of simulated faults in above said electrical appliances.
- 4.4 Introduction to a Lead-acid battery and its working.
Job IV Installation of a battery and to connect in series and parallel
Job V Charging a battery and testing it with the help of hydrometer and cell tester.

5. Smithy Shop – I

- 5.1 Demonstration and detailed explanation of tools and equipment used. Forging operations in Smithy shop. Safety measures to be observed in the smithy shop.
- 5.2 Demonstration and description of bending operation, upsetting operation, description and specification of anvils, swage blocks, hammers, etc.
- 5.3 Demonstration and description of tongs, fullers, swages
Job I To forge a L-Hook.
Job II To prepare a job involving upsetting process
Job III To forge a chisel
Job IV To prepare a cube from a M.S. round by forging method.

OR

5. Electronic Shop – I

- 5.1 Identification and familiarization with the following electronic instruments:
 - a) Multimeter digital (Three and half digit)
 - b) Single beam simple CRO, function of every knob on the front panel
 - c) Audio-oscillator sine and square wave output
 - d) Power supply fixed voltage and variable voltage, single output as well as dual output.Job I - Practice in the use of above mentioned equipment through a small experiment
- 5.2 Identification and familiarization with commonly used tools: statement of their uses. Identification and familiarisation with active and passive components; colour code and types of resistor and potentiometers (including VDR, LDR, and thermistor). Identification of components including LED, LCD, UJT, FET, Coils, relays,

switches (SPDT, DPDT, etc.) connectors, micro switches, reed relays, transformers (mains, audio and RF, etc) Linear and Digital ICs, Thyristors, etc.

NOTE: Demonstration Boards for the above components should be made.

Job II Cut, strip, join and insulate two length of wires/ cables (repeat with different types of cables/wires)

Job III Cut, strip, connect/solder/crimp different kinds of wires/ cables (including shielded cable) to different types of power/general purpose/Audio Video/Telephone plugs, sockets, jacks, terminals, binding posts, terminal strips, connectors. The tasks should include making complete recording/ playback/ antenna/ speaker leads for common electronic products such as Radio, TV, VCR, Cassette Recorder, Hi-Fi equipment, Head set, microphone

Job IV Cut, bend, tin component, Leads, inserts and solder components (resistor, capacitor, diodes, transistors, IFT type coils, DIL, ICs etc) on a PCB

Job V Wiring of a small circuit on a PCB/tag strip involving lacing, sleeving and use of identifier tags

6. Sheet Metal Shop –I

Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material.

6.1 Introduction and demonstration of hand tools used in sheet metal shop.

6.2 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine, Nibbling machine, Turning Machine, Wiring Machine, Setting Down Machine, Forming Machine , Punching Machine, Brake, Bending Machine etc.

6.3 Introduction to various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheets etc.

6.4 Study of various types of Nuts, Bolts, Rivets, Steel Screws etc.

Job I Shearing practice on a sheet using hand shears.

a) Single rivetted lap joint/Double rivetted lap joint

b) Single cover plate chain type/zig-zag type single rivetted Butt Joint

RECOMMENDED BOOKS

1. *Workshop Technology I,II,III*, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay
2. *Workshop Technology* by Manchanda Vol. I,II,III India Publishing House, Jalandhar.
3. *Manual on Workshop Practice* by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi
4. *Basic Workshop Practice Manual* by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi

2.1 ENGLISH AND COMMUNICATION SKILLS - II

L T P
3 - 2

RATIONALE

*Language is the most commonly used medium of self-expression in all spheres of human life – personal, social and professional. A student must have a fair knowledge of English language and skills to communicate effectively to handle the future jobs in industry. The objective of this course is to enable the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the course, the student will be able to develop comprehension skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English. It is expected that each polytechnic will establish a **communication skill laboratory** for conducting practicals mentioned in the curriculum.*

DETAILED CONTENTS

1. **Facets of Literature** (14 hrs)
 - 1.1 Short stories
 - 1.1.1 The Portrait of a Lady - Khushwant Singh
 - 1.1.2 The Refugees – Pearl S. Buck
 - 1.2 Prose
 - 1.2.1 Forgetting- Robert Lynd.
 - 1.2.2 Walking Tours- Robert Louis Stevenson
 - 1.3 Poems
 - 1.3.1 All The World's A Stage – W. Shakespeare
 - 1.3.2 No Men are Foreign- James Kirkup
2. **The Art of Précis Writing** (04 hrs)
3. **Grammar and Usage** (08 hrs)
 - 3.1 Narration
 - 3.2 Voice
 - 3.3 Idioms and Phrases
4. **Correspondence** (04 hrs)
 - 4.1 Business Letters
 - 4.2 Personal letters
 - 4.3 Application for Job
5. **Drafting** (06 hrs)
 - 5.1 Report Writing
 - 5.2 Inspection Notes
 - 5.3 Memos, Circulars
 - 5.4 Telegrams
 - 5.5 Press Release
 - 5.6 Agenda and Minutes of Meetings

- | | | |
|----|---|----------|
| 6. | Glossary of Technical & Scientific Terms | (04 hrs) |
| 7. | Communication | (08 hrs) |
| | 7.1 Media and Modes of Communication | |
| | 7.2 Channels of Communication | |
| | 7.3 Barriers to Communication | |
| | 7.4 Listening Skills- Types of Listening | |
| | 7.5 Body language | |

LIST OF PRACTICALS

1. Practice on browsing information from Internet
2. Group Discussions
3. Mock Interviews
4. Telephone Etiquette – demonstration and practice
5. Situational Conversation with feedback through video recording
6. Presentation on a given theme (using PowerPoint)
7. Exercises leading to personality development like mannerism, etiquettes, body language etc.
8. Reading unseen passages
9. Writing (developing) a paragraph
10. Exercises on writing notices and telephonic messages

Note:

1. *The Text Book on “English and Communication Skills, Book-II By Kuldip Jaidka et. al. developed by NITTTR, Chandigarh is recommended to be used for teaching & setting-up the question papers.*
2. *A communication laboratory may be set up consisting of appropriate audio-video system with facility of playing CDs/DVDS and a video camera for recording the performance of each student with play back facility. A set of CDs from any language training organization e.g. British Council etc. may be procured for use of students.*
3. *Elements of body language will be incorporated in all practicals*
4. *The practical exercises involving writing may also be included in Theory Examination.*

RECOMMENDED BOOKS

1. *English and Communication Skills, Book-II By Kuldip Jaidka, Alwainder Dhillon and Parmod Kumar Singla, Prescribed by NITTTR, Chandigarh & Published By Abhishek Publication, 57-59, Sector-17, Chandigarh*
2. *Essentials of Business Communication by Pal and Rorualling; Sultan Chand and Sons*
3. *The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India*
4. *New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,*
5. *New Design English Reading and Advanced Writing Skills for Class XI and XII by MK Kohli and AL Kohli; Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,*
6. *A Practical English Grammar by Thomson and Marlinet*
7. *Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill*

8. *English Conversation Practice* by Grount Taylor; Tata McGraw Hill
9. *Developing Communication Skills* by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi
10. *Business Correspondence and Report Writing* by RC Sharma and Krishna Mohan; Tata McGraw Hill Publishing Company Ltd. New Delhi
11. *Communication Skills* by Ms R Datta Roy and KK Dhir; Vishal Publication, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	14	40
2	4	10
3	8	15
4	4	10
5	6	10
6	4	5
7	8	10
Total	48	100

GLOSSARY OF TECHNICAL & SCIENTIFIC TERMS

1. Absolute	परम, अचर, पूर्ण, स्थिर
2. Acceleration	त्वरण, प्रवेग
3. Acid	अम्ल
4. Alkaline	क्षारीय, स्वारा
5. Air Compressor	वायु - संपीडक
6. Air Conditioning	वातानुकूलन
7. Alignment	सरेखन
8. Alternating Current	प्रत्यावर्ती धारा
9. Altimeter	ऊंचाई मापने का यंत्र
10. Alum	फिटकरी
11. Ammeter	अम्मीटर
12. Ampere	ऐम्पियर
13. Amplification	प्रवर्धन
14. Amplitude	आयाम
15. Angle	कोण
16. Angular Velocity	कोणीय वेग
17. Angular Momentum	कोणीय संवेग
18. Annealing	तापानुशीतन
19. Anode	अनोड
20. Apex	शीर्ष, शिखर, शिखाग्र
21. Apparent	स्पष्ट
22. Applied Mechanics	अनुप्रयुक्त यंत्रिकी
23. Applied Science	अनुप्रयुक्त विज्ञान
24. Archimedes's Principle	आर्किमिडीज़ का सिद्धांत
25. Architecture	वास्तुकला, स्थापत्यकला
26. Armature	आर्मेचर
27. Atom	परमाणु
28. Automatic	स्वचलित
29. Axis	अक्ष
30. Axle	धुरी
31. Balance (Scale)	तुला, तराजू
32. Ball Bearing	बाल - बेयरिंग
33. Bar magnet	छड़ - चुम्बक
34. Barometer	वायुदाबमापी
35. Base	आधार
36. Base Plate	आधार पट्टिका
37. Battery	बैटरी
38. Beaker	बीकर
39. Bending Moment	वंकन आघूर्ण
40. Blast Furnace	झोका भट्टी
41. Bleach	विरंजक
42. Boiler	उबालक
43. Bridge	पुल
44. Burette	ब्यूरेट
45. Callipers	कैलिपर्स
46. Calorie	कैलोरी
47. Canal	नहर
48. Capacitance	धारिता
49. Carburettor	कार्बुरेटर
50. Cast Iron	ढलवा लोहा

51.	Catalyst	उत्प्रेरक
52.	Cathode	कैथोड
53.	Centre of Gravity	गुरुत्वाकर्षण - केन्द्र
54.	Centrifugal	उपकेन्द्रीय
55.	Centripetal	अभिकेन्द्रीय
56.	Centroid	केन्द्रीय
57.	C.G.S. System	सी.जी.एस. पद्धति
58.	Chemical Action	रासायनिक क्रिया
59.	Chai	श्रृंखला, माला
60.	Change of State	अवस्था परिवर्तन
61.	Characteristics	लक्षण
62.	Charge (n)	आवेश
63.	Choke	चोक
64.	Chord, Major	गुरु स्वर - संघात
65.	Chord, Minor	लघु स्वर - संघात
66.	Circular	वृत्ताकार, वर्तुल
67.	Clock-wise	दक्षिणा वर्त
68.	Coagulation	स्कंदन
69.	Coefficient of Expansion	प्रसार गुणांक
70.	Coil	कुंडली
71.	Combustion	दहन
72.	Compass	दिशासूचक
73.	Compound	यौगिक
74.	Concave	अवतल
75.	Convex	उत्तल
76.	Concentrated (Solution)	गाढ़ा, सांद्रित (घोल)
77.	Concrete	कंकरीट
78.	Conduction	चालन
79.	Conductor	चालक
80.	Cone	शंकु
81.	Connection	सम्बंध, जोड़
82.	Constant (Adj.)	स्थिर, अचल, एकसमान
83.	Convection	संवहन
84.	Coulomb	कूलोम (विद्युत शक्ति की इकाई)
85.	Couple	बल युग्म
86.	Crane	क्रेन
87.	Crystalline	रवेदार
88.	Dehydrate	निर्जल करना
89.	Distil	आसहन करना
90.	Effervescence	बुदबुदाहट
91.	Element	तत्त्व, मूलतत्त्व
92.	Empirical Formula	मूलअनुपाती सूत्र
93.	Equivalent Weight	तुल्यांकी - भार
94.	Flame Test	ज्वाला - परीक्षण
95.	Flash Point	प्रज्वलन - ताप
96.	Flask	फ्लास्क
97.	Spring Balance	कमानी तुला
98.	Soluble	विलयशील
99.	Viscosity	गाढ़ापन
100.	Volumetric Analysis	आयतनी विश्लेषण

2.2 APPLIED MATHEMATICS - II

L T P
5 - -

RATIONALE

Applied mathematics forms the backbone of engineering students. Basic elements of Differential calculus and integral calculus and statistics have been included in this course. This will develop analytical abilities to apply in engineering field and will provide continuing educational base to the students.

DETAILED CONTENTS

1. **Algebra** (12 hrs)
 - 1.1 Determinants: Elementary properties of determinants up to 3rd order, consistency of equations, Cramer's rule.
 - 1.2 Matrix: Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables.

2. **Co-Ordinate Geometry** (20 hrs)
 - 2.1 Cartesian and Polar coordinates (two dimensional), conversion from cartesian to polar coordinates and vice-versa, distance between two points (cartesian co-ordinates), section formulae
 - 2.2 Area of triangle when its vertices are given, co-ordinates of centroid, in center of a triangle when the vertices are given, simple problems on locus.
 - 2.3 Equation of straight line in various standard forms (without proof), inter section of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula
 - 2.4 General equation of a circle and its characteristics. To find the equation of a circle, given:
 - * Centre and radius
 - * Three points lying on it
 - * Coordinates of end points of a diameter;

3. **Integral Calculus** (30 hrs)
 - 3.1 Integration as inverse operation of differentiation
 - 3.2 Simple integration by substitution, by parts and by partial fractions (for linear factors only)
 - 3.3 Applications of integration for :
 - (a) Simple problem on evaluation of area bounded by a curve and axes.
 - (b) Calculation of Volume of a solid formed by revolution of an area about axes. (Simple problems).
 - (c) To calculate average and root mean square value of a function

4. **Vector Algebra** (12 hrs)
 a) Definition notation and rectangular resolution of a vector.
 b) Addition and subtraction of vectors.
 c) Scalar and vector products of 2 vectors.
 d) Simple problems related to work, moment and angular velocity
5. **Differential Equations** (06 hrs)
 Solution of first order and first degree differential equation by variable separation method (simple problems)

RECOMMENDED BOOKS

1. *Elementary Engineering Mathematics* by BS Grewal, Khanna Publishers, New Delhi.
2. *Engineering Mathematics by Vol. I & II* by S Kohli, IPH, Jalandhar
3. *Applied Mathematics* by Dr. RD Sharma
4. *Applied Mathematics, Vol. I & II* by SS Sabharwal & Sunita Jain/ M.L. Moudgil & P.C. Chopra, Eagle Parkashan, Jalandhar
5. *Comprehensive Mathematics, Vol. I & II* by Laxmi Publications
6. *Engineering Mathematics* by Dass Gupta
7. *Engineering Mathematics* by C Dass Chawla, Asian Publishers, New Delhi
8. *Comprehensive Mathematics, Vol. I & II* by Laxmi Publications
9. *Engineering Mathematics, Vol I, II & III* by V Sundaram et.al, Vikas Publishing House (P) Ltd., New Delhi
10. *Engineering Mathematics* by N.Ch.S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi
11. *Engineering Mathematics, Vol I & II* by SS Sastry, Prentice Hall of India Pvt. Ltd.,
12. *Engineering Mathematics, Vol I & II* by AK Gupta, Macmillan India Ltd., New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	20
2	20	20
3	30	40
4	12	10
5	06	10
Total	80	100

2.3 APPLIED PHYSICS – II

L T P
3 - 2

RATIONALE

Applied physics includes the study of a large number of diverse topics related to things that go in the world around us. It aims to give an understanding of this world both by observation and prediction of the way in which objects behave. Concrete use of physical principles and analysis in various fields of engineering and technology

DETAILED CONTENTS

Section – A : Waves and Applications

1. **Waves and vibrations** (10 hrs)
 - 1.1 Wave motion with examples, generation of waves by vibrating particles
 - 1.2 Types of wave motion - transverse and longitudinal wave motion with examples, sound and light waves, velocity, frequency and wave length of a wave. Relationship between wave velocity, frequency and wave length.
 - 1.3 Simple harmonic motion: definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M.
 - 1.4 Vibration of cantilever and beam, determination of time period of a cantilever
 - 1.5 Free, forced and resonant vibrations with examples
2. **Applications of sound waves** (05 hrs)
 - 2.1 Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time
 - 2.2 Ultrasonics – production (magnetostriction and piezoelectric methods) and their engineering applications
3. **Light** (10 hrs)

Electromagnetic Waves, properties of Electromagnetic waves, Electromagnetic Spectrum interference of light, types of interference, young's double slit experimentm Coherent source of Light, Diffraction of light, Difference between diffraction and interference.

Section – B : Electrical Circuits and Electromagnetism

4. **Electrostatics** (08 hrs)
- 4.1 Coulombs law, unit charge
 - 4.2 Electric flux and Gauss's Law, Electric field intensity and electric potential
 - 4.3 Electric field of point charge, charged sphere (conducting and non-conducting), straight charged conductor, plane charged sheet
 - 4.4 Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors, charging and discharging of capacitor, their behaviour under AC and DC
 - 4.5 Dielectric and its effect on capacitors, dielectric constant and dielectric break down
5. **DC Circuits** (08 hrs)
- 5.1 Concept of electricity, various applications of electricity
 - 5.2 Current, voltage and resistance, potential difference, power, electrical energy and their units, advantages of electrical energy over other forms of energy
 - 5.3 Ohm's law
 - 5.4 Series and parallel combination of resistors, specific resistance, effect of temperature on resistance, co-efficient of resistance
 - 5.5 Kirchhoff's laws, wheatstone bridge principle and its applications
 - 5.6 Heating effect of current and concept of electric power
6. **Electromagnetism** (08 hrs)
- 6.1. Magnetic field and its units
 - 6.2. Biot-Savart Law, magnetic field around a current carrying straight conductor, circular loop and solenoid
 - 6.3. Force on a moving charge and current in a magnetic field, force between two current carrying parallel conductors
 - 6.4. Moving coil galvanometer, conversion of galvanometer into ammeter and voltmeter
 - 6.5. Permeability, dia, para and ferro-magnetic materials

Section – C : Advanced Physics

7. **Semiconductor physics** (05 hrs)
- 7.1 Energy bands, intrinsic and extrinsic semiconductors, p-n junction diode and its characteristics
 - 7.2 Diode as rectifier – half wave and full wave rectifier
8. **Modern Physics** (10 hrs)
- 8.1 Lasers: concept of energy levels, ionization and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, helium – neon and ruby lasers and applications
 - 8.2 Fibre optics: introduction, optical fiber materials, types, light propagation and applications
 - 8.3 Superconductivity: phenomenon of superconductivity, effect of magnetic field, critical field, type I and type II superconductors and their applications

LIST OF PRACTICALS (To perform minimum eight experiments)

1. To determine and verify the time period of cantilever by drawing graph between load (w) and depression (d)
2. To verify Ohm's law
3. Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions
4. To verify laws of resistances in series and in parallel
5. To convert a galvanometer into an ammeter of a given range
6. To convert a galvanometer into a voltmeter of a given range
7. To study the capacitance of a parallel plate capacitor
8. To study characteristics of a pn junction diode
9. To find the wavelength of a He-Ne laser
10. To compare capacitance using DeSauty bridge
11. To determine ionization potential of Mercury
12. To determine high resistance by substitution method
13. To plot sine wave, square wave on CRO and to determine wavelength and velocity of waves

RECOMMENDED BOOKS

1. *Test Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T*
2. *Test Book of Physics for Class XII (Part-I, Part-II) N.C.E.R.T*
3. *Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi*
4. *Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi*

5. *Fundamentals of Physics by Resnick, Halliday and Walker, Asian Book Pvt. Ltd., New Delhi*
6. *Berkeley Physics Course, Vol. I, II & III, Tata McGraw Hill, Delhi*
7. *The Feynman Lectures on Physics by Feynman, Leighton and Sands, Vol. I & II, Narosa Publishing House, Delhi*
8. *Fundamentals of Optics by Francis A. Jenkins & Harvey E White, McGraw Hill International Editions, Physics Series*
9. *A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi*
10. *Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publishers*
11. *Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi*
12. *Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar*

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	15
2	05	10
3	10	15
4	08	10
5	08	10
6	08	15
7	05	10
8	10	15
Total	64	100

2.4 BASIC ELECTRICAL ENGINEERING

L T P
4 - 2

RATIONALE

This course will enable the students to understand the basic concepts and principles of d.c and a.c fundamental, a.c circuits, batteries, electromagnetic induction etc. including constant voltage and current sources. A diploma holder may be involved in various jobs ranging from preventive maintenance of electrical installation to fault location etc. In addition, he may be working in testing laboratories where he uses measuring instruments. To carry out these and similar jobs effectively, knowledge of basic concepts, principles and their applications is very essential.

DETAILED CONTENTS

1. **Overview of DC Circuits** (08 hrs)
 - 1.1 Simple problems on series and parallel combination of resistors with their wattage consideration,
 - 1.2 Application of Kirchhoff's current law and Kirchhoff's voltage law to simple circuits. Conversion of circuits from Star to Delta and Delta to Star.
2. **DC Circuit Theorems** (06 hrs)

Thevenin's theorem, Norton's theorem, application of network theorem in solving d.c circuit problems.
3. **Constant Voltage and Constant Current Sources** (04 hrs)
 - a) Concept of constant voltage source, symbol and graphical representation characteristics of ideal and practical sources.
 - b) Concept of constant current sources, symbol, characteristics and graphical representation of ideal and practical current sources.
4. **Electro Magnetic Induction** (10 hrs)
 - a) Concept of magnetic field produced by flow of current, Magnetic circuit, concept of magneto-motive force (MMF), flux, reluctance, permeability, analogy between electric and magnetic circuit.
 - b) Faraday's law and rules of electro-magnetic induction, principles of self and mutual induction, self and mutually induced e.m.f, simple numerical problems.
 - c) Concept of current growth, decay and time constant in an inductive (RL) circuit.
 - d) Energy stored in an inductor, series and parallel combination of inductors.
5. **Batteries** (06 hrs)
 - 5.1 Basic idea about primary and secondary cells
 - 5.2 Construction, working and applications of Lead-Acid, Nickel-Cadmium and Silver-Oxide batteries
 - 5.3 Charging methods used for lead-acid battery (accumulator)
 - 5.4 Care and maintenance of lead-acid battery
 - 5.5 Series and parallel connections of batteries
 - 5.6 General idea of solar cells, solar panels and their applications

6. **AC Fundamentals** (10 hrs)
- 6.1 Concept of alternating voltage and current
 - 6.2 Difference between a.c and d.c
 - 6.3 Concept of cycle, frequency, time period, amplitude, instantaneous value, average value, r.m.s. value, maximum value, form factor and peak factor.
 - 6.4 Representation of sinusoidal quantities by phasor diagrams.
 - 6.5 Equation of sinusoidal wave form (with derivation)
 - 6.6 Effect of alternating voltage applied to a pure resistance, pure inductance and pure capacitance.
7. **AC Circuits** (20 hrs)
- 7.1 Inductive reactance and Capacitive reactance
 - 7.2 Alternating voltage applied to resistance and inductance in series.
 - 7.3 Alternating voltage applied to resistance and capacitance in series.
 - 7.4 Impedance triangle and phase angle
 - 7.5 Solutions and phasor diagrams for simple RLC circuits (series and parallel).
 - 7.6 Introduction to series and parallel resonance and its conditions
 - 7.7 Power in pure resistance, inductance and capacitance, power in combined RLC circuits. Power factor, active and reactive power and their significance, importance of power factor.
 - 7.8 j-notation and its application in solving a series and parallel a.c circuits
 - 7.9 Definition of conductance, susceptance and admittance

LIST OF PRACTICALS

1. Familiarization of measuring instruments viz voltmeter, ammeter, CRO, Wattmeter and multi-meter and other accessories
2. Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions.
3. To measure (very low) resistance of an ammeter and (very high) resistance of a voltmeter
4. To verify in d.c circuits:
 - a.. Thevenin's theorem,
 - b. Norton's theorem,
5. To observe change in resistance of a bulb in hot and cold conditions, using voltmeter and ammeter.
6. Verification of Kirchhoff's Current Law and Kirchhoff's Voltage Laws in a dc circuit
6. To find the ratio of inductance of a coil having air-core and iron-core respectively and to observe the effect of introduction of a magnetic core on coil inductance
8. To find the voltage current relationship in a single phase R-L and R-C Series circuits, draw their impedance triangles and determination of the power factor in each case .
9. To test a lead - acid storage battery and to charge it.
10. Measurement of power and power factor in a single phase R.L.C. circuit and to calculate active and reactive power.

INSTRUCTIONAL STRATEGIES

This being a prerequisite and foundation subject, the teacher should give emphasis on understanding of concepts and explanation of various terms used in the subject. Practical exercises will reinforce various concepts. Industrial/field exposure must be given by organizing visits(s)

RECOMMENDED BOOKS

1. *Electrical Technology, Fifth Edition by Edward Hughes, Longman Publishers*
2. *Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and Sons, New Delhi*
3. *Experiments in Basic Electrical Engineering by SK Bhattacharya, KM Rastogi; New Age International (P) Ltd.; Publishers New Delhi*
4. *Electrical Science by Choudhury S.; Narosa Publishing House Pvt Ltd, Daryaganj, New Delhi*
5. *Basic Electrical and Electronics Engineering by Kumar KM, Vikas Publishing House Pvt Ltd, Jang pura, New Delhi*
6. *Basic Electrical Science and Technology by Kumar KM, Vikas Publishing House Pvt Ltd, Jang pura, New Delhi*
7. *Electrical Technology by BL Theraja, S Chand and Co, New Delhi*
8. *Basic Electricity by BR Sharma; Satya Prakashan; New Delhi*
9. *Principles of Electrical Engineering by BR Gupta, S Chand and Co, New Delhi*
10. *Basic Electrical Engineering by PS Dhogal, Tata Mc Graw Hill, New Delhi*
11. *Basic Electrical Engineering by JB Gupta; SK Kataria and Sons, New Delhi*
12. *Experiments in Basic Electrical Engineering by GP Chhalhotra, Khanna Publishers, New Delhi*

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	08	10
2.	06	10
3.	04	08
4.	10	15
5.	06	12
6.	10	15
7.	20	30
Total	64	100

2.5 BASIC ELECTRONICS

L T P
4 - 2

RATIONALE

This subject gives the knowledge of fundamental concepts of basic electronics and aims at providing the students with basic understanding of conductors, semiconductors and insulators, extrinsic and intrinsic semi-conductors, p-n junction, need of rectifiers in electronics, understanding of filters in rectifiers, tunnel diodes, LEDs, varactor diodes, LCD; understanding the working of transistors in various configurations; understanding of FETs and MOSFET etc. for effective functioning in the field of electronic service industry. The teacher should give emphasis on understanding of concepts and explanation of various term used in the subject. Practical exercises will reinforce various concepts. Industrial/field exposure must be given by organizing visit.

DETAILED CONTENTS

1. **Semi conductor physics:** (12 hrs)
 - Review of basic atomic structure and energy levels, concept of insulators, conductors and semi conductors, atomic structure of Germanium (Ge) and Silicon (Si), covalent bonds
 - Concept of intrinsic and extrinsic semi conductor, P and N impurities, doping of impurity.
 - P and N type semiconductors and their conductivity. Effect of temperature on conductivity of intrinsic semi conductor.
 - Energy level diagram of conductors, insulators and semi conductors; minority and majority carriers.

2. **Semi conductor diode:** (12 hrs)
 - PN junction diode, mechanism of current flow in PN junction, Drift and diffusion current, depletion layer, forward and reverse biased PN junction, potential barrier, concept of junction capacitance in forward and reverse bias condition.
 - V-I characteristics, static and dynamic resistance and their calculation from diode characteristics.
 - Diode as half wave, full wave and bridge rectifier. PIV, rectification efficiencies and ripple factor calculations, shunt capacitor filter, series inductor filter, LC filter and RC filter.
 - Types of diodes, characteristics and applications of Zener diodes. Zener and avalanche breakdown.

3. **Introduction to Bipolar transistor:** (12 hrs)
 - Concept of bipolar transistor, structure, PNP and NPN transistor, their symbols and mechanism of current flow; Current relations in transistor; concept of leakage current;
 - CB, CE, CC configuration of the transistor; Input and output characteristics in CB and CE configurations; input and output dynamic resistance in CB and CE configurations; Current amplification factors. Comparison of CB CE and CC Configurations;
 - Transistors as an amplifier in CE Configurations; d.c load line and calculation of current gain, voltage gain using d.c load line.

4. **Transistor biasing Circuits:** (06 hrs)
Concept of transistor biasing and selection of operating point. Need for stabilization of operating point. Different types of biasing circuits.
5. **Single stage transistor amplifier:** (10 hrs)
Single stage transistor amplifier circuit, a.c load line and its use in calculation of currents and voltage gain of a single stage amplifier circuit. Explanation of phase reversal of output voltage with respect to input voltage. H- parameters and their significance.
6. **Field effect Transistors** (12 hrs)
Construction, operation and characteristics of FET and its application.
 - Construction, operation and characteristics of MOSFET in depletion and enhancement modes and its applications.
 - C MOS - advantages and applications
 - Comparison of JFET, MOSFET and BJT
 - FET amplifier circuit and its working principle. (No analysis).

LIST OF PRACTICALS

1. Familiarization with operation of following instruments.
Multi-meter, CRO, Signal generator, Regulated Power Supply by taking readings of relevant quantities with their help.
2. Plot V-I characteristics for PN junction diode
3. Plot V-I characteristics of Zenor diode
4. Observe the wave shape of following rectifier circuit
 - a. Half wave rectifier
 - b. Full wave rectifier
 - c. Bridge rectifier
5. Plot the wave shape of full wave rectifier with
 - a. Shunt capacitor filter
 - b. Series inductor filter
 - c. RC filter
6. Plot input and output characteristics and calculate parameters of transistors in CE configuration.
7. Plot input and output characteristics and calculate of parameters of transistors in CB configuration.
8. Plot V-I characteristics of FET amplifier.
9. Measure the Q-Point and note the variation of Q-Point.
 - a. By increasing the base resistance in fixed bias circuit.
 - b. By changing out of bias resistance in potential divider circuit.
10. Measure the Voltage Gain, input, output impedance in single state CE amplifier circuit.

INSTRUCTIONAL STRATEGIES

This being a prerequisite and foundation subject, the teacher should give emphasis on understanding of concepts and explanation of various terms used in the subject. Practical exercises will reinforce various concepts. Industrial/field exposure must be given by organizing visits(s).

RECOMMENDED BOOKS

1. *Basic Electronics and Linear Circuit* by NN Bhargava and Kulshreshta, Tata McGraw Hill, New Delhi.
2. *Principles of Electrical and Electronics Engineering* by VK Mehta; S Chand and Co., New Delhi
3. *Electronic Components and Materials* by SM Dhir, Tata McGraw Hill, New Delhi
4. *Electronics Devices and Circuits* by Millman and Halkias; McGraw Hill.
5. *Principles of Electronics* by Albert Paul Malvino; Tata McGraw Hill, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	20
2	12	20
3	12	20
4	6	8
5	10	12
6	12	20
Total	64	100

2.6 BASICS OF INFORMATION TECHNOLOGY

L T P
- - 4

RATIONALE

Information technology has great influence on all aspects of life. Almost all work places and living environment are being computerized. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools of MS office; using internet etc. form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

Note:

1. There will be no theory examination.
2. Explanation of Introductory part should be dovetailed with practical work so that following topics may be explained in the laboratory along with the practical exercises.

DETAILED CONTENTS

- (1) Information Technology – its concept and scope
- (2) Computers for information storage, information seeking, information processing and information transmission
- (3) Elements of computer system, computer hardware and software; data – numeric data, alpha numeric data; contents of a program, processing
- (4) Computer organization, block diagram of a computer, CPU, memory
- (5) Input devices; keyboard, Scanner, mouse etc; output devices; VDU and Printer, Plotter
- (6) Electrical requirements, inter-connections between units, connectors and cables
- (7) Secondary storage; magnetic disks – tracks and sectors, optical disk (CD, CD-RW and DVD Memory), primary and secondary memory: RAM, ROM, PROM etc., Capacity; device controllers, serial port, parallel port, system bus
- (8) Installation concept and precautions to be observed while installing the system and software
- (9) Introduction about Operating Systems such as Windows, Windows NT etc.
- (10) About the internet – server types, connectivity (TCP/IP, shell); applications of internet like: e-mail and browsing
- (11) Various Browsers like WWW (World wide web); hyperlinks; HTTP (Hyper Text Transfer Protocol); FTP (File Transfer Protocol)
- (12) Basics of Networking – LAN,WAN, Topologies

LIST OF PRACTICALS

1. Given a PC, name its various components and list their functions
2. Identification of various parts of a computer and peripherals
3. Practice in installing a computer system by giving connection and loading the system software and application software
4. Installation of DOS and simple exercises on TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP commands
5. Exercises on entering text and data (Typing Practice)
6. Installation of Windows 98 or 2000 or NT or XP.
 - (1) Features of Windows as an operating system
 - Start
 - Shutdown and restore
 - Creating and operating on the icons
 - Opening closing and sizing the windows
 - Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file
 - Creating and operating on a folder
 - Changing setting like, date, time color (back ground and fore ground)
 - Using short cuts
 - Using on line help
7. MS-Word
 - File Management:
Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, Giving password protection for a file
 - Page Set up:
Setting margins, tab setting, ruler, indenting
 - Editing a document:
Entering text, Cut, copy, paste using tool- bars
 - Formatting a document:
Using different fonts, changing font size and colour, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
 - Aligning of text in a document, justification of document ,Inserting bullets and numbering
 - Formatting paragraph, inserting page breaks and column breaks, line spacing
 - Use of headers, footers: Inserting footnote, end note, use of comments
 - Inserting date, time, special symbols, importing graphic images, drawing tools
 - Tables and Borders:
Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table
 - Print preview, zoom, page set up, printing options

- Using Find, Replace options
- Using Tools like:
Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelopes and labels
- Using shapes and drawing toolbar,
- Working with more than one window in MS Word,
- How to change the version of the document from one window OS to another
- Conversion between different text editors, software and MS word

8. MS-Excel

- Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets
- Menu commands:
Create, format charts, organise, manage data, solving problem by analyzing data, exchange with other applications. Programming with MS-Excel, getting information while working
- Work books:
Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations, working with arrays
- Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet
- Creating a chart:
Working with chart types, changing data in chart, formatting a chart, use chart to analyze data
- Using a list to organize data, sorting and filtering data in list
- Retrieve data with MS – query: Create a pivot table, customising a pivot table. Statistical analysis of data
- Exchange data with other application: embedding objects, linking to other applications, import, export document.

9. MS PowerPoint

- a) Introduction to Powerpoint
 - How to start Powerpoint
 - Working environment: concept of toolbars, slide layout, templates etc.
 - Opening a new/existing presentation
 - Different views for viewing slides in a presentation: normal, slide sorter etc.
- b) Addition, deletion and saving of slides
- c) Insertion of multimedia elements
 - Adding text boxes
 - Adding/importing pictures
 - Adding movies and sound
 - Adding tables and charts etc.
 - Adding organisational chart

- d) Formatting slides
 - Using slide master
 - Text formatting
 - Changing slide layout
 - Changing slide colour scheme
 - Changing background
 - Applying design template
 - e) How to view the slide show?
 - Viewing the presentation using slide navigator
 - Slide transition
 - Animation effects etc.
10. Internet and its Applications
- a) Log-in to internet
 - b) Navigation for information seeking on internet
 - c) Browsing and down loading of information from internet
 - d) Sending and receiving e-mail
 - Creating a message
 - Creating an address book
 - Attaching a file with e-mail message
 - Receiving a message
 - Deleting a message

RECOMMENDED BOOKS

1. *Fundamentals of Computer* by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. *Computers Today* by SK Basandara, Galgotia publication Pvt ltd. Daryaganj, New Delhi.
3. *MS-Office 2000 for Everyone* by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., New Delhi
4. *Internet for Every One* by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
5. *A First Course in Computer* by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
6. *Mastering Windows 95*, BPB Publication, New Delhi
7. *Computer Fundamentals* by PK Sinha; BPB Publication, New Delhi
8. *Fundamentals of Information Technology* by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
9. *On Your Marks - Net...Set...Go... Surviving in an e-world* by Anushka Wirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
10. *Learning MS Office XP* by Ramesh Bangia, Khanna Book Publishing Co. (P) Ltd., New Delhi.
11. *Fundamentals of Information Technology* by Vipin Arora, Eagle Parkashan, Jalandhar

2.7 WORKSHOP PRACTICE - II

L T P

- - 6

RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. workshop practices are included in the curriculum in order to provide hand on experience about use of different tools and basic manufacturing practices.

This course aims at developing general manual and machining skills in the students. Besides above, the development of dignity of labour, precision, safety at work place, team working and development of right attitude are the other objectives.

DETAILED CONTENTS (PRACTICALS)

The following shops are included in the syllabus:

1. Machine Shop
2. Electronic Shop
3. Sheet Metal Shop

Note:

The contents of shops prescribed under Workshop Practice-II are same as that of General Workshop Practice-I which is common for most of engineering diploma courses except Computer Engineering.

1. Machine Shop

1. Demonstration of functioning of lathe machine with the help of dis-assembled lathe, the names of different parts of machine. Lathe operations and safety measures and practice in the starting and stopping of the machine.
2. Practical demonstration by instructor : Holding the round bar, facing at one end, centring and rough turning.
3. Simple exercise on plain and step turning.
4. Demonstration of simple exercise on shaping machine
5. Demonstration of simple exercise on Milling machine
6. Drilling: simple exercise on drilling machine

2. Electronic Shop

- 2.1 Identification and familiarization with the following electronic instruments:
 - a) Multimeter digital (Three and half digit)
 - b) Single beam simple CRO, function of every knob on the front panel
 - c) Audio-oscillator sine and square wave output
 - d) Power supply fixed voltage and variable voltage, single output as well as dual output.Job I - Practice in the use of above mentioned equipment through a small experiment
- 2.2 Identification and familiarization with commonly used tools: statement of their uses. Identification and familiarisation with active

and passive components; colour code and types of resistor and potentiometers (including VDR, LDR, and thermistor). Identification of components including LED, LCD, UJT, FET, Coils, relays, switches (SPDT, DPDT, etc.) connectors, micro switches, reed relays, transformers (mains, audio and RF, etc) Linear and Digital ICs, Thyristors, etc.

NOTE: *Demonstration Boards for the above components should be made.*

Job II Cut, strip, join and insulate two length of wires/ cables (repeat with different types of cables/wires)

Job III Cut, strip, connect/solder/crimp different kinds of wires/ cables (including shielded cable) to different types of power/general purpose/Audio Video/Telephone plugs, sockets, jacks, terminals, binding posts, terminal strips, connectors. The tasks should include making complete recording/ playback/ antenna/ speaker leads for common electronic products such as Radio, TV, VCR, Cassette Recorder, Hi-Fi equipment, Head set, microphone

Job IV Cut, bend, tin component, Leads, inserts and solder components (resistor, capacitor, diodes, transistors, IFT type coils, DIL, ICs etc) on a PCB

Job V Wiring of a small circuit on a PCB/tag strip involving latching, sleeving and use of identifier tags

3. Sheet Metal Shop

Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material.

3.1 Introduction and demonstration of hand tools used in sheet metal shop.

3.2 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine, Turning Machine, Wiring Machine, Setting Down Machine, Forming Machine, Brake etc.

3.3 Introduction to various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanized corrugated sheet, aluminium sheets etc.

3.4 Study of various types of Nuts, Bolts, Rivets, Steel Screws etc.

Job I Shearing practice on a sheet using hand shears.

a) Single rivetted lap joint/Double rivetted lap joint

b) Single cover plate chain type/zig-zag type single rivetted Butt Joint

RECOMMENDED BOOKS

- 1) *Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay*
- 2) *Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.*
- 3) *Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi*
- 4) *Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi*

3.1 NETWORK FILTERS AND TRANSMISSION LINES

L T P
3 - 2

RATIONALE

The Study of networks, filters and transmission lines leads to understanding of line communication, audio and video communication, and microwave communication. Particularly the study of networks takes off from principles of a.c. theory and introduces the student to parameters and characteristics of various networks, including filters. Also the study of transmission lines becomes important as its analogy is used in study of transmission of plane electromagnetic waves in bounded media.

DETAILED CONTENTS

1. **Networks** (14 hrs)
 - a) Two port (four terminals) network: Basic concepts of the following terms:
 - Symmetrical and asymmetrical networks: Balanced and unbalanced network; T-network, Π network, Ladder network; Lattice network; L-network and Bridge T-network
 - b) Symmetrical Network:
 - Concept and significance of the terms characteristic impedance, propagation constant, attenuation constant, phase shift constant and insertion loss.
 - T-network
 - Π Network
 - c) Asymmetrical Network
 - Concept and significance of iterative impedance, image impedance, image transfer constant and insertion loss.
 - The half section (L-section); symmetrical T and Π sections into half sections
2. **Attenuators** (05 hrs)
 - a) Units of attenuation (Decibels and Napers): General characteristics of attenuators
 - b) Analysis and design of simple attenuator of following types; Symmetrical T and Π type, L type.
3. **Filters** (13 hrs)
 - a) Brief idea of the use of filter networks in different communication systems, concept of low pass, high pass, band pass and band stop filters. Basic ideas of Butterworth, Chebychev filters
 - b) Prototype Filter Section:
 - Impedance characteristics vs frequency characteristics of a low and high pass filter and their significance
 - Attenuation Vs frequency; Phase shift Vs frequency, characteristics impedance vs frequency of T and Π filters and their significance
 - Simple design problems of prototype low pass section.

- c) M-Derived Filter Sections
Limitation of prototype filters, need of m-derived filters
 - d) Crystal Filters
Crystal and its equivalent circuits, special properties of piezoelectric filters and their use
 - e) Active Filters
Basic concept of active filters and their comparison with passive filters.
4. **Transmission Lines** (16 hrs)
- a) Transmission Lines, their types and applications.
 - b) Distributed constants, T and Π representation of transmission line section.
 - c) Definition of characteristic impedance, propagation constant, attenuation constant and phase shift constant.
 - d) Concept of infinite line
 - e) Condition for minimum distortion and minimum attenuation of signal on-the-line and introduction to loading methods.
 - f) Concept of reflection and standing waves, definition of reflection coefficient, SWR & VSWR and their relation (no derivation).
 - g) Transmission line equation, expression for voltage, current and impedance at a point on the line.
 - h) Concept of transmission lines at high frequencies.
 - i) Introduction to stubs. (single, open and short stubs).

LIST OF PRACTICALS

1. To measure the characteristic impedance of symmetrical T and Π networks
2. To measure the image impedance of a given asymmetrical T and Π networks
3. For a prototype low pass filter:
 - a) Determine the characteristic impedance experimentally
 - b) Plot the attenuation characteristic
4. To design and measure the attenuation of a symmetrical T/ Π type attenuator
5. For a prototype high pass filter:
 - a) Determine the characteristic impedance experimentally
 - b) To plot the attenuation characteristic
6. a) To plot the Impedance characteristic of a prototype band-pass filter
b) To plot the attenuation characteristic of a prototype band pass filter
7. a) To plot the impedance characteristic of m- derived low pass filter
b) To plot the attenuation characteristics of m-derived high pass filter
8. To observe the information of standing waves on a transmission line and measurement of SWR and characteristic impedance of the line
9. Draw the attenuation characteristics of a crystal filter

INSTRUCTIONAL STRATEGY

Stress should be laid on problems in networks/ filter and transmission lines. Practical must be carried out after completion of topic to gain a good know how on the subject students should be given home assignments on various topics, stress on making own circuit models to calculate input/output impedance, characteristic impedance, losses etc. should be carried out by the students.

RECOMMENDED BOOKS

1. *Network Lines and Fields* by John D Ryder; Prentice Hall of India, New Delhi
2. *Network Filters and Transmission Lines* by AK Chakarvorty; Dhanpat Rai & Co. Publication, New Delhi
3. *Network Analysis* by Van Valkenbury; Prentice Hall of India, New Delhi
4. *Network Analysis* by Soni and Gupta; Dhanpat Rai & Co. Publication, New Delhi
5. *Network Theory and Filter Design* by Vasudev K. Aatre
6. *Network Filters and Transmission line* by Umesh Sinha
7. *Electrical & Electronics Measuring instrumentation*, A.K Sawhney, Dhanpat Rai & Co. Publication, New Delhi
8. *Network Analysis*, G.K. Mithal
9. *Network Filters and Transmission line* by Nardeep Goyal, Rajneesh Kumari, Tech. Max Publication, Pune.

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Networks	14	25
2	Attenuators	05	10
3	Filters	13	30
4	Transmission Lines	16	35
Total		48	100

3.2 ELECTRONIC COMPONENTS AND MATERIALS

L T P

4 - -

RATIONALE

Study of Electronic components and Materials is important from point of view of manufacturing, testing and maintenance of electronic devices and systems. Students should understand the procedure of identification, characteristics, specifications, merits, limitations, and applications of electronic components and materials. This subject will enable the students to understand various types of materials, their characteristics and components used in electronic systems.

DETAILED CONTENTS

1. **Materials** (32 hrs)
- 1.1 Classification of materials (04 hrs)
Conducting, semi-conducting and insulating materials through a brief reference to their atomic structure.
- 1.2 Conducting Materials (06 hrs)
Resistivity and factors affecting resistivity such as temperature, alloying and mechanical stressing. Classification of conducting materials into low resistivity and high resistivity materials.
- 1.3 Insulating Materials (12 hrs)
 - Electrical properties: Volume resistivity, surface resistance, dielectric loss, dielectric strength (breakdown voltage) and dielectric constant.
 - Thermal properties: Heat resistance, classification according to temperature endurance, thermal conductivity.
 - Important relevant (electrical, mechanical and thermal) characteristics and applications of the following materials.

Mica	Paper (dry and impregnated)
Asbestos	Rubber
Ceramic	Silicon rubber
Glass	PVC
Cotton	Polythene
Jute	Polyester
Teflon	Plastics
Acrylics	
Silicon grease	
Bakelite	Phosphor-Bronze alloy
Epoxy Glass	Beryllium-copper alloy
Varnish	Soldering Lead alloy
Lacquer	Copper
Enamel	Sliver, Gold
- 1.4 Magnetic Materials (06 hrs)
Different Magnetic materials; (Dia, Para, Ferro) and their properties. Ferro magnetism, Domains, permeability, Hysteresis loop. Soft and hard magnetic materials, their examples and typical applications.
- 1.5 Latest developments in Materials (04 hrs)
Idea about latest materials in the light of technological advancements like hybrid carbon etc

2. **Components** (32 hrs)
- 2.1 Capacitors (08 hrs)
- Concept of capacitance and capacitors, units of capacitance, types of capacitors, constructional details and testing specifications
 - Capacity of parallel plate capacitors, spherical capacitors, cylindrical capacitor.
 - Energy stored in a capacitor.
 - Concept of di-electric and its effects on capacitance, di-electric constant, break down voltage.
 - Series and parallel combination of capacitor. Simple numerical problems of capacitor.
 - Charging and discharging of capacitor with different resistances in circuit, concept of current growth and decay, time constant in R-C circuits, simple problems.
- 2.2 Resistors: (04 hrs)
Carbon film, metal film, carbon composition, wound and variable types (presets and potentiometers)
- 2.3 Transformer, inductors and RF coils: (04 hrs)
Methods of manufacture, testing, Need of shielding, application and trouble shooting
- 2.4 Surface Mounted Devices (SMDs): (03 hrs)
Constructional details and specifications.
- 2.5 Connectors, Relays, switches and cables: (05 hrs)
Different types of connectors, relays, switches and cables, their symbols, specifications, construction, types, applications and their testing.
- 2.6 Semi Conductors and Integrated Circuits (08 hrs)
- Basic characteristics of Semiconductor materials, testing of diodes, transistors, FETs and SCRs.
 - Various processes in IC manufacturing. Hybrid IC technology.
 - Superconductivity and piezoelectric ceramic transducer elements

INSTRUCTIONAL STRATEGY

The teacher may demonstrate the materials and components in the class during lecture session. To enhance the knowledge of students regarding different materials and components, they should be given exercises on identification of materials used in various electrical and electronic gadgets etc.

RECOMMENDED BOOKS

- Electronic components and Materials by Grover and Jamwal; Dhanpat Rai and Sons, New Delhi*
- Basic Electronics and Linear Circuits by NN Bhargava and Kulshreshtha; Tata McGraw Hill, New Delhi*
- Electronic components and Materials by SM Dhir, Tata McGraw Hill, New Delhi*
- Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi*
- Electronic Engineering Materials by ML Gupta, Dhanpat Rai and Sons; New Delhi.*

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Materials	32	50
2	Components	32	50
Total		64	100

3.3 COMPUTER PROGRAMMING AND APPLICATIONS (For Electronics Engineering)

L T P
2 - 4

RATIONALE

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

DETAILED CONTENTS

1. **Algorithm and Program Development** (4 hrs)
 - a) Steps in development of a program
 - b) Flow-charts, algorithm development
 - c) Introduction to various computer languages
 - d) Concept of interpreter, compiler, high level language(HLL), machine language (ML) and Assembly Language
2. **Program Structure (C Programming)** (24 hrs)
 - a) History of 'C', data types, input output statements, arithmetic and logical operations, data assignments, precedence and associativity
 - b) I/O statements
Assignment, Variables, arithmetic operation- their precedence, data types standard I/O function, formulated I/O
 - c) Control Statements
Logical and relational operators; if-else, while, do- while, for loops, breaks, switch statements
 - d) Functions:
Function declaration, parameter passing- by value, storage classes (Local, Global and Static variables), standard library functions
 - e) Arrays:
Single and multi dimensional arrays, character arrays
 - f) Pointers:
To various data types, pointers in parameters passing, pointers to function
 - g) Structures:
Definition of a structure, pointer to structure, union and array of structure
 - h) Strings:
String processing, functions and standard library function
 - i) Data files
File handling and manipulation, file reading and writing, Binary and ASCII files, file records using standard function type mouse

3. **Software Applications in Electronics Engineering** (4 hrs)
Computer application overview through various applications software related to Electronics Engineering branch viz: Orcad, p spice, 20 Sim, Keil, Circuit Maker, MATLAB, Electronic Workbench, EAGLE and CB Design Software, MicroSim SZ etc.

LIST OF PRACTICALS

1. Programming exercise on executing a C Programs.
2. Programming exercise on editing a C program.
3. Programming exercise on defining variables and assigning values to variables
4. Programming exercise on arithmetic and relation operators
5. Programming exercise on arithmetic expressions and their evaluation
6. Programming exercise on reading a character
7. Programming exercise on writing a character
8. Programming exercise on formatting input using print
9. Programming exercise on formatting output using scan
10. Programming exercise on simple IF statement
11. Programming exercise on IF... ELSE statement
12. Programming exercise on SWITCH statement
13. Programming exercise on GOTO statement
14. Programming exercise on DO-WHILE statement
15. Programming exercise on FOR statement
16. Programming exercise on one dimensional arrays
17. Programming exercise on two dimensional arrays
18. Demonstration of Application software to Electronics and communication Engineering branch such as: MATLAB, PSIM, MULTISIM, PSPICE in Electrical Engineering

INSTRUCTIONAL STRATEGY

This course is a highly practical and C. self- study oriented courses. The teachers are expected to explain the theoretical part and ensure that the students execute and debug different programs. The PC needed to have either Turbo C.

RECOMMENDED BOOKS

1. *Programming in C by Schaum series McGraw Hill*
2. *Programming in C by Kerning Lan and Richie; Prentice Hall of India, New Delhi*
3. *Programming in C by Balaguru Swamy, Tata McGraw Hill, New Delhi.*
4. *Let us C- Yashwant Kanetkar, BPB Publications, New Delhi*
5. *Vijay Mukhi Series for C and C++*
6. *Programming in C by R Subburaj, Vikas Publishhing House Pvt. Ltd., Jangpura, New Delhi*
7. *Programming in C by Kris A Jansa, Galgotia Publications Pvt. Ltd., Daryaganj, New Delhi*
8. *Programming in C by BP Mahapatra, Khanna Publishers, New Delhi*
9. *Elements of C by MH Lewin, Khanna Publishers, New Delhi*
10. *The Complete Reference to Visual Basic 6, by Noel Jerke, Tata McGraw Hill, New Delhi*
11. *Web site www.Beyondlogic.org*
12. *Pointers in C by Yashwant Kanetkar, BPB Publishers New Delhi*

13. *Programming in Applications* by Chandershekhar, Unique International Publications, Jalandhar
14. *The essentials of Computer Organizing and Architecture* by Linda Null and Julia Labur, Narosa Publishing House Pvt. Ltd., New Delhi

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1.	Algorithm and Program Development	4	15
2.	Program Structure (C Programming)	24	70
3.	Software Applications	4	15
Total		32	100

3.4 ELECTRONIC DEVICES AND CIRCUITS

L T P

5 - 2

RATIONALE

Having attained basic knowledge of electronic devices like diodes, transistors, and elementary circuits, in second semester, this course will enable the students to learn about the use of transistors in analog circuits like power amplifier, multistage amplifier, oscillators, wave shaping circuits and in multivibrators etc. It also gives information about timer, operational amplifier, voltage regulator, ICs and their applications for effective functioning in the field of electronic service industry.

DETAILED CONTENTS

- 1. Multistage Amplifiers** (10 hrs)
 - a) Need for multistage amplifier
 - b) Gain of multistage amplifier
 - c) Different types of multistage amplifier like RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth
- 2. Large Signal Amplifier** (10 hrs)
 - a) Difference between voltage and power amplifiers
 - b) Importance of impedance matching in amplifiers
 - c) Class A, Class B, Class AB, and Class C amplifiers, collector efficiency and Distortion in class A,B,C
 - d) Single ended power amplifiers, Graphical method of calculation (without derivation) of out put power; heat dissipation curve and importance of heat sinks. Push-pull amplifier, and complementary symmetry push-pull amplifier
- 3. Feedback in Amplifiers** (10 hrs)
 - a) Basic principles and types of feedback
 - b) Derivation of expression for gain of an amplifier employing feedback
 - c) Effect of feedback (negative) on gain, stability, distortion and bandwidth of an amplifier
 - d) RC coupled amplifier with emitter bypass capacitor
 - e) Emitter follower amplifier and its application
- 4. Sinusoidal Oscillators** (10 hrs)
 - a) Use of positive feedback
 - b) Barkhausen criterion for oscillations
 - c) Different oscillator circuits-tuned collector, Hartley, Colpitts, phase shift, Wien's bridge, and crystal oscillator. Their working principles (no mathematical derivation but only simple numerical problems)
- 5. Tuned Voltage Amplifiers** (06 hrs)
 - a) Series and parallel resonant circuits and bandwidth of resonant circuits
 - b) Single and double tuned voltage amplifiers and their frequency response characteristics

6. **Wave Shaping Circuits** (06 hrs)
 - a) General idea about different wave shapes
 - b) RC and RL integrating and differentiating circuits with their applications
 - c) Diode clipping and clamping circuits and simple numerical problems on these circuits
7. **Multivibrator Circuits** (10 hrs)
 - a) Working principle of transistor as switch
 - b) Concept of multi-vibrator: astable, monostable, and bistable and their applications
 - c) Block diagram of IC555 and its working and applications
 - d) IC555 as monostable and astable multi-vibrator
8. **Operational Amplifiers** (08 hrs)
 - a) Characteristics of an ideal operational amplifier and its block diagram
 - b) Definition of differential voltage gain, CMRR, PSRR, slew rate and input offset current
 - c) Operational amplifier as an inverter, scale changer, adder, subtractor, differentiator, and integrator
 - d) Concept of Schmitt trigger circuit and sample/hold circuit using operational amplifier and their application
9. **Regulated DC Power Supplies** (04 hrs)
 - a) Concept of DC power supply. Line and load regulation
 - b) Concept of fixed voltage, IC regulators (like 7805, 7905), and variable voltage regulator like (IC 723)
10. **Opto Electric Devices** (04 hrs)

Working principles and characteristics of photo resistors, photo diodes, photo transistors, opto couplers.
11. VCO (IC 565) and Phase Locked Control (IC 566) and their Applications (02hrs)

LIST OF PRACTICALS

- (1) Plot the frequency response of two stage RC coupled amplifier and calculate the bandwidth and compare it with single stage amplifier
- (2) To measure the gain of push-pull amplifier at 1KHz
- (3) To measure the voltage gain of emitter follower circuit and plot its frequency response
- (4) Plot the frequency response curve of Hartley and Colpitts Oscillator
- (5) Plot the frequency response curve of phase shift and Wein bridge Oscillator
- (6) To observe the output waveforms of series and shunt clipping circuits
- (7) To observe the output for clamping circuits
- (8) Use of IC 555 as monostable multivibrator and observe the output for different values of RC
- (9) Use of IC 555 as astable multivibrator and observe the output at different duty cycles

- (10) To use IC 741 (op-amplifier) as
 i) Inverter, ii) Adder, iii) Subtractor iv) Integrator
- (11) To realize positive and negative fixed voltage AC power supply using three terminal voltage regulator IC (7805, 7812, 7905)

INSTRUCTIONAL STRATEGY

This subject being of fundamental importance for diploma holders in electronics engineering and related fields, emphasis on conceptual understanding may be given by taking the help of charts, simulation packages etc. Sufficient exercises may given to the students in single stage and multi-stage amplifier circuits in addition to simple exercises in fabricating and testing of various simple d.c circuits. The students may be encouraged to perform some additional practical exercises preferably using breadboards apart from the list provided.

LIST OF RECOMMENDED BOOKS

- (1) *Basic Electronics and Linear Circuits by NN Bhargava, Tata McGraw Hills, New Delhi*
- (2) *Electronic Principles by Sahdev, Dhanpat Rai and Sons, New Delhi.*
- (3) *Electronics Principles by Malvino, Tata McGraw Hills, New Delhi*
- (4) *Electronic Devices and Circuits by Millman and Halkias, McGraw Hills, New Delhi*
- (5) *Electronics Devices and Circuits by Bhupinderjit Kaur, modern Publishers, Jalandhar*
- (6) *Basic Electronics by Grob, Tata McGraw Hills, New Delhi*
- (7) *Art of Electronics by Horowitz*
- (8) *Electronic Circuit Theory by Boylestead*
- (9) *Electronic Devices and Circuits by BL Theraja, S Chand and Co Ltd. New Delhi*
- (10) *Operational Amplifiers and Linear Integrated Circuits by Ramakant A. Gaykwad*
- (11) *Electronics Devices and Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi*
- (12) *Electronics Devices and Circuits-II by Naresh Gupta, Jyotesh Malhotra and Harish C. Saini, Eagle Prakashan, Jalandhar*

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Multistage Amplifiers	10	15
2	Large Signal Amplifier	10	15
3	Feedback in Amplifier	10	15
4	Sinusoidal Oscillators	10	10
5	Tuned Voltage Amplifiers	06	5
6	Wave Shaping Circuits	06	5
7	Multivibrator Circuits	10	10
8	Operational amplifiers	08	10
9	Regulated power supplies	04	5
10	Opto Electric Devices	04	5
11	VCO & PLC and their Application	02	5
Total		80	100

3.5 DIGITAL ELECTRONICS

L T P

5 - 2

RATIONALE

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

DETAILED CONTENTS

1. **Introduction** (05 hrs)
 - a) Distinction between analog and digital signal.
 - b) Applications and advantages of digital signals.
 - c) General principles of A/D and D/A conversion, brief idea of their application
2. **Number System** (06 hrs)
 - a) Binary and hexadecimal number system: conversion from decimal and hexadecimal to binary and vice-versa.
 - b) Binary addition, subtraction, multiplication and division including binary points. 1's and 2's complement method of addition/subtraction, sign magnitude method of representation, floating point representation
3. **Codes and Parity** (06 hrs)
 - a) Concept of code, weighted and non-weighted codes, examples of 8421, (BCD), excess-3 and Gray code.
 - b) Concept of parity, single and double parity and error detection and correction using Hamming code
 - c) Alpha numeric codes: ASCII and EBCDIC.
4. **Logic Gates and Families** (12 hrs)
 - a) Concept of negative and positive logic
 - b) Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates, EXNOR gates, NAND and NOR as universal gates.
 - (c) Logic family classification:
 - Definition of SSI, MSI, LSI, VLSI
 - TTL and CMOS families and their sub classification
 - Characteristics of TTL and CMOS digital gates. Delay, speed, noise margin, logic levels, power dissipation, fan-in, power supply requirement and comparison between TTL and CMOS families
5. **Logic Simplification** (08 hrs)
 - a) Postulates of Boolean algebra, De Morgan's Theorems. Various identities. Formulation of truth table and Boolean equation for simple problem. Implementation of Boolean (logic) equation with gates
 - b) Karnaugh map (upto 4 variables) and simple application in developing combinational logic circuits

6. **Arithmetic circuits** (08 hrs)
 - a) Half adder and Full adder circuit, design and implementation.
 - b) Half and Full subtractor circuit, design and implementation.
 - c) 4 bit adder/subtractor.
 - d) Adder and Subtractor IC (7484)
7. **Decoders, Multiplexeres and De Multiplexeres** (08 hrs)
 - a) Four bit decoder circuits for 7 segment display and decoder/driver ICs.
 - b) Basic functions, symbols and logic diagrams of 4 inputs, 8 inputs and 16inputs multiplexers.
 - c) Basic function, sym ols and logic digrams of 1:4, 1:8, 1:16 demultiplexers
8. **Latches and flip flops** (07 hrs)
 - a) Concept and types of latch with their working and applications
 - b) Operation using waveforms and truth tables of RS, JK, T, D, Master/Slave JK flip flops.
 - c) Difference between a latch and a flip flop
 - d) Flip flop ICs
9. **Counters** (11 hrs)
 - a) Introduction to Asynchronous and Synchronous counters
 - b) Binary counters
 - c) Divide by N ripple counters, Decade counter.
 - d) Pre settable and programmable counters
 - e) Up/down counter
 - f) Ring counter with timing diagram
 - g) Counter ICs

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

10. **Shift Register** (09 hrs)

Introduction and basic concepts including shift left and shift right.

 - a) Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out.
 - b) Bi-directional Storage Register
 - c) Universal shift register
 - d) Buffer register, Tristate Buffer register
 - e) IC 7495

LIST OF PRACTICALS

1. Verification and interpretation of truth tables for AND, OR , NOT NAND, NOR and Exclusive OR (EXOR) and Exclusive NOR(EXNOR) gates
2. Realisation of logic functions with the help of NAND or NOR gates
3. - Construction of half adder using gates and verification of its operation
- Construction of a full adder circuit using gates and verify its operation
4. 4 bit adder, 2's complement subtractor circuit using an 4 bit adder IC and an XOR IC and verify the operation of the circuit.
5. - Construction of Nand Gate Latch and verification of its operation
- Construction of NOR Gate Latch and verification of its operation

6. Verification of truth table for positive edge triggered, negative edge triggered, level triggered IC flip-flops (At least one IC each of D latch , D flip-flop, JK flip-flops).
7. Verification of truth table for encoder and decoder ICs, Mux and DeMux
8. Construction of a 4 bit SISO, SIPO, PISO, PIPO shift registers using JK/D flip flops and verification of their operation.
9. Construction and testing of a 4 bit ring counter .
10. Asynchronous Counter ICs
Verification of truth table for any one universal shift register IC
Use of IC 7490 or equivalent TTL (a) divide by 2 (b) divide by 10 Counter **OR**
Use of IC 7493 or equivalent TTL (a) divide by 2 (b) divide by 8 (c) divide by 16 counter

INSTRUCTIONAL STRATEGY

The digital systems in microprocessors have significant importance in the area of electronics. Adequate competency needs to be developed by giving sufficient practical knowledge in microprocessors (programming as well as interfacing,. Help may be taken in the form of charts, simulation packages to develop clear concepts of the subject. Programming exercises may be given to the students.

RECOMMENDED BOOKS

1. *Digital Electronics and Applications by Malvino Leach, Tata McGral Hill, New Delhi*
2. *Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi*
3. *Digital Fundamentals by Thomas Floyds, Universal Book Stall*
4. *Digital Electronics by RP Jain, Tata McGraw Hill, New Delhi*
5. *Digital Electronics by KS Jamwal, Dhanpat Rai and Co., New Delhi*
6. *Digital Electronics by Rajiv Sapra, Ishan Publication, Ambala*
7. *Digital Electronics by BR Gupta, Dhanpat Rai & Co., New Delhi*
8. *Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi*
9. *Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi*
10. *Fundamentals of Digital Electronics by Naresh Gupta, Jain Brothers, New Delhi*

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Introduction	5	5
2	Number System	6	5
3	Codes and Parity	6	5
4	Logic Gates and Families	12	15
5	Logic Simplification	8	10
6	Arithmetic Circuits	8	10
7	Decoders, Multiplexers and Demultiplexers	8	10
8	Latches and Flip flops	7	10
9	Counters	11	15
10	Shift Registers	9	15
Total		80	100

3.6 PRINCIPLES OF COMMUNICATION ENGINEERING

L T P

4 - 2

RATIONALE

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

DETAILED CONTENTS

1. **Introduction** (04 hrs)
 - a) Need for modulation frequency translation and demodulation in communication systems
 - b) Basic scheme of a modern communication system.
2. **Amplitude modulation** (06 hrs)
 - a) Derivation of expression for an amplitude modulated wave. Carrier and side band components. Modulation index. Spectrum and BW of AM Wave. Relative power distribution in carrier and side bands.
 - b) Elementary idea of DSB-SC, SSB-SC, ISB and VSB modulations, their comparison, and areas of applications
3. **Frequency modulation** (06 hrs)
 - a) Expression for frequency modulated wave and its frequency spectrum (without Proof and analysis of Bassel function) Modulation index, maximum frequency deviation and deviation ratio, BW and FM signals, Carson's rule.
 - b) Effect of noise an FM carrier. Noise triangle, Role of limiter, Need for pre-emphasis and de-emphasis, capture effect.
 - c) Comparison of FM and AM in communication systems
4. **Phase modulation** (06 hrs)

Derivation of expression for phase modulated wave, modulation index, comparison with frequency modulation.
5. **Principles of Modulators** (10 hrs)

Working principles and typical application as:

 - Sqaure Law Modulator
 - Switching Modulator
 - Collector modulator
 - Base Modulator
 - Balanced Modulator
 - Ring Modulator

6. **Principles of FM Modulators** (06 hrs)
Working principles and applications of reactance modulator, varactor diode modulator, VCO and Armstrong phase modulator. Stabilization of carrier for using AFC Block diagram approach).
7. **Demodulation of AM Waves** (06 hrs)
a) Principles of demodulation of AM wave using diode detector circuit; concept of Clipping and formula for RC time constant for minimum distortion (no derivation)
b) Principle of demodulation of AM Wave using synchronous detection.
8. **Demodulation of FM Waves** (06 hrs)
a) Basic principles of FM detection using slope detector
b) Principle of working of the following FM demodulators
- Foster-Seeley discriminator
- Ratio detector
- Quadrature detector
- Phase locked Loop (PLL) FM demodulators
9. **Pulse Modulation** (14 hrs)
a) Statement of sampling theorem and elementary idea of sampling frequency for pulse modulation
b) Basic concepts of time division multiplexing (TDM) and frequency division multiplexing (FDM)
c) Basic ideas about PAM, PPM, PWM
d) Pulse code Modulation (PCM) Basic scheme of PCM system. Quantisation, quantisation error, companding, block diagram of TDM-PCM communication system and function of each block. Advantages of PCM systems. Concepts of differential PCM (DPCM)
e) Delta Modulation (DM)
Basic principle of delta modulation system, advantages of delta modulation system over PCM system. Limitations of delta modulation, concept of adaptive delta modulation (ADM)

LIST OF PRACTICALS

1.
 - a) To observe an AM wave on CRO produced by a standard signal generator using internal and external modulation
 - b) To measure the modulation index of the wave obtained in above practical
2.
 - a) To obtain an AM wave from a square law modulator circuit and observe waveforms
 - b) To generate a DSB-SC signal and observe the pattern on CRO for different levels of modulating signal
3. To obtain an AM wave from reactance tube modulator/voltage controlled oscillator circuit and measure the frequency deviation for different modulating signals.

4. To obtain modulating signal from an AM detector circuit and observe the pattern for different RC time constants and obtain its optimum value for least distortion.
5. To obtain modulating signal from a FM detector (Foster Seely/Ratio detector /quadrature/c) circuit and plot the discriminator characteristics.
6. To observe the sampled signal and compare it with the analog input signal. Note the effect of varying the sampling pulse width and frequency on the sampled output.
7. To verify the sampling theorem
8. To observe and note the pulse modulated signals (PAM, PPM, PWM) and compare them with the corresponding analog input signal
9. To measure the Quantisation noise in a 3 bit/4 bit coded PCM signal
10. To feed an analog signal to a PCM modulator and compare the demodulated signal with the analog input. Also note the effect of low pass filter at the demodulated output.
11. To study the process of delta modulation/demodulation

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas. Visits to instrumentation and communications industries must be carried out, so as to make the students can understand where and how the various instruments are used in the industry.

RECOMMENDED BOOKS

- (1) *Electronics Communication by Kennedy, Tata McGraw Hill, New Delhi*
- (2) *Electronics Communication by KS Jamwal, Dhanpat Rai and Co, New Delhi*
- (3) *Radio Engineering by GK Mittal, Khanna Publishers, New Delhi*
- (4) *Principles of Communication Engineering by DR Arora, Ishan Publications, Ambala*
- (5) *Communication Engineering by A Kumar*
- (6) *Principles of Communication Engineering by Manoj Kumar, Satya Prakashan, New Delhi*
- (7) *Principles of Communication Engineering by Anokh Singh, S.Chand and Co., New Delhi*
- (8) *Principles of Communication Engineering by Roody , Coolin*

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Introduction	4	5
2	Amplitude modulation	6	10
3	Frequency modulation	6	10
4	Phase modulation	6	10
5	Principles of Modulators	10	15
6	Principles of FM Modulators	6	10
7	Demodulation of AM Waves	6	10
8	Demodulation of FM Waves	6	10
9	Pulse Modulation	14	20
Total		64	100

4.1 COMMUNICATION SYSTEMS-1

L T P
4 - 2

RATIONALE

This course provides the basics of electronic communication systems including transmitters, receivers, antennas and various modes of propagation of signals. In addition to components and systems of fiber optic communication, the students will learn the basics of satellite communication. This course will provide the students with perspectives of different communication systems.

DETAILED CONTENTS

1. **AM/FM Transmitters** (08 hrs)
 - a) Classification of transmitters on the basis of modulation, service, frequency and power
 - b) Block diagram of AM transmitters and working of each stage
 - c) Block diagram and working principles of reactance FET and armstrong FM transmitters

2. **AM/FM Radio Receivers** (14 hrs)
 - a) Principle and working with block diagram of super heterodyne of AM receiver. Function of each block and typical waveforms at input and output of each block
 - b) Performance characteristics of a radio receiver sensitivity, selectivity, fidelity S/N ratio, image rejection ratio and their measurement procedure. ISI standards on radio receivers (brief Idea)
 - c) Selection criteria for intermediate frequency (IF). Concepts of simple and delayed AGC
 - d) Block diagram of an FM receiver, function of each block and waveforms at input and output of different blocks. Need for limiting and de-emphasis in FM reception
 - e) Block diagram of communication receivers, differences with respect to broadcast receivers.

3. **Antennas:** (14 hrs)
 - a) Electromagnetic spectrum and its various ranges: VLF, LF, MF, HF, VHF, UHF, Microwave.
 - b) Physical concept of radiation of electromagnetic energy from a dipole. Concept of polarization of EM Waves.
 - c) Definition and physical concepts of the terms used with antennas like point source, gain directivity, aperture, effective area, radiation pattern, beam width and radiation resistance, loss resistance.
 - d) Types of antennas-brief description, characteristics and typical applications of half wave dipole, medium wave (mast) antenna, folded dipole, turns tile, loop antenna, yagi and ferrite rod antenna (used in transistor receivers)

- e) Brief description of broad-side and end fire arrays, their radiation pattern and applications (without analysis); brief idea about Rhombic antenna and dish antenna
4. **Propagation:** (10 hrs)
- a) Basic idea about different modes of wave propagation and typical areas of application. Ground wave propagation and its characteristics, summer field equation for field strength.
 - b) Space wave communication – line of sight propagation, standard atmosphere, concept of effective earth radius range of space wave propagation standard atmosphere
 - c) Duct propagation : sky wave propagation - ionosphere and its layers. Explanation of terms - virtual height, critical frequency, skip distance, maximum usable frequency, multiple hop propagation.
5. **Fibre optic communications:** (12 hrs)
- Advantages of Fibre optic communication
 - Block diagram of a fibre-optic communication link
 - Constructional features of optical fibre and fibre optic cables. Concepts of numerical aperture (NA). Modes of propagation in an optical fibre and characteristics of single mode and multi mode fibres. Fibre attenuation and dispersion
 - Light sources - Diode, Laser, LEDs and their characteristics
 - Light detectors and their characteristics
 - Basic idea of fibre connection techniques - splicing and lensing
6. **Satellite Communications:** (06 hrs)
- Basic idea, passive and active satellites, Meaning of the terms; orbit, apogee, perigee
 - Geo-stationary satellite and its need. Block diagram and explanation of a satellite communication link.

LIST OF PRACTICALS

1. To plot the sensitivity characteristics of a *radio* receiver and determination of the frequency for maximum sensitivity
2. To plot the selectivity characteristics of a radio receiver
3. To plot the fidelity characteristics of a radio receiver
4. To align AM broadcast radio receiver
5. To plot the radiation pattern of a directional and omni directional antenna
6. To plot the variation of field strength of a radiated wave, with distance from a transmitting antenna
7. Familiarisation and identification of fibre optic components such as fibre optic light source, detector, connector assembly etc

8. To assemble the fibre optic communication set up (using teaching module) and compare the transmitted signal with the output of the receiver
9. To measure the light attenuation of the optic fibres

NOTE: *Visits to appropriate sites of digital/data communication networks, satellite communication, telemetry centres (like remote sensing) and fibre optic communication installations should be made with a view to understand their working. A comprehensive report must be prepared by all students on these visits, especially indicating the dates and locations of their visits.*

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas. Visits to instrumentation and communications industries must be carried out, so as to make the students can understand where and how the various instruments are used in the industry.

RECOMMENDED BOOKS

1. Communication systems By George Kennedy Tata McGraw Hill, New Delhi.
2. Communication systems By A.K. Gautam, SK Katria and Sons, New Delhi.
3. Electronic communication systems By K.S. Jammal, Dhanpat Rai and Sons, New Delhi.
4. Electronic communication system by Roddy and Coolen Prentice Hall of India, New Delhi.
5. Handbook of Experiments in Electronics and Communication Engineering by S. Poornachandra Rao, and B Sasikala, Vikas Publishing House Pvt Ltd, Jangpura, New Delhi

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted%
1	AM/FM Transmitters	08	10
2	AM/FM Radio Receivers	14	25
3	Antennas	14	25
4	Propagation	10	15
5	Fibre Optic Communications	12	20
6	Satellite Communications	06	5
Total		64	100

4.2 ELECTRONIC INSTRUMENTS AND MEASUREMENT

L T P

4 - 2

RATIONALE

In the real world of work the technician is required to handle wide variety of instruments while testing, trouble shooting, calibration etc. the study of this subject will help students to gain the knowledge of working principles and operation of different instruments. During practical sessions, he will acquire the requisite skills.

DETAILED CONTENTS

1. **Basics of Measurements** (06 hrs)
 - 1.1 Measurement, method of measurement, types of instruments
 - 1.2 Specifications of instruments: Accuracy, precision, sensitivity, resolution, range, errors in measurement, sources of errors, limiting errors, loading effect, importance and applications of standards and calibration

2. **Voltage, Current and Resistance Measurement** (12 hrs)
 - 2.1 Principles of measurement of dc voltage, dc current, ac voltage, ac current, Principles of operation and construction of permanent magnet moving coil (PMMC) instruments
 - 2.2 Moving iron type instruments, measurement of d.c voltage and current, measurement of ac voltage and current, milli-volt measurement
 - 2.3 Block diagram of multimeter and measurement of voltage, current and resistance using multimeter
 - 2.4 Specifications of multimeter and their applications
 - 2.5 Limitations with regard to frequency and input impedance

3. **Cathode Ray Oscilloscope** (10 hrs)
 - Construction and working of Cathod Ray Tube(CRT)
 - Time base operation and need for blanking during flyback, synchronization
 - Block diagram description of a basic CRO and triggered sweep oscilloscope, front panel controls
 - Specifications of CRO and their explanation
 - Measurement of current, voltage, frequency, time period and phase using CRO
 - CRO probes, special features of dual beam, dual trace, delay sweep
 - Digital storage oscilloscope (DSO) : block diagram and working principle

4. **Signal Generators and Analytical Instruments** (08 hrs)
 - 4.1 Explanation of block diagram specifications of low frequency and RF generators, pulse generator, function generator
 - 4.2 Distortion factor meter; wave analyser and spectrum analyser

5. **Impedance Bridges and Q Meters** (14 hrs)
 - 5.1 Wheat stone bridge
 - 5.2 AC bridges: Maxwell's induction bridge, Hay's bridge, De-Sauty's bridge, Schering bridge and Anderson bridge
 - 5.3 Block diagram description of laboratory type RLC bridge, specifications of RLC bridge
 - 5.4 Block diagram and working principle of Q meter

6. **Digital Instruments** (14 hrs)
 - 6.1 Comparison of analog and digital instruments
 - 6.2 Working principle of ramp, dual slope and integration type digital voltmeter
 - 6.3 Block diagram and working of a digital multimeter
 - 6.4 Measurement of time interval, time period and frequency using universal counter/frequency counter
 - 6.5 Working principle of logic probe, logic pulser, logic analyzer, logic comparator, signature analyzer and logic analyzer

LIST OF PRACTICALS

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance
2. To observe the limitations of a multimeter for measuring high frequency voltage
3. Measurement of voltage, frequency, time period and phase using CRO
4. Measurement of rise time and fall time using CRO
5. Measurement of Q of a coil and its dependence on frequency
6. Measurement of voltage, frequency, time and phase using DSO
7. Measurement of resistance and inductance of coil using RLC Bridge
8. Measurement of distortion of RF signal generator using distortion factor meter
9. Use of logic pulser and logic probe
10. Measurement of time period, frequency, average period using universal counter/ frequency counter

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas. Visits to instrumentation and communications industries must be carried out, so as to make the students can understand where and how the various instruments are used in the industry.

RECOMMENDED BOOKS

1. *Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Sons, New Delhi*
2. *Electronics Instrumentation by Cooper, Prentice Hall of India, New Delhi*
3. *Electronics Test and Instrumentation by Rajiv Sapra, Ishan Publications, Ambala*
4. *Electronics Instrumentation by JB Gupta, Satya Prakashan, New Delhi*

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No.	Topic	Time Allotted (hrs)	Marks Allocation%
1.	Basics of Measurements	6	5
2.	Voltage, Current and Resistance Measurement	12	20
3.	Cathode Ray Oscilloscope	10	15
4.	Signal Generators and Analysis Instruments	8	10
5.	Impedance Bridges and Q Meters	14	25
6.	Digital Instruments	14	25
Total		64	100

4.3 POWER ELECTRONICS

L T P
4 - 2

RATIONALE

Diploma holders in Electronics and related fields are required to handle a wide variety of power electronic equipment used in process control Industry. This subject will provide the student basic understanding of the principles of their working. The practical training will further re-inforce the knowledge and skill of the students.

DETAILED CONTENTS

1. **Introduction to thyristors and other Power Electronics Devices**(18 hrs)
 - 1.1 Construction, Working principles of SCR, two transistor analogy of SCR, V-I characteristics of SCR.
 - 1.2 SCR specifications & ratings.
 - 1.3 Different methods of SCR triggering.
 - 1.4 Different commutation circuits for SCR.
 - 1.5 Series & parallel operation of SCR.
 - 1.6 Construction & working principle of DIAC, TRIAC & their V-I characteristics.
 - 1.7 Construction, working principle of UJT, V-I characteristics of UJT. UJT as relaxation oscillator.
 - 1.8 Brief introduction to Gate Turn off thyristor (GTO), Programmable uni-junction transistor (PUT), MOSFET.
 - 1.9 Basic idea about the selection of Heat sink for thyristors.
 - 1.10 Application such as light intensity control, speed control of universal motors, fan regulator, battery charger.
2. **Controlled Rectifiers** (08 hrs)
 - 2.1 Single phase half wave controlled rectifier with load (R, R-L)
 - 2.2 Single phase half controlled full wave rectifier (R, R-L)
 - 2.3 Fully controlled full wave bridge rectifier.
 - 2.4 Single phase full wave centre tap rectifier.
3. **Inverters, Choppers, Dual Converters and Cyclo converters.** (16 hrs)
 - 3.1 Principle of operation of basic inverter circuits, concepts of duty cycle, series & parallel. Inverters & their applications.
 - 3.2 Choppers: Introduction, types of choppers (Class A, Class B, Class C and Class D). Step up and step down choppers.
 - 3.3 Dual Converters and cyclo converters: Introduction, types & basic working principle of dual converters and cyclo converters & their applications.
4. **Thyristorised Control of Electric drives** (14 hrs)
 - 4.1 DC drive control
 - i) Half wave drives.
 - ii) Full wave drives
 - iii) Chopper drives (Speed control of DC motor using choppers)
 - 4.2 AC drive control
 - i) Phase control
 - ii) Constant V/F operation
 - iii) Cycloconverter/Inverter drives.

5. **Uninterrupted Power supplies** (08 hrs)
- 5.1 UPS, on-line, off line & its specifications
- 5.2 Concept of high voltage DC transmission
- 5.3 Idea of SMPS

LIST OF PRACTICALS

- 1) To plot VI characteristic of an SCR.
- 2) To plot VI characteristics of TRIAC.
- 3) To plot VI characteristics of UJT.
- 4) To plot VI characteristics of DIAC.
- 5) Study of UJT relaxation oscillator. And observe I/P and O/P wave forms
- 6) Observation of wave shape of voltage at relevant point of single-phase half wave controlled rectifier and effect of change of firing angle.
- 7) Observation of wave shapes of voltage at relevant point of single phase full wave controlled rectifier and effect of change of firing angle.
- 8) Observation of wave shapes and measurement of voltage at relevant points in TRIAC based AC phase control circuit for .
- 9) Varying lamp intensity and AC fan speed control.
- 10) Installation of UPS system and routine maintenance of batteries.
- 11) Speed control of motor using SCRs

INSTRUCTIONAL STRATEGY

Power Electronics being very important for industrial controls requires a thorough know how about industrial devices. Teacher should take to the class various SCRs and other semiconductor devices to demonstrate these to the students. The teacher may encourage students to perform practical simultaneously for better understanding of the subject and verification of theoretical concepts. So industrial visit in between the course is a must.

RECOMMENDED BOOKS

- 1) *Power Electronics by P.C. Sen Tata Mc Graw Hill. New Delhi*
- 2) *Power Electronics by P.S. Bhimbhra, Khanna Publishers, New Delhi*
- 3) *Power Electronics by M.S. Berde, Khanna Publishers, New Delhi.*
- 4) *Power Electronics by MH Rashid*
- 5) *Industrial Electronics and Control by SK Bhattacharya and S. Chatterji, New Age Publications. New Delhi*
- 6) *Power Electronics by S Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi*
- 7) *Power Electronics by Sugandhi and Sugandhi*
- 8) *Power Electronics – Principles and Applications by J Michael Jacob, Vikas Publishing House, New Delhi*

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted%
1	Introduction to thyristors and other power electronics devices	18	30
2	Controlled Rectifiers	08	15
3	Inverters, Choppers, Dual Converters and Cyclo converters.	16	25
4	Thyristorised Control of Electric drives	14	20
5	Uninterrupted Power supplies	08	10
Total		64	100

4.4 MICROPROCESSOR AND INTERFACING DEVICES

L T P
5 - 2

RATIONALE

The study of microprocessors in terms of architecture, software and interfacing techniques leads to the understanding of working of CPU in a microcomputer. The development in microprocessors of 32 bit architecture brings them face-to-face with mainframe finding employment in R&D, assembly, repair and maintenance of hardware of microprocessors and computers.

Microprocessors find application in process control industry. They also form a part of the electronic switching system between source and destination in long distance telecommunications. Thus the microprocessor is an area of specialization. Students of electronics and related engineering branches often use microprocessors to introduce programmable control in their projects, in industrial training.

DETAILED CONTENTS

1. **Evolution of Microprocessor** (4 hrs)
 - 1.1 Typical organization of a microcomputer system and functions of its various blocks
 - 1.2 Microprocessor, its evolution, function and impact on modern society
2. **Architecture of a Microprocessor (With reference to 8085 micro-processor)** (12 hrs)
 - 2.1 Concept of Bus, bus organization of 8085
 - 2.2 Functional block diagram of 8085 and function of each block
 - 2.3 Pin details of 8085 and related signals
 - 2.4 Demultiplexing of address/data bus of read/write control signals
 - 2.5 Steps to execute a stored programme
3. **Memories and I/O interfacing** (10 hrs)
 - 3.1 Memory organization, Concept of memory mapping, partitioning of total memory space. Address decoding, concept of I/O, mapped I/O and memory mapped I/O. Interfacing of memory mapped I/O devices.
 - 3.2 Concept of stack and its function
 - 3.3 Basic RAM Cell, N X M bit RAM, Expansion of word length and capacity, static and dynamic RAM, basic idea of ROM, PROM, EPROM and EEPROM.
4. **Programming (with respect to 8085 microprocessor)** (16 hrs)
 - 4.1 Brief idea of machine and assembly languages, Machines and Mnemonic codes.
 - 4.2 Instruction format and Addressing modes. Identification of instructions as to which addressing mode they belong.
 - 4.3 Concept of Instruction set. Explanation of the instructions of the following groups of instruction set
 - 4.4 Data transfer groups, Arithmetic Group, Logic Group, Stack, I/O and Machine Control Group.
 - 4.5 Programming exercises in assembly language. (Examples can be taken from the list of experiments).

- | | | |
|----|--|----------|
| 5. | Instruction Timing and Cycles | (08 hrs) |
| | 5.1 Instruction cycle, machine cycle and T-states | |
| | 5.2 Fetch and execute cycle. | |
| 6. | Interrupts | (4 hrs) |
| | 6.1 Concept of interrupt, | |
| | 6.2 Maskable and non-maskable | |
| | 6.3 Edge triggered and level triggered interrupts | |
| | 6.4 Software interrupt | |
| | 6.5 Restart interrupts and its use | |
| | 6.6 Various hardware interrupts of 8085 | |
| | 6.7 Servicing interrupts, extending interrupt system. | |
| 7. | Data transfer techniques | (4 hrs) |
| | 7.1 Concept of programmed I/O operations, sync data transfer (hand shaking), | |
| | 7.2 Interrupt driven data transfer | |
| | 7.3 DMA | |
| | 7.4 Serial output data | |
| | 7.5 Serial input data. | |
| 8. | Peripheral devices | (10 hrs) |
| | 8.1 8255 PPI and 8253 PIT | |
| | 8.2 8257 DMA controller | |
| | 8.3 8279 Programmable KB/Display Interface. | |
| | 8.4 8251 Communication Interface Adapter | |
| | 8.5 8155/8156 | |

LIST OF PRACTICALS

1. Familiarization of different keys of 8085 microprocessor kit and its memory map
2. Steps to enter, modify data/program and to execute a programme on 8085 kit
3. Writing and execution of ALP for addition and subtraction of two 8 bit numbers
4. Writing and execution of ALP for multiplication and division of two 8 bit numbers
5. Writing and execution of ALP for arranging 10 numbers in ascending/descending order
6. Writing and execution of ALP for 0 to 9 BCD counters (up/down counter according to choice stored in memory)
7. Interfacing exercise on 8255 like LED display control
8. Interfacing of LCD with microprocessor
9. Interfacing of Microprocessor with Stepper Motor

INSTRUCTIONAL STRATEGY

The digital systems in microprocessors have significant importance in the area of electronics. Adequate competency needs to be developed by giving sufficient practical knowledge in microprocessors (programming as well as interfacing). Help may be taken in the form of charts, simulation packages to develop clear concepts of the subject. Programming exercises other than the given in the list may be given to the students.

RECOMMENDED BOOKS

1. *Microprocessor Architecture, Programming and Applications with 8080/8085* by Ramesh S Gaonker, Willey Eastern Ltd. New Delhi
2. *Microprocessor and Microcontrollers* by Dr BP Singh, Galgotia Publications, New Delhi
3. *Microprocessor and Applications* by B Ram
4. *Microprocessor and Microcomputers* by Refiquzzaman, Prentice Hall of India Ltd., New Delhi.
5. *Introduction to Microprocessors* by Mathur, Tata McGraw Hill, New Delhi
6. *Digital Logic and Computer Design* by Mano, M Morris; Prentice Hall of India, New Delhi
7. *Digital Electronics and Applications* by Malvino Leach; Publishers McGraw Hills, New Delhi
8. *Digital Integrated Electronics* by Herbert Taub and Donalds Sachilling; Prentice Hall of India Ltd., New Delhi
9. *Digital Electronics* by Rajaraman; Prentice Hall of India Ltd., New Delhi
10. *Digital Electronics and Microprocessor* by Rajiv Sapra, Ishan Publication, Ambala

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted%
1	Evolution of Microprocessor	4	5
2	Architecture of a Microprocessor (With reference to 8085 microprocessor)	12	20
3	Memories and I/O interfacing	10	15
4	Programming (with respect to 8085 microprocessor)	16	25
5	Instruction Timing and Cycles	8	10
6	Interrupts	4	5
7	Data transfer techniques	4	5
8	Peripheral devices	6	15
Total		64	100

4.5 MINOR PROJECT WORK (Fabrication Techniques using CAD)

L T P
- - 6

RATIONALE

The purpose of this subject is to give practice to the students in elementary design and fabrication of the PCB. The topics of assembly, soldering, testing, and documentation have been included to give overall picture of the process of manufacturing of electronic devices.

Minor project work aims at developing interest of the students about the, what is inside the electronics devices, what is happening and how it happens. 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.

DETAILED CONTENTS

1. **Fabrication Techniques** **(6 hrs)**
 - 1.1 Printed Circuit Boards (PCBs):
 - a) PCB board materials, their characteristics and plating, corrosion and its prevention.
 - b) Photo processing, screen printing, etching, high speed drilling, buffing, surface treatment and protection from harsh environments, plated through holes, double sided and multilayer PCBs.
 - c) Standards of board sizes. Modular assemblies edge connectors, multi board racks, flexible boards.
 - d) Assembly of circuits on PCB, soldering techniques, role of tinning, flow and wave soldering, solderability, composition of solder. Edge connector. Elements of wire shaping.
 - 1.2 Production

Storage and supply of components for assembly, role of incoming inspection of components, assembly line reduction, tools and jigs for lead bending. Manual and automatic insertion techniques. Closed loop assembly of modules and/or complete instruments. Specific examples of small scale and large-scale production be given to illustrate above mentioned methods.
 - 1.3 Testing

Jigs and fixtures for operational testing of modules / sub-assemblies. Sequence testing for failure analysis. Environmental testing at elevated temperature and humidity. Vibration and mechanical endurance testing. Packing for transportation.
 - 1.4 Documentation

Statement of brief specifications, detailed specifications and limitations. Block diagram detailed diagrams. Testing and checking points. Warning relative to high voltage for handling during repair. Fault location guide. Simple solutions for fault removal

2. **Computer aided design(CAD)** (4 hrs)
Computer aided design of electric circuit using different software like eagle, orcad, circuit maker.
3. **Production Planning** (3 hrs)
4. **CNC drilling, photo plating** (3 hrs)

LIST OF PRACTICALS

1. Preparation of PCBs (handsome and screen printed) from schematic diagram such as voltage stabilizer, regulated supply, timer. (20 hrs)
2. Computer Aided Design and Single sided and double sided PCBs using different software like eagle, orcad, circuit maker. (28 hrs)

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

INSTRUCTIONAL STRATEGY

More emphasis may be laid on practical Project. Small industrial problems may be taken as assignments. Practical training regarding fabrication techniques using CAD may be carried out.

LIST OF RECOMMENDED BOOKS

1. *Printed circuit Board by Bosshart*
2. *Electronics Techniques by Rajesh Kumar, NITTTR, Chandigarh*
3. *Modular CAD for PCBs using EAGLE software by Rajesh Kumar, NITTTR, Chandigarh*
4. *Electronic Manufacturing Technology by KS Jamwal, Dhanpat Rai and Sons, New Delhi*

4.6 GENERIC SKILLS AND ENTREPRENEURSHIP DEVELOPMENT

L T P
3 - -

RATIONALE:- *Generic Skills and Entrepreneurship Development is one of the courses from “Human Science” subject area. General skills have emerged as an important component of employability skills, which enable an individual to become and remain employable over lifetime and to lead happy and prosperous life. Entrepreneurship Development aspect of Human Resource Development has become equally important in the era, where wage employment prospects has become meagre.*

Both the areas are supplementary to each other and skill related to them are required to be developed in diploma passports for enhancing their employability for wage as well as self employment

DETAILED CONTENTS

1. **Introduction to Generic Skills** (4 hrs)
 - 1.1 Importance of Generic Skill Development (GSD)
 - 1.2 Global and Local Scenario of GSD
 - 1.3 Life Long Learning (LLL) and associated importance of GSD.

2. **Managing Self** (8 hrs)
 - 2.1 Knowing Self for Self Development
 - Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc.
 - 2.2 Managing Self - Physical
 - Personal grooming, Health, Hygiene, Time Management
 - 2.3 Managing Self – Intellectual development
 - Information Search: Sources of information
 - Reading: Purpose of reading, different styles of reading, techniques of systematic reading.
 - Note Taking: Importance of note taking, techniques of note taking
 - Writing: Writing a rough draft, review and final draft.
 - 2.4 Managing Self – Psychological
 - Stress, Emotions, Anxiety-concepts and significance
 - Techniques to manage the above

3. **Managing in Team** (6 hrs)
 - 3.1 Team - definition, hierarchy, team dynamics
 - 3.2 Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background
 - 3.3 Communication in group - conversation and listening skills

4. **Task Management** (3 hrs)
 - 4.1 Task Initiation, Task Planning, Task execution, Task close out
 - 4.2 Exercises/case studies on task planning towards development of skills for task management

5. **Problem Solving** (5 hrs)
- 5.1 Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving
 - 5.2 Different approaches for problem solving.
 - 5.3 Steps followed in problem solving.
 - 5.4 Exercises/case studies on problem solving.
6. **Entrepreneurship** (22 hrs)
- 6.1 **Introduction**
 - Concept/Meaning and its need
 - Competencies/qualities of an entrepreneur
 - Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level.
 - 6.2 **Market Survey and Opportunity Identification (Business Planning)**
 - How to start a small scale industry
 - Procedures for registration of small-scale industry
 - List of items reserved for exclusive manufacture in small-scale industry
 - Assessment of demand and supply in potential areas of growth.
 - Understanding business opportunity
 - Considerations in product selection
 - Data collection for setting up small ventures.
 - 6.3 **Project Report Preparation**
 - Preliminary Project Report
 - Techno-Economic Feasibility Report
 - Exercises regarding “Project Report Writing” for small projects

INSTRUCTIONAL STRATEGY

This subject will require a blend of different teaching and learning methods beginning with lecture method. Some of the topics may be taught using question answer, assignment, case studies or seminar. In addition, expert lectures may be arranged from within the institution or from management organizations. Conceptual understanding of Entrepreneurship, inputs by teachers and outside experts will expose the students so as to facilitate in starting ones own business venture/enterprise. The teacher will discuss success stories and case studies with students, which in turn, will develop managerial qualities in the students. There may be guest lectures by successful diploma holding entrepreneurs and field visits also. The students may also be provided relevant text material and handouts.

RECOMMENDED BOOKS

1. *Generic skill Development Manual, MSBTE, Mumbai.*
2. *Lifelong learning, Policy Brief (www.oecd.org)*
3. *Lifelong learning in Global Knowledge Economy, Challenge for Developing countries – World Bank Publication*
4. *Towards knowledge society, UNESCO Paris Publication*
5. *Your Personal Pinnacle of Success by DD Sharma, Sultan Chand and Sons, New Delhi*

6. *Human Learning Ormrod*
7. *A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)*
8. *Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi*
9. *Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and Sons, New Delhi*
10. *Environmental and Pollution Awareness by Sharma BR, Satya Prakashan , New Delhi*
11. *Essentials of Environmental Studies by Joseph, Pearson Education (Singapore) Pte, Ltd. 482,FIE Patparganj, Delhi 110092*
12. *Thakur Kailash, Environmental Protection Law and policy in India: Deep and Deep Publications, New Delhi*
13. *Handbook of Small Scale Industry by PM Bhandari*

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted%
1	Introduction to Generic Skills	4	5
2	Managing self	8	15
3	Managing in Team	6	10
4	Task Management	3	10
5	Problem solving	5	10
6	Entrepreneurship	22	50
Total		48	100

ENTREPRENEURIAL AWARENESS CAMP

This is to be organized at a stretch for two to three days during or at the end of 4th semester. Lectures will be delivered on the following broad topics. There will be no examination for this subject.

1. Who is an entrepreneur?
2. Need for entrepreneurship, entrepreneurial career and wage employment
3. Scenario of development of small scale industries in India
4. Entrepreneurial history in India, Indian values and entrepreneurship
5. Assistance from District Industries Centres, Commercial Banks, State Financial Corporations, Small industries Service Institutes, Research and Development Laboratories and other financial and development corporations
6. Considerations for product selection
7. Opportunities for business, service and industrial ventures
8. Learning from Indian experiences in entrepreneurship (Interaction with successful entrepreneurs)
9. Legal aspects of small business
10. Managerial aspects of small business

5.1 CONSUMER ELECTRONICS

L T P
4 - 4

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:** (10 hrs)
 - 1.1 M Microphones: construction, working principles and applications of microphones, their types viz: a) Carbon b) moving coil, c) velocity, d) crystal, e) condenser, e) cordless etc.
 - 1.2 Loud Speaker: Direct radiating, horn loaded woofer, tweeter, mid range, multi-speaker system, baffles and enclosures.
 - 1.3 Sound recording on magnetic tape, its principles, block diagram, and tape transport mechanism.
 - 1.4 Digital sound recording on tape and disc.
 - 1.5 CD System.
 - Hi-Fi system, pre-amplifier, amplifier and equalizer system, stereo amplifier.
2. **Television:-**
 - 2.1 Monochrome TV:- (20 hrs)
 - 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.
 - Construction and working of camera tube: vidicon and plumbicon, Block diagram of TV camera and the transmitter chain.
 - Block diagram of a TV receiver: function of each block and waveform at the input and output of each block.
 - 2.2 Concept of of positive and negative modulation VSB Transmission Tuner.
3. **COLOUR TV** (18hrs)
 - 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, non spectral colour, visibility curve

3.2 Compatibility of colour TV system with monochrome system. Block diagram of colour TV camera.

3.3 Colour Schemes

- Introduction to PAL, NTSC, SECAM systems, Advantages and disadvantages, block diagram of video camera and its explanation
- Construction and working principles of trinitron and PIL types of colour picture tubes.
- Concept of convergence, purity of beam shifting
- Block diagram of PAL TV receiver, explanation and working

4. **Cable Television:-** (06 hrs)

4.1 Block diagram and principles of working of cable TV and DTH, Cable TV using internet

5. **Tape Recorder, VCD and DVD** (04 hrs)

5.1 Working Principle of Tape Recorder, VCD and DVD recording and playback

6. **Basic Block Diagram, Working Principle and Application of:** (6hrs)

6.1 Cordless Telephone

6.2 Photostat M/C.

6.3 Electronic Ignition System for Automobiles.

6.4 Automatic Washing Machine

6.5 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 Microwave oven
4. Trouble shooting of tape-recorder systems
5. To observe the wave forms and voltage B/W and colour T.V receiver.
6. Fault finding of colour T.V
7. Trouble shooting of C.D. Player
8. Demonstration of DVD Player.
9. Demonstration and study to VCD especially its transport mechanism.
10. Study of a TV cable network system
11. Demonstration of Photostat M/c
12. Demonstration of Automatic Washing Machine

INSTRUCTION STRATEGY

This subject gives the knowledge of the various day-to-day life electronic products. So, the teacher is required to show and demonstrate the gadgets and impart practical knowledge to the students. For that one should give home assignment and frequent industrial visit should be there. Visit to TV station and TV transmitter should be arranged to give a practical exposure to the students

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*
5. *Colour TV by A.Dhake*
6. *Service Manuals, BPB Publication, New Delhi*

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Audio System	10	20
2	Television	20	30
3	Colour TV	18	25
4	Cable Television	06	10
5	VCD and DVD	04	5
6	Basic Block Diagram, Working Principle and Application	06	10
Total		64	100

Elective I

5.2(a) 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** (12 hrs)
 - 1.1 Introduction to different type of mother boards.
 - 1.2 Single Board Based System, Block diagram of motherboard. Installation of Computer system.
2. **Buses and Ports** (12 hrs)
 - 2.1 Different type of Buses PCI, SCSI and Serial and Parallel ports (COM ports) Ports COM 1, LPT1, USB. RS 232 C, use of computer for instrumentation
3. **Memory** (10hrs)

Principle and Construction of Floppy Disk Drive and hard disk device (HDD). Floppy disk Controller & Hard disk controller. Pen Drives, common faults with hard disk drive and floppy disk drive, RAM Module.
4. **Keyboard and Mouse** (10hrs)

Block Diagram of keyboard Controller, keyboard switches, keyboard faults, mouse, common faults with mouse. Introduction to scanner, digitizer.
5. **CRT Display Devices:** (10hrs)

Block Diagram, Principle of operation of Computer Monitor, Difference between TV & Computer Monitor. Video display Adaptors (monochrome and Colour), introduction to solid state displays.
6. **Printers** (10hrs)

Printing Mechanism, Construction and working principles of Dot Matrix Printer, Inkjet Printer, Laser Printer, Printer Controller, Centronic 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. *IBM PC Colons by Govinda Rajalu, Tata McGraw Hill Publishers, New Delhi.*
3. *Text Book by Mark Minasi*
4. *Computers by P.Norton*

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Mother Board	12	18
2	Buses and Ports	12	18
3	Memory	10	16
4	Keyboard and Mouse	10	16
5	CRT Display Devices	10	16
6	Printers	10	16
Total		64	100

Elective
5.2 (b) 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** (8 hrs)
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. (10 hrs)
3. Implementation of discrete time systems, Recursive and non-recursive FIR systems. (8 hrs)
4. Z-transform and its application to LTI systems: Direct and inverse Z transform, properties of Z transform. (10 hrs)
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 (10 hrs)
7. Fast Fourier transforms: Efficient computation of DFT; FFT, DIT algorithm (10 hrs)
8. Introduction to IIR and FIR filters, Application of DSP Processors (8 hrs)

INSTRUCTIONAL STRATEGY

Reinforce lectures with hardware practical, programming practice and visits to the industry. Use resources/software for DSP theory lectures.

RECOMMENDED BOOKS

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

4. *Digital Signal Processing Using MATLAB* by Vinay K Ingle and John G Proakis; Vikas Publishing House, New Delhi
5. *Theory and Applications of Digital Signal Processing* by Rabiner and Gold; Prentice Hall of India
6. *DSP a Practical approach* by Ifeachor, Emmanuel Pearson Education

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Introduction	8	13
2	Discrete time Signals and Systems	10	15
3	Implementation of Discrete Time System	8	15
4	Z-Transform and its Application	10	15
5	Discrete Fourier Transform	10	15
6	Fast Fourier Transform	10	15
7.	Introduction to IR and FIR filters	8	12
Total		64	100

Elective
5.2 (c) MEDICAL ELECTRONICS

L T P
4 - -

RATIONALE

A large number of electronic equipment s 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** (08 hrs)
 - 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 and reproduction system
2. Overview of Medical Electronics Equipment, classification, application and specifications of diagnostic, therapeutic and clinical laboratory equipment, method of operation of these instruments (06 hrs)
3. **Electrodes** (08 hrs)

Bioelectric signals, Bio electrodes, Electrode, Electrode tissue interface, contact impedance, Types of Electrodes, Electrodes used for ECG , EEG
- 4 **Transducers** (08 hrs)

Typical signals from physiological parameters, pressure transducer, flow transducer, temperature transducer, pulse sensor, respiration sensor,
- 5 **Bio Medical Recorders** (12 hrs)

Block diagram description and application of following instruments

 - 5.1 ECG Machine
 - 5.2 EEG Machine
 - 5.3 EMG Machine
6. **Patient Monitoring Systems** (12 hrs)
 - 6.1 Heart rate measurement
 - 6.2 Pulse rate measurement
 - 6.3 Respiration rate measurement
 - a. Blood pressure measurement
 - b. Principle of defibrillator and pace mark
7. **Safety Aspects of Medical Instruments** (10 hrs)
 - Gross current shock
 - Micro current shock
 - Special design from safety consideration8.
 - Safety standards.

INSTRUCTIONAL STRATEGY

The teacher has to play a proactive role in arranging visits to hospitals and well equipped laboratories to reinforce theory. The apparatus and equipment available should be shown to students so they can understand where and how the various biomedical instruments are used. Various charts and models be used for demonstration. Exposure to Spectrometer and UV Spectrometer must be given to students in addition to arranging visits to biomedical industries.

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

Sr. No.	Topic	Time Allotted (Hrs)	Marks Allocation (%)
1	Anatomy and physiology	08	10
2	Overview of medical electronics equipment, classification, application etc.	06	8
3	Electrodes	08	18
4	Transducers	08	18
5	Bio Medical Recorders	12	18
6	Patient Monitoring Systems	12	18
7	Safety Aspects of Medical Instruments	10	10
Total		64	100

5.3 TROUBLE SHOOTING OF ELECTRONIC EQUIPMENT

L T P
2 - 4

RATIONALE

The course provides the students with necessary knowledge and competency to diagnose the faults for trouble shooting and for systematic repair and maintenance of electronic equipment and testing of components.

DETAILED CONTENTS

1. **Repair, Servicing and Maintenance Concepts** (06 hrs)
Introduction, Modern electronic equipment, Mean time between failures (MTBF), Mean time to repair (MTR), Maintenance policy, potential problems, preventive maintenance, corrective maintenance.
 - a) Study of basic procedure of service and maintenance
 - b) Circuit tracing techniques
 - c) Concepts of shielding, grounding and power supply considerations in instruments.
2. **Fundamental Trouble Shooting Procedures** (06 hrs)
 - i) Fault location
 - ii) Fault finding aids
 - Service manuals
 - Test and measuring instruments
 - Special tools
 - iii) Trouble Shooting Techniques
 - Functional Areas Approach
 - Split half method
 - Divergent, convergent and feedback path circuit analysis
 - Measurement techniques
3. **Passive Components** (02 hrs)
Test procedures for checking passive components, resistors, capacitors, inductors, chokes and transformers.
4. **Semiconductor Devices (From testing procedure point of view)**(04 hrs)
Diodes, rectifier and zener diodes. Bipolar transistors. Field effect transistors JFET and MOSFET. Thyristors, uni-junction transistors, Photo cells, Transistor equivalents. Data Books on transistors
5. **Trouble-Shooting Digital Systems** (06 hrs)
Typical faults in digital circuits. Use of Logic clip, logic probe, logic pulsar, IC tester
6. **Typical Examples of Troubleshooting** (06 hrs)
Here is a sample or grouping of electronic equipments whose repair can be carried out by students (any one group)

Group-I Communication	Group-II Consumer	Group-III Instrumentation	Group-IV Computer
Telephone Handsets.	Inverters	CRO	Monitor
Codeless Phones	Stabilizers	Power Supply	Printers (Laser)

Fax Machine	UPS	Function Generators	Printers (Inkjets)
Mobile Phone	Emergency lights	X-Ray Machines	CPU
T.V.(Monochrome & Colored)	VCR	ECG Machines	Scanner
Modem	VCD/DVD players	EEG	Keyboard
HUB/SWITCHES	Audio Systems		Mouse
EPABX	Fan regulator		Video Games

7. Log Book and History Sheet

(02 hrs)

Introduction, preparation and significance of log book and History sheet.

LIST OF PRACTICALS

- Selection, demonstration and correct use of tools and accessories: pliers, wire cutter, wire stripper, tweezers, soldering iron, desoldering tools, neon tester, screw driver
 - Accessories : insulating tapes, solders, solder tips, fluxes, desoldering wick, solder cleaning fluids, sleeves, tags, identifiers
- Develop skill in assembly of components, wiring, soldering and desoldering methods
- Selection and use of commonly used passive components and accessories
- Testing of active and passive components
- Testing of linear integrated circuits
- Use of digital tools for troubleshooting digital components

RECOMMENDED BOOKS

- Repair Manuals*
- Specifications of Equipment supplied by the manufacturer*
- Introduction to Biomedical Equipment Technology – Joseph J. Carr and John M Brown.*
- Principles of Biomedical Instrumentation and measurement – Richard Aston.*
- Introduction to Biomedical Equipment Technology by Carr and Brown, Regents and Prentice Hall of India, New Delhi*
- Principles of Bio-medical Instrumentation and Measurements by Leslie Cromwell, Fred J Weibell, Erich A Pfeiffer Prentice Hall of India, New Delhi*
- Handbook of Biomedical Engineering- R.S. Khandpur.*
- Modern Electronic Equipment Trouble shooting, Repair and Maintenance by RS Khandpur, Tata McGraw Hill Publishing House, New Delhi*
- Bio-medical Instrumentation by M Arumugam, Anuradha agencies Publishers, Vidayakaruppur, Kumbakonam RMS*

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Repair, Servicing and Maintenance Concepts	06	20
2	Fundamental Trouble Shooting Procedures	06	20
3	Passive Components	02	05
4	Semiconductor Devices (From testing procedure point of view)	04	10
5	Trouble-Shooting Digital Systems	06	20
6	Typical Examples of Troubleshooting	06	15
7.	Log Book and History Sheet	02	05
Total		32	100

5.4 COMMUNICATION SYSTEMS – II

L T P
4 - 3

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:** (04 hrs)
Basic block diagram of digital and data communication systems. Their comparison with analog communication systems.
2. **Coding** (08 hrs)
 - 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. Characteristics/working of data transmission circuits; bandwidth requirements, data transmission speeds, noise, cross talk, echo suppressors, distortion, equalizers (06 hrs)
5. **UART, USART:**
Their need and function in communication systems (06 hrs)
6. **Modems:** (08hrs)
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, Modem interfacing (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:** (08 hrs)
 - 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.** (06 hrs)
Concept of cells and frequency reuse. Special features of cellular mobile telephone. Block diagram of Mobile phone and its working.
10. **Facsimile (FAX)** (04 hrs)
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 and FSK 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

NOTE:

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

INSTRUCTIONAL STRATEGY

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

Recommended Books:-

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

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Introduction	04	5
2	Coding	08	10
3	Digital Modulation Techniques:	08	15
4	Characteristics/working of data transmission circuits;	06	10
5	UART, USART:	06	10
6	Modems	08	10
7	Telemetry	06	10
8	Electronic Exchange	08	15
9	Operation of Cellular Mobile Telephone System.	06	10
10	Facsimile (FAX)	04	5
Total		64	100

5.5 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** (14 hrs)
Architecture of 8051/8031 Microcontroller
 - 1.1 Pin details
 - 1.2 I/O Port structure
 - 1.3 Memory Organization
 - 1.4 Special Function Registers (SFRs)
 - 1.5 External Memory
2. **Instruction Set; Addressing Modes, Instruction types** (14 hrs)
 - 2.1 Timer operation
 - 2.2 Serial Port operation
 - 2.3 Interrupts
3. **Assembly/C programming for Micro controller** (14 hrs)
 - 3.1 Assembler directives
 - 3.2 Assembler operation
 - 3.3 Compiler operations
 - 3.4 De bugger
 - 3.5 Simulator
4. **Design and Interface** (12 hrs)
Examples like: keypad interface, 7- segment interface, LCD, stepper motor. A/D, D/A, RTC interface.
5. Introduction of PIC Micro controllers (04 hrs)
6. Application of Micro controllers in Communication System (06 hrs)

LIST OF PRACTICALS

1. Familiarization with Micro-controller Kit
2. Assembly Language Programming (PC Based)
3. C Language Programming- (PC Based)
4. Write Program for LCD interface.
5. Write Program for A/D converter, result on LCD.
6. Write Program for D/A converter, result on LCD.
7. Write a Program for serial data transmission from Kit to PC.
8. Application of micro controllers in GSM.
9. Program to Interface Sensors.

INSTRUCTIONAL STRATEGY

More emphasis while teaching this subject should be given on practical aspects along with the theory input. Lots of programming exercises may be given to the students. Mini-projects based on microprocessor and micro-controller operations may be identified and given to students as assignments.

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 FOR FACILITATING THE PAPER SETTER

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Micro controller series (MCS) – 51 Overview	14	20
2	Instruction Set; Addressing Modes, Instruction types	14	20
3	Assembly language programming/C	14	25
4	Design and Interface	12	20
5	Introduction of PIC micro controllers	4	5
6	Application of Micro controllers in Communication System	6	10
Total		64	100

5.6 MICROWAVE AND RADAR ENGINEERING

L T P
3 - 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.

DETAILED CONTENTS

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** (10hrs)
Basic concepts of thermionic emission and vacuum tubes, Effects of inter-electrode capacitance, 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** (6hrs)
Rectangular and circular wave guides and their applications. Mode of wave guide; Propagation constant of a rectangular wave guide, cut off wavelength, guide wavelength and their relationship with free space wavelength (no mathematical derivation). 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 to wave guide adapter
5. **Microwave antennas** (4 hrs)
Structure characteristics and typical applications of Horn and Dish antennas
6. **Microwave Communication systems :** (8 hrs)
 - 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** (8 hrs)
- 7.1 Introduction to radar, its various applications, radar range equation (no derivation) 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. Introduction to VSAT transponders multiple access techniques, VSAT and its features. (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.

NOTE:

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

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

1. *Microwave 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 FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Introduction to Microwaves	02	5
2	Microwave Devices	10	20
3	Wave guides	06	10
4	Microwave Components	08	15
5	Microwave antennas	04	10
6	Microwave Communication systems	08	15
7	Radar Systems	08	15
8	Introduction to VSAT	02	10
Total			100

6.1 BASICS OF MANAGEMENT

L T P
3 - -

RATIONALE

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

DETAILED CONTENTS

1. **Introduction:** (8 Hrs)
Definition and concept of Management, functions of management viz. planning, organizing, staffing, coordinating, controlling; Various areas of management - Human Resource Management (HRM), Financial Management, Marketing Management, Material Management etc.
2. **Structure of Industrial Organization** (4 Hrs)
Concept and structure of an organization, hierarchical management structure (top, middle and lower level management) and functional management structure.
3. **Leadership** (4 Hrs)
Concept, importance, types and qualities of a good leader
4. **Motivation** (4 Hrs)
Concept and importance of motivation - drives and incentives, intrinsic and extrinsic motivation, brief about theories of motivation.
5. **Customer Relationship Management (CRM)** (6 Hrs)
Need, various types of customers, customer satisfaction, life- long customer, Customer Satisfaction Index (CSI) and its significance in playing effective role of engineers in changing scenario.
6. **Legal Aspects of Business** (12 Hrs)
 - a) Elementary knowledge of Income Tax, Sales Tax, Excise Rules, Provident Fund
 - b) Elementary knowledge of Factory Act, 1948 and Payment of Wages Act 1936, Workmen Compensation Act, Industrial Dispute act 1947, Employees State Insurance Act 1978.
 - c) Labour Welfare schemes including wage payment-types, system of wage payment and incentives.
 - d) Intellectual Property Rights (IPR): Concepts, definition, infringements and remedies related to patents, copyrights, trademarks, and designs. Introduction to registering procedure, patent rules.
 - e) Accident and Safety: Classification, precaution and treatment after accident, safety practices promotion, personal protection equipment (PPEs) for safety at work places.

7. Introduction to Total Quality Management (TQM) and steps to achieve this. (2 hrs)
8. Environmental Considerations (8 Hrs)
 - a) Concept of ecology and environment
 - b) Factors contributing to Air, Water, Noise Pollution
 - c) Pollution Control Board
 - d) Disaster Management-basic idea

INSTRUCTIONAL STRATEGY

It is observed that the diploma holders generally take up middle level managerial positions, 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 Shyamal Bannerjee: 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 Pvt Limited , 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, Maruti Udyog 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.	8	15
2.	4	10
3.	4	10
4.	4	12
5.	6	10
6.	12	15
7.	2	08
8.	8	20
Total	48	100

6.2 Elective

6.2(a) OPTICAL FIBER COMMUNICATION

L T P
4 - 0

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:** (12hrs)
 - 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:-** (08hrs)

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** (10hrs)

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, principle of operation, different injection laser diodes, 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** (10hrs)

Types of optical amplifiers, semiconductor & fiber optical amplifiers Functional types, principal of operation of SOA, types of SOA. FPA, TWA SOA applications, advantages Drawbacks, EDFAS, Roman amplifiers.

7. **Optical Fiber System** (8hrs)

Optical transmitter circuit, optical receiver circuit, optical power budgeting, multiplexing methods used. Modulation methods used.

INSTRUCTIONAL STRATEGY

This subject gives the complete knowledge of optical fibre communication techniques. The teacher should make the students aware about the historical development, optical sources and optical fibre system in addition to applications of optical fibre in . Since this subject deals with theory and practical. The theory should be re-enforced by visit to sites and industries like HFCL having optical fiber installations in addition to practical work in the laboratory.

RECOMMENDED BOOKS

1. *Optical fiber Communication by John M Senior, Prentice Hall of India, New Delhi*
2. *Optical fiber Communication by J. Gower , Prentice Hall of India, New Delhi*
3. *Optical fiber Communication by ‘ Gerd Keiser, McGraw Hill International Editions*
4. *Optical Communications – Components and Systems by JH Franz and VK Jain, Narosa Publishing House, New Delhi*
5. *Optical fiber Communication Systems by GP Agrawal, John Wiley & Sons, New Delhi*

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Introduction	12	20
2	Optical Fibers and Cables	8	15
3	Losses in Optical Fiber Cable:	8	15
4	Optical Sources	10	15
5	Optical Detectors	8	10
6	Optical Amplifiers	10	15
7	Optical Fiber System	8	10
Total		64	100

ELECTIVE 6.2

6.2 (b) ADVANCED MICROPROCESSORS

L T P
4 - 0

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. Micro controller 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** (10hrs)
 - 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** (14hrs)
 - 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. **Micro Controller** (10hrs)

Introduction of Micro Controllers.

 - 5.1 Main features and architecture of 8051/8951
 - 5.2 Application of Micro controllers such as washing machines, photocopier, cars etc

6. **Application of Microprocessors** (10hrs)
 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.
7. **Introduction to 32 bit Microprocessors** (06hrs)
 Main features of 80386, 80486, Pentium microprocessor.

INSTRUCTIONAL STRATEGY

The subject is of high importance and requires thorough knowledge of theoretical aspects of different microprocessors. The regular teaching should be supplemented by learning resources available and practical applications of microprocessors. The survey of latest available microprocessors should be made to make students abreast with the developments. Programming exercises other than the given in the list may be given to the students.

RECOMMENDED BOOKS

1. *Microprocessor and Application by D.V. Hall.*
2. *8051 Micro Controller.*
3. *Microprocessor 8086/88 by B.B. Brey*
4. *Microprocessors & Micro controllers by Dr. B.P. Singh*
5. *Microprocessor by Rajiv Sapra, Ishan Publications, Ambala*
6. *Microprocessor by Naresh Grover*
7. *Microprocessors and Microcomputers and their Applications by AK Mukhopadhyay*
8. *Microprocessors and Applications by Uffenback*
9. *Introduction to Microprocessor by Adithya Mathur, Tata McGraw Hill Publishing Co, New Delhi*
10. *Microprocessor Architecture, Programming and Applications with 8085 by RS Gaonkar, Wiley Eastern Ltd, New Delhi*
11. *Microprocessor and Applications by B Ram*
12. *Microprocessor by SK Goel*
13. *8051 by Mcakenzie, Prentice Hall of India, New Delhi*

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	The 8086 Microprocessor	08	10
2	System Design using 8086	10	15
3	Programming of 8086	14	25
4	8086 Interrupt System	06	10
5	Micro Controller	10	15
6	Application of Microprocessors	10	15
7.	Introduction to 32 bit Microprocessors	06	10
Total		64	100

6.2(C) 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 works on IV).The size of the overall circuit reduced due to embedding of thousand 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:** (12 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:** (14 hrs)
VHDL Models and simulation of sequential circuits, Shift registers, Counters etc.
- 5. Introduction to CPLDs and FPGAs:** (12 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

INSTRUCTIONAL STRATEGY

This subject is very important for designing Digital Systems. For this, the students need to have strong base understanding of fundamental concepts of digital electronics. The teacher is required to lay more emphasis on programming practice in VHDL.

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (hrs)	Marks Allocation %
1	Overview of VLSI	12	20
2	VHDL Statements	12	15
3	Combinational Circuit Design	14	25
4	Sequential Circuit Design	14	25
5	Introduction to CPCLDs and FPGAs	12	15
Total		64	100

6.3 WIRELESS AND MOBILE COMMUNICATION

L T P
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RATIONALE

The wireless/mobile communication technology though complex but is spreading at a very fast rate. People use more of mobile phones in comparison to land line phones. It is expected that with in very short period almost every body 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** (12 hrs)
 - 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** (12 hrs)
 - 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** (16 hrs)
 - 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** (24 hrs)
- 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 RDFI.

LIST OF PRACTICALS

1. Study the features of cellular mobile
2. Opening of Mobile Phone
3. Putting a SIM inside mobile phone
4. Practice of paging on two mobile phones
5. Signal strength measurement of various points from a transmitting antenna/cordless phone
6. Measurement of range for a cordless phone
7. Visit of a Mobile Switching Centre(MSC) in the nearest M.S. facility provider
8. Demonstration of Base Trans Receiver(BTS) with nearby cellular tower
9. Observing call processing of GSM trainer Kit.
10. Observing call processing of CDMA trainer Kit.
11. Signal wave shapes on a CRO for AM, FM, MSK, PSK etc. modulated wave shapes
12. Repair of a VSNL (GSM) and a Reliance (CDMA) mobile phones
13. Measurement of cell boundary (time consuming project)

<i>Demonstration Only</i>

INSTRUCTIONAL STRATEGY

Wireless and Mobile Communication is heaving significant impact in Electronics Market. For the proper awareness of this subject it is must to provide the students the detail functioning of wireless/mobile system/equipment. Ffor this visits must be arranged to BTS/MSC (Mobile Switching Centre) providers. The theory classes need to be application based in addition to industrial visits in the BSNL, Vodafone, Airtel, SPICE , TATA indicom etc

RECOMMENDED BOOKS

1. *Wireless Communications (Principles and Practice), by Theodore S.Rappaport.*
2. *Introduction to Wireless and Mobile Systems, by Dharma Prakash Agarwal, Qing-An zeng.*
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 FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Wireless Communication	12	22
2	Cellular Concept	12	23
3	Multiple Access Techniques for Wireless Communication	16	25
4	Mobile Communication Systems	24	30
Total		64	100

6.4 INSTRUMENTATION AND PROGRAMMABLE LOGIC CONTROLLERS

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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** (4 hrs)
 - a) Distinction between active and passive transducers with examples. Basic requirements of a transducer
 - b) Principle of operation of the following transducers and their applications in measuring the physical quantities listed against each one of them.

Transducer	Physical quantities
c) Variable Resistance Type	(08 hrs)
- Potentiometric Resistance device	Displacement and force
- Strain gauge	Torque and displacement
- Thermistor	Temperature
- Resistance hygrometer	Humidity
d) Variable capacitance type	(06 hrs)
- Variable capacitance	Displacement and pressure
- Pressure gauge	
- Dielectric gauge	Liquid Level and thickness
e) Variable inductance type	(06 hrs)
- LVDT	Pressure force, displacement and position
- Burdon pressure gauge	Pressure force, displacement pressure, force, displacement
- Strain gauge	
f) Other Types	(08 hrs)
- 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 How 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** (10 hrs)
What is PLC, limitations of relays. Advantages of PLCs over electromagnetic relays, Different programming languages, PLC manufacturer etc.
6. **Working of PLC** (08 hrs)
- Basic operation and principle of PLC,
 - Architectural details – Processor
 - Memory structure, I/O Structure
 - Programming terminal, Power Supply
7. **Instruction Set** (06 hrs)
- 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, less than, less than equal mask equal, limit etc.
8. **Ladder diagram programming** (04 hrs)
Programming based on Basic instructions, timer counter, sequencer to comparison instruction using ladder diagrams.
9. **Applications of PLCs** (04 hrs)
- Assembly
 - CNC Machines
 - Packaging
 - Process controls
 - Car parking
 - Doorbell operation
 - Traffic light control
 - Sorting of objects etc
 - Microwave Oven
 - Washing machine

LIST OF PRACTICALS

1. Measurement and plot of 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 clamping operation
6. Sequence control system e.g in lifting a device for packaging and counting
7. Use of PLC for various mechanical outputs viz motion of a piston in a single cylinder multiple cylinders, driving machine operation etc.
8. Familiarization of the working of PLC
9. Writing entering and testing programs using a hand-held programmer for the following operations
 - Ladder Logic
 - Timers
 - Counters
 - Sequencers
10. Writing, entering and testing programs using computers for the following operations.

INSTRUCTIONAL STRATEGY

The teacher should explain the scope of various measuring devices and their practical application in the field. The transducers and measuring devices must be shown to the students and they should be trained in the selection, operation, maintenance and calibrations. Frequent visits to nearby process industries will be of immense help to the students. The inputs shall start with theoretical inputs to architecture, instruction set, assembly language programming, Small projects may be identified, be designed and implemented. PLC ladder diagram and programming should be supplemented with visits to industry. More emphasis may be given to practical work.

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. *Transducers by Peter Norton*
4. *Mechanical and Industrial Measurements by R.K. Jain, Khanna Publishers, New Delhi*

5. *Process Control Instrumentation Technology by Johnson, Curits; EE Edition, Prentice Hall of India, New Delhi*
6. *Programmable Logic Controller by Job Dan Otter; P.H. International, Inc, USA*
7. *Introduction to PLCs by Gary Dunning. McGraw Hill*
8. *Module on PLCs and their Applications by Rajesh Kumar, NITTTR Chandigarh*
9. *Module on “Allen Bradlag PIC (SLC 500), Institution set-1, by Rajesh Kumar, NITTTR, Chandigarh*
10. *Module on “PLC Applications based on SLC 5/03” By Rajesh Kumar, NITTTR Chandigarh*

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING
PAPER SETTER**

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Introduction to instrumentation	04	5
2	Transducers	32	35
3	Signal Conditioners	08	10
4	Output Devices and Displays	04	5
5	Introduction to PLCs	10	15
6	Working of PLC	08	15
7	Instruction Set	06	5
8	Ladder diagram programming	04	5
9.	Applications	04	5
Total		80	100

6.5 COMPUTER NETWORKS

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4 - 2

RATIONALE

The future of computer technology is in computer networks. Global connectivity can be achieved through computer networks. A diploma holder in computer engineering should therefore understand the function of networks. Knowledge about hardware and software requirements of networks is essential.

DETAILED CONTENTS

1. **Networks Basics** (06 hrs)
What is network, Models of network computing, Networking models, Peer-to-peer Network, Server Client Network, LAN, MAN and WAN, Network Services, Topologies, Switching Techniques
2. **OSI Model** (09 hrs)
Standards, OSI Reference Model, OSI Physical layer concepts, OSI Data-link layer concepts, OSI Networks layer concepts, OSI Transport layer concepts, OSI Session layer concepts, OSI presentation layer concepts, OSI Application layer concepts
3. **Introduction to TCP/IP** (07 hrs)
Concept of physical and logical addressing, Different classes of IP addressing special IP address, Sub netting and super netting, Loop back concept, IPV4 packet Format, Need of IPV6
4. **Protocol Suites** (03 hrs)
Models and Protocols, Network IPX/SPX, Internet Protocols
5. **Network Architecture** (06 hrs)
ARC net specifications, Ethernet Specification and Standardization: 10 mbps (Traditional Ethernet), 10 mbps (Fast Ethernet) and 1000 mbps (Gigabit Ethernet), Introduction to Media Connectivity (Leased lines, ICDN, PSTN, RF, VSAT, Optical and IPLC)
6. **Network Connectivity** (07 hrs)
Network connectivity Devices, NICs, Hubs, Repeaters, Multiplexers, Modems, Routers and Protocols, Firewall, ATM, VOIP and Net-to-Phone Telephony, Laws and Protocols.
7. **Network Printing** (03 hrs)
Print Services
8. **Network Administration / Security** (09 hrs)
Client Server Technology, Server Management, Raid management and mirroring, Hauffman codes, Cryptography

9. **Network Trouble Shooting Techniques** (06 hrs)
 Trouble Shooting process, Trouble Shooting Tools
10. **Error Detection** (05 hrs)
 Source of errors in data communication. Effect of errors, data error rate and its dependency on data transfer rates. Error detection through parity bit, block parity to detect double errors and correct single errors. General principles of error detection and correction using cyclic redundancy checks. Encoding redundant and recovery of data.
11. **Wireless Networking** (03 hrs)
 Basics of Wireless: Wireless MAN, Networking, Wireless LAN, Wi Fi, Wi Max (Broad Band Wireless) and Blue Tooth technology

LIST OF PRACTICALS

1. Recognize the physical topology of a network.
2. Identify the IP address of a workstation and the class of the address and configure the IP address on a workstation
3. Subnet a Class C IP address.
4. Use User Manager for Domains to create, delete and rename a user in Windows NT.
5. Create, Edit and Delete a Linux user account.
6. Use of Netstat and its switches.
7. Install and configure a network interface card in a workstation.
8. Edit a windows login script in a windows NT workstation.
9. Add and change security rights in a Windows NT network.
10. Implement a full backup with the Sbackup utility.
11. Troubleshooting connectivity issues on a Multiplatform network.
12. Editing file system rights in a Linux environment.
 - a) Interfacing with the network (Ethernet)
 - b) Preparing of network cables including hubs, connectors etc.
 - c) Establishment of LAN network for homogeneous systems
 - d) Establishment of LAN network for heterogeneous systems
 - e) Use of protocols and gateways in establishing LAN
 - f) Writing small programs such as file security, file transfer, remote testing
 - g) Trouble shooting of networks
 - h) Writing login scripts

Support Equipment PC Workstation

- Serial Mouse
- 2.3" Floppy drive
- CD drive
- A network Interface card
- Network connection with Internet connectivity
- A tape backup device attached to and configured on the NetWare5 server
- Access to a DNS server
- An external modem with cables
- Hub/switch

Required Software

- Windows XP/2000

- Windows NT server
- NetWare5 server
- Linux OS
- S/W drivers for NIC and modem.

Required Tools and Supplies

- Anti-static wrist wrap
- Anti-static mat
- Crimping tool for RJ 45 connector
- UTP Cable (category 5), RJ 45 connector
- Screwdriver kit

INSTRUCTIONAL STRATEGY

This subject deals with both theory and practicals. The students should practically establish LAN with various hardware and software and their integration.

RECOMMENDED BOOKS

1. *Computer Networks by Tanenbaum, Prentice Hall of India, New Delhi*
2. *Local Area Networks by Peter Hudson*
3. *Understanding Local Area Network by Neil Jenkins*
4. *Area Networks by Stan Schatt, Prentice Hall of India, New Delhi*
5. *Network+ Lab manual,- BPB Publications -by Tami Evanson*
6. *Networking Essentials – BPB Publications New Delhi*
7. *Computer Network and Communications By V.K. Jain and Narija Bajaj, Cyber Tech Publications, New Delhi.*
8. *Data Communications and Networking by Foronzan, Tata McGraw Hill, New Delhi.*
9. *Linux – The complete Reference by Richard Peterson, Tata McGraw Hill, New Delhi.*
10. *Linux – Install and Configuration Black Book by Dee Annleblanc and Issac Yates, IDG Books India Private Limited, Delhi.*
11. *Unleashed Linux by TechMedia Publishers, New Delhi*

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Networks Basics	6	10
2	OSI Model	9	15
3	Introduction to TCP/IP	7	10
4	Protocol Suites	3	05
5	Protocol Suites	6	10
6	Network Architecture	7	10
7	Network Connectivity	3	05
8	Network Printing	9	15
9	Network Administration / Security	6	05
10	Error Detection	5	10
11	Wireless Networking	3	05
Total		64	100

6.6 MAJOR PROJECT WORK

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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 classroom 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 project activities are given below:

- Projects related to designing small electronic equipment / instruments.
- Projects related to increasing productivity in electronic manufacturing areas.
- Projects related to quality assurance.
- Projects connected with repair and maintenance of plant and equipment.
- Projects related to design of PCBs.
- Projects related to suggesting substitutes of electronics components being used.
- Projects related to design of small oscillators and amplifier circuits.

- Projects related to design, fabrication, testing and application of simple digital circuits and components.
- Projects related to microprocessor/microcontroller based circuits/ instruments.

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

NOTE:

The list is only the guideline for selecting a project, however a student is at liberty to select any other related project of his choice independently under guidance of his teacher

A suggestive criteria for assessing student performance by the external (person from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance Criteria	Max.** Marks	Rating Scale				
			Excel lent	Very Good	Good	Fair	Poor
1.	Selection of project assignment	10%	10	8	6	4	2
2.	Planning and execution of considerations	10%	10	8	6	4	2
3.	Quality of performance	20%	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20%	20	16	12	8	4
5.	Sense of responsibility	10%	10	8	6	4	2

6.	Self expression/ communication skills	5%	5	4	3	2	1
7.	Interpersonal skills/human relations	5%	5	4	3	2	1
8.	Report writing skills	10%	10	8	6	4	2
9.	Viva voce	10%	10	8	6	4	2
Total marks		100	100	80	60	40	20

The overall grading of the practical training shall be made as per following table.

In order to qualify for the diploma, students must get “Overall Good grade” failing which the students may be given one more chance to improve and re-evaluate before being disqualified and declared “not eligible to receive diploma”. It is also important to note that the students must get more than six “goods” or above “good” grade in different performance criteria items in order to get “Overall Good” grade.

	Range of maximum marks	Overall grade
1.	More than 80	Excellent
2.	79 <> 65	Very good
3.	64 <> 50	Good
4.	49 <> 40	Fair
5.	Less than 40	Poor

Important Notes

1. *This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.*
2. *The criteria for evaluation of the students have been worked out for 150 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.*
3. *The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.*
4. *It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.*

The teachers are free to evolve another criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations in such an exhibition.

6.7 PRACTICE IN COMMUNICATION SKILLS

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RATIONALE

For successful completion of diploma programme, a student should possess adequate command on language and communication skills so that he/she is able to express himself/herself with ease and felicity. The language used by the student should be appropriate to objectives and occasion. The contents of this subject shall provide practical training to the students through language laboratory.

LIST OF PRACTICAL EXERCISES

1. Exercises on phonetics
2. Interactive session (case studies)
3. Presentation of periodic progress reports (written/oral) and maintaining daily diary
4. Exercises on self assessment using tools like SWOT analysis.
5. Communication empowerment through breaking language Barriers.
6. Internet communication
7. Correspondence
 - 7.1 Resume writing
 - 7.2 Covering letter
 - 7.3 Follow-up correspondence
 - 7.4 Internal and External business Correspondence
8. Practice on public relation skills with live examples.
9. Practice on listening skills.
10. Speaking exercises with emphasis on voice modulation (reading and extempore)
11. Demonstration and practice on Body language and Dress sense.
12. Exercises on etiquettes and mannerism in difficult situations like business meetings, table manners, telephone etiquettes and manners related to opposite gender.
13. Exercises on wit and humour in conversations and creating lively environment.
14. Role play for effective Communication.
15. Cross-cultural Communication
16. Group Discussion
17. Mock interviews (telephonic/personal)