Curriculum for

Diploma Programme in

ELECTRONICS ENGINEERING

For the State of Uttar Pradesh

Prepared by:

Curriculum Development Centre

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

January, 2019

Approved and Implemented by B.T.E,U.P
(Effective from session 2019-20)

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PREFACE

An important issue generally debated amongst the planners and educators world over is how technical education can contribute to sustainable development of the societies struggling hard to come in the same bracket as that of the developed nations. The rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In India, a shift has taken place from the forgettable years of closed economy to knowledge based and open economy in the last few decades. In order to cope with the challenges of handling new technologies, materials and methods, we have to develop human resources having appropriate professional knowledge, skills and attitude. Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Now it is time to consolidate and infuse quality aspect through developing human resources, in the delivery system. Polytechnics play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by the State Board of Technical Education, UP to revise the existing curricula of 6 diploma programmes as per the needs of the industry and making them NSQF compliant,are laudable.

In order to meet the requirements of future technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of diploma programmes. The curricula for diploma programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma programme.

The real success of the diploma programme depends upon its effective implementation. However best the curriculum document is designed, if that is not implemented properly, the output will not be as expected. In addition to acquisition of appropriate physical resources, the availability of motivated, competent and qualified faculty is essential for effective implementation of the curricula.

It is expected of the polytechnics to carry out job market research on a continuous basis to identify the new skill requirements, reduce or remove outdated and redundant courses, develop innovative methods of course offering and thereby infuse the much needed dynamism in the system.

Dr. SS Pattnaik
Director
National Institute of
Technical Teachers Training & Research
Chandigarh

ACKNOWLEDGEMENTS

We gratefully acknowledge the guidance and contribution received from the following persons:

i) Sh. Bhuvnesh Kumar , IAS, Secretary Govt. of UP, Technical Education Department, Secretariat Lucknow.

ii) Sh.R.C. Rajput,Director, Technical Education, UP for taking keen interest in the review of this curriculum.

iii) Sh.ManojKumar, Director, I.R.D.T.,Kanpur for entrusting this project of Curriculum revision to NITTTR, Chandigarh.

iv) Secretary, Board of Technical Education, UP for keen interest for this project of review curriculum.

v) Director, National Institute of Technical Teachers' Training and Research, Chandigarh for his support and academic freedom provided to Curriculum Development Centre.

vi) All the participants from industry/field organizations, engineering colleges, polytechnics and other technical institutions for their professional inputs during curriculum workshops.

vii) Sh. AshokKushwaha,TextBookOfficer/CDCOfficer,IRDT,Kanpur

viii) Faculty/SubjectExperts from U.P. Government polytechnics

ix) Faculty from different departments of NITTTR, Chandigarh for content updation.

x) Ramesh Gupta, UDC for her support and secretarial assistance in the conduct of Curriculum workshops at Chandigarh

xi) Amit Kumar Sachdeva, LDC, Curriculum Development Centre for word processing this document

Coordinator

1. SALIENT FEATURES OF DIPLOMA PROGRAMME IN ELECTRONICS ENGINEERING

1)	Name of the Programme	:	Diploma Programme in Electronics Engineering
2)	Duration of the Programme	:	Three years (Six Semesters)
3)	Entry Qualification	:	Matriculation or equivalent NSQF Level as Prescribed by State Board of Technical Education, UP
4)	Intake	:	60 (or as prescribed by the Board)
5)	Pattern of the Programme	:	Semester Pattern
6)	NSQF Level	:	Level - 5
7)	Ratio between theory and Practice	:	45 : 55 (Approx.)

8) Industrial Training:

Four weeks of industrial training is included after IV semester during summer vacation. Total marks allotted to industrial training will be 50.

9) Ecology and Environment :

As per Govt. of India directives, a subject on Environmental Studies has been incorporated in the curriculum.

10) Energy Conservation:

A subject on Energy Conservation has been incorporated in the curriculum.

11) Entrepreneurship Development:

A full subject on Industrial Management and Entrepreneurship Development has been incorporated in the curriculum.

12) Student Centred Activities:

A provision of 3-6 hrs per week has been made for organizing Student Centred Activities for overall personality development of students. Such activities will comprise of co–curricular activities such as expert lectures, self study, games, hobby classes like

photography, painting, singing etc. seminars, declamation contests, educational field visits, NCC, NSS and other cultural activities, disaster management and safety etc.

13) Project work

A project work has been included in the curriculum to enable the student get familiarize with the practices and procedures being followed in the industries and provide an opportunity to work on some live projects in the industry.

2. EMPLOYMENT OPPORTUNITIES OF DIPLOMA HOLDERS IN ELECTRONICS ENGINEERING

The diploma holders in Electronics Engineering find employment in the following organizations:

(A) EMPLOYMENT OPPORTUNITIES

Various Departments/ organizations/boards and corporations

1) Tele-Communication Engineering and related Departments
2) AIR, Doordarshan
3) Radar and Wireless
4) Railways
5) Defence Services, Para-military Forces
6) Civil Aviation
7) Defence Research and Development Organizations
8) Electricity Boards and Corporations etc.
9) Research and Development Deptt.
10) Maintenance Deptt.

Industry

11) Communication Industry manufacturing wireless mobile equipment for Defence and Paramilitary forces
12) PCB Design and Fabrication Industry
13) Consumer Electronics Industry
14) Electronic Components and Devices Manufacturing and Installation Organizations
15) Computer Assembling and Computer Peripheral Industry;
16) Computer Software Areas for Electronic Design and Semi Conductor Manufacturing Industry
17) Instrumentation and Control Industries
18) Internet Server Provides
19) Public Sector Undertakings (like BHEL, BEL, HAL, IOCL, HPCL, ISRO etc)
20) D.T.H component and Fabrication factory
21) Mobile Phone assembly Industries
22) Medical Electronics Industry

23) EPBX/ Telephone Exchange Manufacturing Industries
24) Automobile Industry
25) Automation and Control Industry (viz bottling plant, cement plant, automobile units, escalators etc.

Development/Testing Laboratories/Organizations

26) Electronics Service Centres
27) Opto Electronics (Medical & Comm.)
28) Computer Networking
29) Hospitals
30) Sales and Services of Electronic Gadgets from Small Scale Industries
31) 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)

3. LEARNING OUTCOMES OF DIPLOMA PROGRAMME IN ELECTRONICS ENGINEERING

At the end of the programme, the students will be able to:

1.	Communicate effectively in English with others
2.	Apply basic principles of Mathematics to solve single engineering problems
3.	Apply basic principles of Physics and Chemistry to solve engineering problems
4.	Prepare computerized reports, presentations using IT tools and computer application software
5.	Prepare and interpret Engineering Drawings
6.	Use cutting tools, equipment and tooling for fabrication of jobs by following safe practices at workplace
7.	Use appropriate instruments to measure various engineering parameters .
8.	Measure and compute parameters related to basic electrical engineering
9.	Use appropriate procedures for preventing environmental pollution and energy conservation
10.	Assemble, test and troubleshoot electronic circuits consisting of passive and active components by applying appropriate soldering, testing and measurement techniques at workplaces.
11.	Understand principles of communication engineering .
12.	Understand basic principles of digital electronics and design combinational and sequential circuits.
13.	Write basic programmes using C /C++
14.	Apply principles of various networks, filters and transmission lines and their associated parameters
15.	Use various power controlled devices in industrial applications
16.	Use microprocessor and microcontroller based system using assembly level language programming
17.	Carryout trouble shooting of different basic consumer electronic products like TV, Audio system and mobile..
18.	Use optical fiber engineering for communication systems
19.	Use different digital communication systems
20.	Programme microcontroller for Embeded Systems Applications using C /C++
21.	Understand Microwave and radar engineering
22.	Understand basic concepts of control systems
23.	Understand Embedded systems and its applications

24	Work with various active and passive microwave devices.
25	Use biomedical instruments
26	Apply acquired knowledge and skill in solving a live problem or Industrial project
27	Use modern communication system

4. DERIVING CURRICULUM AREAS FROM LEARNING OUTCOMES OF THE PROGRAMME

The following curriculum area subjects have been derived from learning outcomes:

Sr. No.	Learning Outcomes	Curriculum Areas/Subjects
1.	Communicate effectively in English with others	Communication Skills
2.	Apply basic principles of Mathematics to solve single engineering problems	Applied Mathematics
3.	Apply basic principles of Physics and Chemistry to solve engineering problems	– Applied Physics – Applied Chemistry
4.	Prepare computerized reports, presentations using IT tools and computer application software	Basics of Information Technology
5.	Prepare and interpret Engineering Drawings	Engineering Drawing
6.	Use cutting tools, equipment and tooling for fabrication of jobs by following safe practices at workplace	General Workshop Practice
7.	Use appropriate instruments to measure various engineering parameters .	Electronic Instruments and Measurement
8.	Measure and compute parameters related to basic electrical engineering	Electrical Engineering
9.	Use appropriate procedures for preventing environmental pollution and energy conservation	Environmental Studies
10.	Assemble, test and troubleshoot electronic circuits consisting of passive and active components by applying appropriate soldering, testing and measurement techniques at workplaces.	Electronic Devices and Circuits
11.	Understand principles of communication engineering .	Principles of Communication Engineering
12.	Understand basic principles of digital electronics and design combinational and sequential circuits.	Digital Electronics
13.	Write basic programmes using C /C++	Programming in C
14.	Apply principles of various networks, filters	Network Filters and Transmission

	and transmission lines and their associated parameters	Line
15.	Use various power controlled devices in industrial applications	Industrial Electronics and Transducers
16.	Use microprocessor and microcontroller based system using assembly level language programming	– Microprocessors – Microcontrollers and Embedded System
17.	Carryout trouble shooting of different basic consumer electronic products like TV, Audio system and mobile..	Consumer Electronics
18.	Use optical fiber engineering for communication systems	Optical Fiber Communication
19.	Use different digital communication systems	Principles of Communication Engineering
20.	Programme microcontroller for Embeded Systems Applications using C /C++	Programming in C
21.	Understand Microwave and radar engineering	Microwave Engineering
22.	Understand basic concepts of control systems	Control System
23.	Understand Embedded systems and its applications	Microcontrollers and Embedded System
24.	Work with various active and passive microwave devices.	Microwave Engineering
25.	Use biomedical instruments	Biomedical electronics
26.	Apply acquired knowledge and skill in solving a live problem or Industrial project	Project Work
27.	Use modern communication system	Wireless and Mobile communication System

5. ABSTRACT OF CURRICULUM AREAS

a) General Studies

1. Communication Skills
2. Environmental Studies
3. Energy Conservation
4. Industrial Management & Entrepreneurship Development

b) Applied Sciences

5. Applied Mathematics
6. Applied Physics
7. Applied Chemistry

c) Basic Courses in Engineering/Technology

8. Engineering Drawing
9. General Workshop Practice
10. Basics of Information Technology

d) Applied Courses in Engineering/Technology

11. Engineering Mechanics and Materials
12. Electrical Engineering
13. Electronic Components and Devices
14. Electronic Devices and Circuits
15. Electronics Workshop
16. Digital Electronics
17. Industrial Electronics and Transducers
18. Network Filters and Transmission Line
19. Electronic Instruments and Measurement
20. Principles of Communication Engineering
21. Microprocessors
22. Optical Fiber Communication
23. Consumer Electronics
24. Programming in C

25. Microwave Engineering
26. Microcontrollers and Embedded System
27. Wireless and Mobile Communication System

e) Industrial Training

28. Minor Project Work
29. Project Work

f) Elective

30. Control System
31. Medical Electronics
32. Computer Networks

6. HORIZONTAL AND VERTICAL ORGANISATION OF THE SUBJECTS

Sr. No.	Subjects	Distribution in Periods per week in Various Semesters					
		I	II	III	IV	V	VI
1.	Communication Skills	6	-	-	6	-	-
2.	Applied Mathematics	5	5	5	-	-	-
3.	Applied Physics	7	7	-	-	-	-
4.	Applied Chemistry	7	-	-	-	-	-
5.	Engineering Drawing	8	-	-	-	-	-
6.	Engineering Mechanics and Materials	4	-	-	-	-	-
7.	General Workshop Practice	8	8	-	-	-	-
8.	Basics of Information Technology	-	6	-	-	-	-
9.	Electrical Engineering	-	8	8	-	-	-
10.	Electronic Components and Devices	-	12	-	-	-	-
11.	Environmental Studies	-	-	5	-	-	-
12.	Electronic Devices and Circuits	-	-	12	-	-	-
13.	Electronics Workshop	-	-	6	-	-	-
14.	Digital Electronics	-	-	8	-	-	-
15.	Industrial Electronics and Transducers	-	-	-	8	-	-
16.	Universal Human Values			3			
17.	Network Filters and Transmission Line	-	-	-	8	-	-
18.	Electronic Instruments and Measurement	-	-	-	8	-	-
19.	Principles of Communication Engineering	-	-	-	8	-	-
20.	Energy Conservation	-	-	-	5	-	-
21.	Industrial Management & Entrepreneurship Development	-	-	-	-	5	-
22.	Microprocessors	-	-	-	-	8	-
23.	Optical Fiber Communication	-	-	-	-	10	-
24.	Consumer Electronics	-	-	-	-	8	-
25.	Programming in C	-	-	-	-	8	-
26.	Minor Project Work	-	-	-	-	4	-
27.	Microwave Engineering	-	-	-	-	-	8
28.	Microcontrollers and Embedded System	-	-	-	-	-	12
29.	Wireless and Mobile Communication System	-	-	-	-	-	10
30.	Elective	-	-	-	-	-	6

31.	Project Work	-	-	-	-	-	8
32.	Student Centred Activities (SCA)	3	2	1	5	4	4
Total		**48**	**48**	**48**	**48**	**48**	**48**

7. STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN ELECTRONICS ENGINEERING

FIRST SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1	*Communication Skills-I	4	-	2	4	20	10	30	50	2 ½	20	3	70	100
1.2	*Applied Mathematics - I	5	-	-	4	20	-	20	50	2 ½	-	3	50	70
1.3	*Applied Physics – I	5	-	2	5	20	10	30	50	2 ½	20	3	70	100
1.4	*Applied Chemistry	5	-	2	5	20	10	30	50	2 ½	20	3	70	100
1.5	*Engineering Drawing-I	-	-	8	2	-	40	40	60	3	-	-	60	100
1.6	Engineering Mechanics and Materials	4	-	-	3	20	-	20	50	2 ½	-	-	50	70
1.7	General Workshop Practice-I	-	-	8	2	-	40	40	-	-	60	4	60	100
#Student Centred Activities (SCA)		-	-	3	1	-	30	30	-	-	-	-	-	30
Total		23	**-**	**25**	26	100	**140**	**240**	**310**	**-**	**120**	**-**	**430**	**670**

* Common with other diploma programmes

\# Student Centred Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

SECOND SEMESTER (ELECTRONICS ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
2.1	*Applied Mathematics - II	5	-	-	4	20	-	20	50	2 ½	-	-	50	70
2.2	*Applied Physics -II	5	-	2	5	20	10	30	50	2 ½	20	3	70	100
2.3	*Basics of Information Technology	-	-	6	2	-	40	40	-	-	60	3	60	100
2.4	Electrical Engineering -I	4	-	4	5	20	30	50	50	2 ½	50	3	100	150
2.5	Electronic Components and Devices	6	-	6	7	20	30	50	50	2 ½	50	3	100	150
2.6	General Workshop Practice-II	-	-	8	2	-	40	40	-	-	60	4	60	100
#Student Centred Activities (SCA)		-	-	2	1	-	30	30	-	-	-	-	-	30
Total		20	**-**	**28**	26	80	**180**	**260**	**200**	**-**	**240**	**-**	**440**	**700**

* Common with other diploma programmes

\# Student Centred Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

THIRD SEMESTER (ELECTRONICS ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
3.1	*Applied Mathematics-III	5	-	-	4	20	-	20	50	2 ½	-		50	70
3.2	Electrical Engineering -II	4	-	4	6	20	30	50	50	2 ½	50	3	100	150
3.3	*Environmental Studies	3	-	2	3	20	10	30	50	2 ½	20	3	70	100
3.4	Electronic Devices and Circuits	6	-	6	7	20	30	50	50	2 ½	50	3	100	150
3.5	Electronics Workshop	-	-	6	3	-	40	40	-	-	60	4	60	100
3.6	**Digital Electronics	4	-	4	6	20	30	50	50	2 ½	50	3	100	150
3.7	Universal Human Values	2	-	1	1	-	20	20	-	-	30	3	30	50
# Student Centred Activities		-	-	1	1	-	30	30	-	-	-	-	-	30
Total		24	**-**	**24**	31	100	**190**	**290**	**250**	**-**	**260**	**-**	**510**	**800**

* Common with other diploma programmes

* Common course with Computer Science and Engineering

\# Student Centred Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

FOURTH SEMESTER (ELECTRONICS ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
4.1	*Communication Skill-II	4	-	2	4	20	10	30	50	2 ½	20	3	70	100
4.2	Industrial Electronics and Transducers	4	-	4	5	20	30	50	50	2 ½	50	3	100	150
4.3	Network Filters and Transmission Line	4	--	4	5	20	30	50	50	2 ½	50	3	100	150
4.4	Electronic Instruments and Measurement	4	-	4	5	20	30	50	50	2 ½	50	3	100	150
4.5	Principles of Communication Engineering	4	-	4	5	20	30	50	50	2 ½	50	3	100	150
4.6	*Energy Conservation	3	-	2	3	20	10	30	50	2 ½	20	3	70	100
#Student Centred Activities (SCA)		-	-	5	1	-	30	30	-	-	-	-	-	30
Total		23	**-**	**25**	28	120	**170**	**290**	**300**	**-**	**240**	**-**	**540**	**830**

* Common with other diploma programmes

\# Student Centred Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

Industrial training of 4 weeks duration to be organised after 4th semester exams

FIFTH SEMESTER (ELECTRONICS ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
-	Industrial Training	-		-	2	-	-	-	-	-	50	3	50	50
5.1	*Industrial Management & Entrepreneurship Development	5	-	-	4	20	-	20	50	2 ½	-	-	50	70
5.2	Microprocessors	4	-	4	5	20	30	50	50	2 ½	50	3	100	150
5.3	Optical Fiber Communication	4	-	6	6	20	30	50	50	2 ½	50	3	100	150
5.4	Consumer Electronics	4	-	4	5	20	30	50	50	2 ½	50	3	100	150
5.5	Programming in C	4	-	4	5	20	30	50	50	2 ½	50	3	100	150
5.6	Minor Project Work	-	-	6	2	-	40	40	-	-	60	3	60	100
#Student Centred Activities (SCA)		-	-	3	1		30	30	-	-	-	-	-	30
Total		21	**-**	**27**	30	100	**190**	**290**	**250**	**-**	**310**	**-**	**560**	**850**

Student Centred Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

SIXTH SEMESTER (ELECTRONICS ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
6.1	Microwave Engineering	4	-	4	5	20	30	50	50	2 ½	50	3	100	150
6.2	Microcontrollers and Embedded System	6	-	6	7	20	30	50	50	2 ½	50	3	100	150
6.3	Wireless and Mobile Communication System	4	-	6	6	20	30	50	50	2 ½	50	3	100	150
6.4	*Elective	4	-	2	4	20	30	50	50	2 ½	50	3	100	150
6.5	Project Work	-	-	8	3	-	50	50	-	-	100	4	100	150
#Student Centred Activities (SCA)		-	-	4	1		30	30	-	-	-	-	-	30
Total		18		**30**	26	80	**200**	**280**	**200**	**-**	**300**	**-**	**500**	**780**

*Elective: Any one out of the following:

6.4.1 Control System 6.4.2 Medical Electronics 6.4.3 Computer Networks

Student Centred Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

8. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 30 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

i. 10 Marks for general behaviour and discipline
(by HODs in consultation with all the teachers of the department)

ii. 5 Marks for attendance as per following:
(by HODs in consultation with all the teachers of the department)

a)	75 - 80%	2 Marks
b)	80 - 85%	4 Marks
c)	Above 85%	5 Marks

iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/ NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)

a)	15	-	State/National Level participation
b)	10	-	Participation in two of above activities
c)	5	-	Inter-Polytechnic level participation

Note: There should be no marks for attendance in the internal sessional of different subjects.

1.1 COMMUNICATION SKILLS – I

L	T	P
4	-	2

RATIONALE

Knowledge of English Language plays an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

.

- Understand the importance of effective communication
- Describe the process of communication
- Communicate effectively in different contexts
- Identify parts of speech
- Write correct sentences using appropriate vocabulary
- Reproduce and match words and sentences in a paragraph
- Write various types of paragraphs, notices for different purposes and composition on picture with appropriate format
- Read unseen texts with comprehension

.

DETAILED CONTENTS

1 Basics of Communication (13 periods)

- 1.1 Definition and process of communication
- 1.2 Types of communication - formal and informal, oral and written, verbal and non-verbal
- 1.3 Communications barriers and how to overcome them
- 1.4 Barriers to Communication, Tools of Communication

2 Application of Grammar (18 periods)

- 2.1 Parts of Speech (Noun, verb, adjective, adverb) and modals
- 2.2 Sentences and its types
- 2.3 Tenses
- 2.4 Active and Passive Voice
- 2.5 Punctuation
- 2.6 Direct and Indirect Speech

3 Reading Skill (10 periods)

Unseen passage for comprehension (one word substitution, prefixes, suffixes, antonyms, synonyms etc. based upon the passage to be covered under this topic)

4 Writing Skill (15 periods)

4.1 Picture composition
4.2 Writing paragraph
4.3 Notice writing

LIST OF PRACTICALS

Note: Teaching Learning Process should be focused on the use of the language in writing reports and making presentations.
Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project oriented manner where the learning happens as a byproduct.

Listening and Speaking Exercises

1. Self and peer introduction
2. Newspaper reading
3. Just a minute session-Extempore
4. Greeting and starting a conversation
5. Leave taking
6. Thanking
7. Wishing well
8. Talking about likes and dislikes
9. Group Discussion
10. Listening Exercises.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centred activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

RECOMMENDED BOOKS

1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; DhanpatRai Publications, New Delhi.
3. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. Excellent General English-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra
5. The Functional aspects of Communication Skills – Dr. P. Prsad, S.K. Katria& Sons, New Delhi
6. Q. Skills for success – Level & Margaret Books, Oxford University Press.
7. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

Websites for Reference:

1. http://www.mindtools.com/ page 8.html – 99k
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	13	24
2	18	32
3	10	16
4	15	28
Total	**56**	**100**

1.2 APPLIED MATHEMATICS - I

L	T	P
5	-	-

RATIONALE

Contents of this course provide fundamental base for understanding elementary mathematics and their uses in solving engineering problems. Contents of this course will enable students to use basic mathematical function like logarithms, partial fractions, matrices and basic 2D, curves in solving various engineering problems of all fields.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- apply Binomial theorem to solve engineering problems
- apply determinants properties and Crammer's rule to solve engineering problems
- apply dot & cross product of vectors to find the solution of engineering problems
- use complex numbers in various engineering problems
- apply differential calculus and higher order to solve engineering problems
- find velocity, acceleration, errors and approximation in engineering problems with application of derivatives.

DETAILED CONTENTS

1. Algebra -I (12 Periods)

   1.1 Series : AP and GP; Sum, nth term, Mean

   1.2 Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem.

   1.3 Determinants : Elementary properties of determinant of order 2 and 3, Multiplication system of algebraic equation, Consistency of equation, Crammer's rule

2. Algebra- II (12 Periods)

   2.1 Vector algebra : Dot and Cross product, Scaler and vector triple product.

   2.2 Complex number.

   Complex numbers, Representation, Modulus and amplitude Demoivre theorem, its application in solving algebraic equations, Mod. function and its properties..

3. Trigonometry (10 Periods)

3.1 Relation between sides and angles of a triangle : Statement of various formulae showing relationship between sides and angle of a triangle.

3.2 Inverse circular functions : Simple case only

4. Differential Calculus - I (18 Periods)

4.1 Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.

4.2 Methods of finding derivative, Trigonometric functions, exponential function, Function of a function, Logaritimic differentiation, Differentiation of Inverse trigonometric function, Differentiation of implicit functions.

5. Differential Calculus - II (18 Periods)

5.1 Higher order derivatives, Leibnitz theorem (without proof). Simple applications.

5.2 Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

INSTRUCTONAL STRATEGY

The basic instructional strategy to teach basic mathematics, Binomial theorem, trigonometry, differential equations etc. should be conceptual with real world applications of relevant branch. More numerical and theory examples can be used for clear understanding of the content**.**

MEANS OF ASSESSMENT

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests
- Model/Prototype Making

RECOMMENDED BOOKS

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3 Applied Mathematics-I by Chauhan and Chauhan, Krishna Publications, Meerut**.**
4. Applied Mathematics-I (A) by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	12	20
2.	12	20
3.	10	12
4	18	24
5	18	24
Total	**70**	**100**

1.3 APPLIED PHYSICS – I

L	T	P
5	-	2

RATIONALE

Applied physics includes the study of a diversified topics related to 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 behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this course content.

Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to learn and appreciate these concepts and principles. In all contents, SI units should be followed.

LEARNING OUTCOMES

After undergoing this course, the students must be able to:

- Identify the use of S.I. system of measurement with accuracy and how it is used in engineering
- Represent physical quantities as scalars and vectors, applying the physical laws and concepts of linear and circular motion in everyday life.
- Solve difficult problems (walking of man, horse and cart problem, flying of bird/ aircraft, etc.)
- Analyse and design banking of roads/railway tracks and apply conservation of momentum principle to Explain rocket propulsion, recoil of gun etc.
- Derive work, power and energy relationship and solve problems about work and power.
- Define work, energy and power and their units.
- Describe conservation of energy and its applications
- Understand the concept of rotational motion of a rigid body and its applications
- Apply the physical laws and concepts of gravity, its variation with longitude and latitude and its uses in space satellite etc. .
- Understand the concept of elasticity, surface tension, pressure and the laws governing movement of fluids.
- Express physical work in term of heat and temperature; Measure temperature in various processes on different scales (Celsius, Kelvin, Fahrenheit etc.)
- Distinguish between conduction, convection and radiation, identify the different methods for reducing heat losses
- Understand the laws of thermodynamics, Carnot cycle and their applications.

DETAILED CONTENTS

1. Units and Dimensions (10 Periods)

   1.1 Need of Measurement in engineering and science, unit of a physical quantities - fundamental and derived units, systems of units (FPS, CGS and SI units)

1.2 Dimensions and dimensional formulae of physical quantities.
1.3 Principle of homogeneity of dimensions
1.4 Dimensional equations and their applications, conversion of numerical values of physical quantities from one system of units into another, checking the correctness of physical equations and deriving relations among various physical quantities
1.5 Limitations of dimensional analysis
1.6 Error in measurement, accuracy and precision of instruments, random and systematic errors, absolute error, relative error, and percentage error, Estimation of probable errors in the results of measurement (combination of errors in addition, subtraction, multiplication, division and powers), rules for representing significant figures in calculation.
1.7 Application of units and dimensions in measuring length, diameter, circumference, volume, surface area etc. of metallic and non metallic blocks, wires, pipes etc (at least two each).

2. Force and Motion (10 periods)

2.1 Scalar and vector quantities – examples, representation of vector, types of vectors
2.2 Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Scalar and Vector Product.
2.3 Resolution of Vectors and its application to lawn roller.
2.4 Force, Momentum, Statement and Derivation of Conservation of linear momentum, its applications such as recoil of gun.
2.5 Impulse and its Applications
2.6 Circular motion (Uniform and Non-uniform), definition of angular displacement, angular velocity, angular acceleration, frequency, time period.
2.7 Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical)
2.8 Central force, Expression and Applications of Centripetal and centrifugal forces with examples such as banking of roads and bending of cyclist, Principle of centrifuge.
2.9 Application of various forces in lifts, cranes, large steam engines and turbines

3. Work, Power and Energy (10 periods)

3.1 Work: and its units, examples of zero work, positive work and negative work, conservative and non-conservative force,
3.2 Friction: modern concept, types, laws of limiting friction, Coefficient of friction and its Engineering Applications.
3.3 Work done in moving an object on horizontal and inclined plane for rough and plane surfaces with its applications

3.4 Energy and its units: Kinetic energy and potential energy with examples and their derivation, work energy theorem.
3.5 Principle of conservation of mechanical energy for freely falling bodies, examples of transformation of energy.
3.6 Power and its units, calculation of power in numerical problems
3.7 Application of Friction in brake system of moving vehicles, bicycle, scooter, car trains etc.

4 Rotational Motion (10 periods)

4.1 Concept of translatory and rotatory motions with examples
4.2 Definition of torque with examples
4.3 Angular momentum, Conservation of angular momentum (quantitative) and its examples
4.4 Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid) (Formulae only). Concept of Fly wheel.
4.5 Rotational kinetic energy, Rolling of sphere on the slant plane,
4.6 Comparison of linear motion and rotational motion.
4.7 Application of rotational motions in transport vehicles, and machines

5 Motion of planets and satellites (08 periods)

5.1 Gravitational force, Kepler's law of planetary motion,
5.2 Acceleration due gravity and its variation,
5.3 Gravitational Potential and Gravitational potential energy,
5.4 Motion of satellite, orbital velocity and time period of satellite, Total energy and Binding energy of a satellite, Escape energy and escape velocity,
5.5 Types of satellites, Geo-stationary satellite, semi-synchronous, polar satellite (concept only) and their uses in science and technology,
5.6 Concept of Black Holes,

6. Properties of Matter (12 periods)

6.1 Elasticity: definition of stress and strain, different types of modulii of elasticity, Hooke's law, significance of stress strain curve
6.2 Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications
6.3 Surface tension: concept, its units, angle of contact, Capillary action and determination of surface tension from capillary rise method, applications of surface tension, effect of temperature and impurity on surface tension
6.4 Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems.

6.5 Concept of fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem and their applications.

7. Heat and Thermodynamics (10 periods)

7.1 Difference between heat and temperature
7.2 Modes of transfer of heat (Conduction, convection and radiation with examples)
7.3 Different scales of temperature and their relationship
7.4 Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them
7.5 Heat conduction in a metal rod, Temperature gradient, Concept of Co-efficient of thermal conductivity, Uses and effects of Heat conduction in Daily life.
7.6 Isothermal and Adibatic process
7.7 Zeroth, First and second law of thermodynamics, Heat engine (concept Only), Carnot cycle.
7.8 Application of various systems of thermometry in refrigeration and air-conditioning etc.

LIST OF PRACTICALS (to perform minimum six experiments)

1 To find radius of wire and its volume and the maximum permissible error in these quantities by using both verniercalipers and screw gauge.
2 To find the value of acceleration due to gravity on the surface of earth by using a simple pendulum.
3 To determine the Radius of curvature of (i) convex mirror, (ii) concave mirror by spherometer
4 To verify parallelogram law of forces
5 To study conservation of energy of a ball or cylinder rolling down an inclined plane.
6 To find the Moment of Inertia of a flywheel about its axis of rotation
7 To determine the atmospheric pressure at a place using Fortin's Barometer
8 To determine the viscosity of glycerin by Stoke's method
9 To determine the coefficient of linear expansion of a metal rod
10 To determine force constant of spring using Hooks law

INSTRUCTIONAL STATREGY

Teacher may use various teaching aids like live models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

MEANS OF ASSEMENTS

– Assignment & Quiz,
– Mid-Term and End-Term written test,
– Model Making,

- Actual Lab & Practical Work,
- VivaVoice

RECOMMENDED BOOKS

1 Text Book of Physics for Class XI (Part-I, Part-II); N.C.E.R.T., Delhi
2 Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3 Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
4 B.Sc.Practical Physics by C L Arora, S. Chand Publication..
5 Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
6 Engineering Physics by DK Bhhatacharya&PoonamTandan; Oxford University Press, New Delhi
7 Modern Engineering Physics by SL Gupta, Sanjeev Gupta, DhanpatRai Publications
8 V. Rajendran,physics-I, Tata McGraw-Hill raw Hill publication, New Delhi
9 Arthur Beiser, Applied Physics, Tata McGraw-Hill raw Hill publication, New Delhi
10 Physics Volume 1, 5th edition, HalidayResnick and Krane, Wiley publication

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	15
2	10	15
3	10	15
4	10	15
5	08	10
6	12	16
7	10	14
Total	**70**	**100**

1.4 APPLIED CHEMISTRY

L	T	P
5	-	2

RATIONALE

The use of various chemicals and chemical products in diverse technical and engineering fields have repeatedly proved the importance of Applied Chemistry, which enhances its role to a new peak. On the other hand, ever increasing use of such materials will compel engineers, technocrats to acquire essential applied chemistry knowledge in order to select engineering materials, which not only suit them but also provide more environmental compatibility. This situation demands principles of Applied Chemistry in diploma-engineering courses. Principles of Applied Chemistry will enable budding engineers and technocrats to develop scientific temper and appreciate physical, chemical and engineering properties of materials. Hence the subject of Applied Chemistry.

LEARNING OUTCOMES

After undergoing this subject, the student will be able to:

- Classify various substances based on state of aggregation
- Substantiate the laws and principles on which structure of atom is established.
- Explain and predict properties of substances.
- Explain sources of water and various characteristics of water (quantitatively).
- Explain cause and factors which can adversely affecting natural water quality and remedial measures available for water purification
- Think critically, develop and adapt water conservation techniques.
- Explain corrosion of metal and their preventive measures.
- explain chemical nature and causes of corrosion
- apply correct and efficient methods of corrosion prevention.
- explain chemistry of fuels and their relative advantages.
- select most efficient fuel for the engine and engineering applications.
- suggest how to subside air pollution caused by the use of fossil fuels
- explain the chemistry of various polymers and plastics
- verify suitability and select polymer/rubber/plastic materials for engineering applications.

DETAILED CONTENTS

1. Atomic Structure, Periodic Table and Chemical Bonding (14 periods)

    1.1 Fundamental particles- mass and charges of electrons, protons and neutrons with names of the scientists who discovered these fundamental particles.
    1.2 Bohr's model of atom and successes and limitations of atomic theory (qualitative treatment only).
    1.3 Atomic number, atomic mass number isotopes and isobars.

1.4 Definition of orbit and orbitals, shapes of s and p orbitals only, quantum numbers and their significance,

1.5 Aufbau's principle, Pauli's exclusion principle and Hund's rule electronic configuration of elements with atomic number (Z) = 30 only. (Electronic configurations of elements with atomic number greater than 30 are excluded).

1.6 Modern periodic law and periodic table, groups and periods, classification of elements into s, p, d and f blocks (periodicity in properties - excluded)

1.7 Chemical bonding and cause of bonding and types such as ionic bond in NaCl sigma (σ) and pi (π) covalent bonds in H_2, HCl, Cl_2, elementary idea of hybridization in $BeCl_2$, BF_3, CH_4, NH_3 and H_2O, VSEPR, Molecular orbital Theory

1.8 States of Matter: Solid, Liquid & Gas, Metallic bonding- explanation with the help of electron gas (sea) model.

2. Fuelsand Lubricants (18 periods)

2.1 Definition of fuel, classification of fuels, characteristics of good fuel, relative merits of gaseous, liquid and solid fuels

2.2 Calorific value-higher calorific value, lower calorific value, determination of calorific value of solid or liquid fuel using Bomb calorimeter and numerical examples.

2.3 Coal - types of coal and proximate analysis of coal

2.4 Fuel rating – Octane number and Cetane number, fuel-structural influence on Octane and Cetane numbers

2.5 Gaseous fuels – chemical composition, calorific value and applications of natural gas (CNG), LPG, producer gas, water gas and biogas.

2.6 Elementary ideal on – hydrogen as future fuels, nuclear fuels.

2.7 Lubricants: Definition and properties, mechanism, industrial application and its function in bearings.

2.8 Synthetic lubricants and cutting fluids.

3. Water (14 periods)

3.1 Demonstration of water resources on Earth using pie chart.

3.2 Classification of water – soft water and hard water, action of soap on hard water, types of hardness, causes of hardness, units of hardness – mg per liter (mgL^{-1}) and part per million (ppm) and simple numerical, pH and buffer solutions and their applications.

3.3 Disadvantages caused by the use of hard water in domestic and boiler feed water. Primming and foaming and caustic embrittlement in boilers.

3.4 Removal of hardness -Permutit process and Ion-exchange process.

3.5 Physico-Chemical methods for Water Quality Testing

a) Determination of pH using pH meter, total dissolved solids (TDS)

b) Testing and Estimation of- alkalinity, indicator their types and application total hardness by EDTA method and O'Hener's Method. (chemical reaction of EDTA method are excluded).
c) Understanding of Indian Water Quality standards as per WHO

3.6 Natural water sterilization by chlorine and UV radiation and reverse osmosis.

3.7 Municipality waste water treatment. Definition of B.O.D and C.O.D.

4. Electrochemistry (4 periods)

Redox Reaction, Electrode Potential, Nernst equation, Electrochemical cell (Galvanic and Electrobytes); Nernst equation.

5. Corrosion and its Control (10 periods)

5.1 Definition of corrosion and factors affecting corrosion rate.
5.2 Theories of
a) Dry (chemical) corrosion- Pilling Bedworth rule
b) Wet corrosion in acidic atmosphere by hydrogen evolution mechanism
5.3 Definition of passivity and galvanic series
5.4 Corrosion control:
a) Metal coatings – Cathodic protection, Cementation on Base Metal Steel – Application of Metal Zn (Sheradizing),Cr (Chromozing) and Al (Calorizing), Sacrificial protection and impressed current voltage
b) Inorganic coatings – Anodizing and phosphating,
c) Organic coatings - use of paints varnishes and enamels
d) Internal corrosion preventive measures- alloying (with reference to passivating, neutralizing and inhibition) and heat treatment (quenching, annealing)

6. Organic compounds, Polymers and Plastics (10 periods)

6.1 Classification of organic compounds and IUPAC Nomenclature
6.2 Definition of polymer, monomer and degree of polymerization
6.3 Brief introduction to addition and condensation polymers with suitable examples (PE, PS, PVC, Teflon, Nylon -66 and Bakelite)
6.4 Definition of plastics, thermo plastics and thermo setting plastics with suitable examples, distinctions between thermo and thermo setting plastics
6.5 Applications of polymers in industry and daily life

LIST OF PRACTICALS

1. Estimation of total hardness of water using standard EDTA solution
2. Estimation of total alkalinity of given water sample by titrating it against standard sulfuric acid solution
3. Proximate analysis of solid fuel)
4. Estimation of temporary hardness of water sample by O' Hener's Method.
5. Determination of flash and fire point of given lubricating oil using Able's flash point apparatus

INSTRUCTIONAL STRATEGY

Teachers may take help of various models and charts while imparting instructions to make the concept clear. More emphasis should be laid on discussing and explaining practical applications of various chemical process and reactions. In addition, students should be encouraged or motivated to study those processes in more details, which may find practical application in their future professional career.

MEANS OF ASSEMENTS

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Model Making,
- Actual Lab & Practical Work,
- Viva Voice

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuricose& J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C. Jain & Monika Jain, DhanapatRai Publishing Company, New Delhi.
3. Eagle's Applied Chemistry - I by S. C. Ahuja & G. H. Hugar, Eagle Prakashan, Jalandhar.
4. Engineering Chemistry – A Text Book by H. K. Chopra & A. Parmar, Narosa Publishing House, New Delhi.
5. Applied Chemistry - I by Dr. P. K Vij&ShikshaVij, Lords Publications, Jalandhar.
6. Engineering Chemistry by Dr.Himanshu Pandey, Goel Publishing House, Meerut, India
7. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topics	Time Allotted (hrs)	Marks Allotted (%)
1.	14	20
2.	18	24
3.	14	20
4.	4	6
5.	10	15
6.	10	15
Total	**70**	**100**

1.5 ENGINEERING DRAWING - I

L	T	P
-	-	8

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 18 sheets to be prepared and atleast 2 sheets on AutoCAD
iii) Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Identify and use of different grades of pencils and other drafting instruments which are used in engineering field
- Draw free hand sketches of various kinds of objects.
- Utilize various types of lines used in engineering drawing.
- Read and apply different dimensioning methods on drawing of objects.
- Use different types of scales and their utilization in reading and reproducing drawings of objects and maps.
- Draw 2 - dimensional view of different objects viewed from different angles (orthographic views)
- Draw and interpret complete inner hidden details of an object which are otherwise not visible in normal view
- To make projections of Solid
- Generate isometric (3D) drawing from different 2D (orthographic) views/sketches
- Identify conventions for different engineering materials, symbols, sections of regular objects and general fittings used in Civil and Electrical household appliances
- Use basic commands of AutoCAD.

DETAILED CONTENTS

1. Introduction to Engineering Drawing (03 sheets)

    1.1 Introduction to drawing instruments, materials, layout and sizes of drawing sheets and drawing boards.
    1.2 Different types of lines in Engineering drawing as per BIS specifications

1.3 Practice of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagonal, pentagon with the help of drawing instruments.

1.4 Free hand and instrumental lettering (Alphabet and numerals) – upper case (Capital Letter), single stroke, vertical and inclined at 75 degree, series of 5,8,12 mm of free hand and instrumental lettering of height 25 to 35 mm in the ratio of 7:4

2. Dimensioning Technique (01 sheet)

2.1 Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)

2.2 Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches

3. Scales (02 sheets)

3.1 Scales –their needs and importance (theoretical instructions), type of scales, definition of R.F. and length of scale

3.2 Drawing of plain and diagonal scales

4. Orthographic Projections (06 sheets)

4.1 Theory of orthographic projections (Elaborate theoretical instructions)

4.2 Projection of Points in different quadrant

4.3 Projection of Straight Line (1^{st} and 3^{rd} angle)

4.3.1. Line parallel to both the planes

4.3.2. Line perpendicular to any one of the reference plane

4.3.3. Line inclined to any one of the reference plane.

4.4 Projection of Plane – Different lamina like square, rectangular, triangular and circle inclined to one plane, parallel and perpendicular to another plane in 1^{st} angle only

4.5 Three views of orthographic projection of different objects. (At least one sheet in 3^{rd} angle)

4.6 Identification of surfaces

5 Projection of Solid (02 sheets)

5.1. Definition and salient features of Solid

5.2. Types of Solid (Polyhedron and Solid of revolution)

5.3 To make projections, sources, Top view, Front view and Side view of various types of Solid.

6. Sections (02 sheets)

6.1 Importance and salient features
6.2 Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.

6.3 Convention sectional representation of various materials, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections
6.4 Orthographic sectional views of different objects.

7. Isometric Views (02 sheets)

7.1 Fundamentals of isometric projections and isometric scale.
7.2 Isometric views of combination of regular solids like cylinder, cone, cube and prism.

8. Common Symbols and Conventions used in Engineering (02 sheets)

8.1 Civil Engineering sanitary fitting symbols
8.2 Electrical fitting symbols for domestic interior installations

*9. Introduction to AutoCAD (02 sheets)

Basic introduction and operational instructions of various commands in AutoCAD. At least two sheets on AutoCAD of cube, cuboid, cone, pyramid, truncated cone and pyramid, sphere and combination of above solids.

* **Auto CAD drawing will be evaluated internally by sessional marks and not by final theory paper.**

INSTRUCTIONAL STRATEGY

Teacher should show model of realia of the component/part whose drawing is to be made. Emphasis should be given on cleanliness, dimensioning and layout of sheet. Focus should be on proper selection of drawing instruments and their proper use. The institute should procure AutoCAD or other engineering graphics software for practice in engineering drawings. Teachers should undergo training in AutoCAD/Engineering Graphic. Separate labs for practice on AutoCAD should be established.

MEANS OF ASSESSMENT

- Sketches
- Drawing
- Use of software

RECOMMENDED BOOKS

1. A Text Book of Engineering Drawing by Surjit Singh; DhanpatRai& Co., Delhi

2. Engineering Drawing by PS Gill; SK Kataria& Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt; Charotar Publishing House Pvt. Ltd., Anand
4. Engineering Drawing I & II by JS Layall; Eagle Parkashan, Jalandhar
5. Engineering Drawing I by DK Goel, GBD Publication.
6. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

1.6 ENGINEERING MECHANICS AND MATERIALS

L	T	P
4	-	-

RATIONALE

Engineering Mechanics & Materials Subject is quite essential for a student of electronics engineering diploma programme. The subject will expose the concept like force analysis, condition of equilibrium, types of materials to be used in electronic application. Lot of development has taken place in the field of materials. New materials are being developed and it has become possible to change the properties of materials to suit the requirements.

LEARNING OUTCOMES

After undergoing the subject, the student will be able to:

- Understand the basic laws and principles of mechanics.
- Able to analyze and solve simple problems related to engineering mechanics.
- Understand the characteristics and properties of different materials used in electronics.

DETAILED CONTENTS

1. Introduction (08 Periods)
   Mechanics and its utility, Concept of scalar and vector quantities, Effect of a force, Tension & compression, Rigid body, Principle of physical independence of force, Principle of transmissibility of a force.
2. Force Analysis (13 Periods)
   Concept of coplanar and non-coplanar forces including parallel forces, Concurrent and non-concurrent forces, Resultant forces, Equilibrium of forces, Law of parallelogram of forces, Law of triangle of forces and its converse. Law of polygon of forces. Solution of simple engineering problems by analytical and graphical methods such as simple wall crane, jib crane and other structures. Determination of resultant of any number of forces in one plane acting upon a particle, condition of equilibrium of coplanar concurrent force system.
3. General Condition of Equilibrium: (11 Periods)
   General condition of equilibrium of a rigid body under the action of coplanar forces, statement of force law of equilibrium, moment law of equilibrium, application of above on body.
4. Stresses and strains (12 Periods)
   Concept of stress and strain, Concept of various types of stresses and strains, Definitions of tension, compression, shear, bending, torsion. Concept of volumetric and lateral strains, Poisson's ratio. Mechanical properties of MS, SS, etc.
5. Materials & Concept Used In Electronics (12 Periods)
   (A) Soldering materials-
   Type, chemical composition and properties, Soldering alloy – Tin lead, Tin antimony, Tin silver, Lead silver, Tin zinc, Different types of flux and their properties, Properties of plastics materials, Epoxy materials for PCB (Single and multi-layer board), Emulsion

parameters, Film emulsion, Type of laminates (Phenolic, Epoxy, Polyester, Silicon, Melamine, Polyamide), Properties of copper clad laminates, Materials (Filler, Resin, Copper Foil) Photo printing basics for double sided PCB, photo resin materials coating process materials, Screen printing and its materials Etching agent, Film processing and used materials.

(B) Soldering & Brazing

For black Galvanized and Tin Coated Iron sheet, Brass and copper sheets only.

1. Its concept, comparison with welding as joining method and classification, electric soldering and forge soldering.
2. Soldering operation – edge preparation of joints, pickling and degreasing, Fluxing, Tinning and Soldering. Wave soldering, solder mask, Dip soldering, Drag soldering,
3. Materials Used-Common fluxes, soft and hard solder, solder wire (Plain and Resin core) and sticks, spelters and their specifications and description (For Identification Only), forge soldering bits.
4. Electric soldering iron, other soldering tools.
5. Common defects likely to occurs during and after soldering.
6. Safety of Personnel, Equipment & Tools to be observed.

INSTRUCTIONAL STRATEGY

Engineering mechanics and materials needs to be handled very carefully in such a manner that students develop clear understanding of basic laws and principles of mechanics. The teacher may lay more emphasis on numerical analysis and give assignments to inculcate self-study.

MEANS OF ASSEMENTS

- Class Tests
- Home Assignments
- Attendance
- Sessional Test

RECOMMENDED BOOKS

1. A Text Book of Engineering Mechanics (Applied Mechanics) by R.K. Khurmi;S.Chand and Co. Ltd. New Delhi
2. A Text Book of Applied Mechanics by R.K. Rajput;Laxmi Publications.
3. A Text Book of Materials Science by R.K. Rajpur;Katson Publications, Ludhiana
4. Material Science and Processes by Hazara Chaudhary; Indian Book Distributors
5. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	8	14
2.	13	24
3.	11	20
4.	12	21
5.	12	21
Total	**56**	**100**

1.7GENERAL WORKSHOP PRACTICE – I

(For Electronics Engineering)

L	T	P
-	-	8

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 hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

LEARNING OUTCOMES

After completing the course, the students will be able to:

- Identify tools and equipment used and their respective functions.
- Identify different types of materials and their basic properties.
- Use and take measurements with the help of basic measuring tools/equipment.
- Select proper tools for a particular operation.
- Select materials, tools, and sequence of operations to make a job as per given specification/drawing.
- Prepare simple jobs independently and inspect the same.
- Follow safety procedures and precautionary measures.
- Use safety equipment and Personal Protection Equipment.

DETAILED CONTENTS (PRACTICAL EXERCISES)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus:

1 Fitting Shop
2 Sheet Metal Shop
3 Welding Shop
4 Plumbing Shop

1. FITTING SHOP

1.1 Use of personal protective equipment and safety precautions while working.
1.2 Basic deburring processes.
1.3 Introduction to fitting shop tools, marking and measuring devices/equipment.
1.4 Identification of materials. (Iron, Copper, Stainless Steel, Aluminium etc.)
1.5 Identification of various steel sections (flat, angle, channel, bar etc.).
1.6 Introduction to various fitting shop operations/processes (Hacksawing, Drilling, Chipping and Filing).

1.7 Job Practice

.

Job I Marking of job, use of marking tools, filing and use of measuring instruments. (Vernier caliper, Micrometer and Vernier height gauge).
Job II Filing a rectangular/square piece to maintain dimensions within an accuracy of ±.25 mm.
Job III Making a cut-out from a square piece of MS flat using hand hacksaw and chipping
Job IV Drilling and tapping practice on MS Flat.

2. SHEET METAL SHOP

2.1. 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.
2.2 Introduction and demonstration of hand tools used in sheet metal shop.
2.3 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine,
2.4 Introduction and demonstration of various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheet etc.
2.5 Study of various types of nuts, bolts, rivets, screws etc.
2.6 Job Practice

Job I: Shearing practice on a sheet using hand shears.
Job II: Practice on making Single riveted lap joint/Double riveted lap Joint.
Job III: Practice on making Single cover plate chain type, zig-zag type and single rivetted Butt Joint.

3. WELDING SHOP – I

3.1 Introduction and importance of welding as compared to other material joining processes. Specifications and type of welding machines, classification and coding of electrodes, welding parameters, welding joints and welding positions. Materials to be welded, safety precautions.

3.2 Job Practice

Job I	Practice of striking arc (Minimum 4 beads on 100 mm long M.S. flat).
Job II	Practice of depositing beads on plate at different current levels. (Minimum 4 beads on M.S. plate at four setting of current level).
Job III	Preparation of lap joint using arc welding process.
Job IV	Preparation of T-joint using gas welding or arc welding on 100 mm x 6 mm MS Flat

4. PLUMBING SHOP

4.1. Use of personal protective equipments, safety precautions while working and cleaning of shop.
4.2. Introduction and demonstration of tools, equipment and machines used in plumbing shop.
4.3. Introduction of various pipes and pipe fittings of elbow, nipple, socket, union etc.
4.4. Job Practice
Job 1 : Preparation of job using elbow, bend and nipple
Job II: Preparation of job using Union, Tap, Plug and Socket.
Job III: Threading practice on pipe with die

MEANS OF ASSESSMENT

- Workshop jobs
- Report writing, presentation and viva voce

RECOMMENDED BOOKS

1. Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
6. Workshop Technology by B.S. Raghuwanshi; DhanpatRai and Co., New Delhi
7. Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi.
8. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

2.1 APPLIED MATHEMATICS - II

L	T	P
5	-	-

RATIONALE

Basic elements of integral calculus, differential calculus, numerical methods, differential equations included in this course will play a vital role in understanding engineering problem mathematically. This will also develop analytical as well as conceptual abilities among students.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Calculate simple integration by methods of integration
- Evaluate the area under curves, surface by using definite integrals.
- Calculate the area and volume under a curve along areas
- Solve the engineering problems with numerical methods.
- Understand the geometric shapes used in engineering problems by co-ordinate geometry.

DETAILED CONTENTS

1. Integral Calculus - I (20 Periods)

   Methods of Indefinite Integration:-
   - 1.1 Integration by substitution.
   - 1.2 Integration by rational function.
   - 1.3 Integration by partial fraction.
   - 1.4 Integration by parts.
   - 1.5 Integration of special function

2. Integral Calculus – II (20 Periods)

   - 2.1 Meaning and properties of definite integrals, Evaluation of definite integrals..
   - 2.2 Application : Length of simple curves, Finding areas bounded by simple curves Volume of solids of revolution, centre of mean of plane areas.
   - 2.3 Simposns 1/3rd and Simposns3/8th rule and Trapezoidal Rule : their application in simple cases. Numerical solutions of algebraic equations; Bisections method, Regula-Falsi method, Newton-Raphson's method(without proof), Numerical solutions of simultaneous equations; Gauss elimination method(without proof)

3. Co-ordinate Geometry (2 Dimension) (18 Periods)

   3.1 Circle

   Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.

4. Co-ordinate Geometry (3 Dimension) (12 Periods)

4.1 Straight lines and planes in space
Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line (without proof)

INSTRUCTONAL STRATEGY

Basic elements of Differential Calculus, Integral Calculus and differential equations can be taught conceptually along with real engineering applications in which particular algorithm and theory can be applied. Numerical examples will be helpful in understanding the content of the subject.

MEANS OF ASSESSMENT

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests
- Model/Prototype Making

RECOMMENDED BOOKS

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3 Applied Mathematics-II by Chauhan and Chauhan, Krishna Publications, Meerut**.**
4. Applied Mathematics-I (B) by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut
5. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	20	28
2.	20	28
3.	18	24
4	12	20
Total	**70**	**100**

2.2 APPLIED PHYSICS – II

L	T	P
5	-	2

RATIONALE

Applied physics includes the study of a diversified topics related to 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 behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this course content.

Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to learn and appreciate these concepts and principles. In all contents, SI units should be followed.

LEARNING OUTCOMES

After undergoing this subject, the student will be able to;

- Define wave motion its types (Transverse and Longitudinal), Periodic and Simple Harmonic Motion, solve simple problems.
- Define the terms: frequency, amplitude, wavelength, velocity of a wave.
- Explain various Engineering, Medical and Industrial applications of Ultrasonics.
- Apply acoustics principles to various types of buildings to get best sound effect
- Explain diffraction, interference, polarization.
- Define capacitance and its unit. They will be able to explain the function of capacitors in simple circuits, solve simple problems using C=Q/V
- Explain the role of free electrons in insulators, conductors and semiconductors, qualitatively the terms: potential, potential difference, electromotive force.
- Explain the concept of electric current, resistance and itsmeasurement.
- List the effects of an electric current and their common applications, State and apply Ohm's law, calculate the equivalent resistance of a variety of resistor combinations, determine the energy consumed by an appliance, distinguish between AC and DC electricity
- Explain Biot-Savart Law, Ampere's law, Lorenz Force.
- State the laws of electromagnetic induction, describe the effect on a current-carrying conductor when placed in a magnetic field
- Explain operation of moving coil galvanometer, simple DC motor
- Apply the knowledge of diodes in rectifiers, adapters IC's and various electronic circuits. Apply the concept of light amplification in designing of various LASER based instruments and optical sources.
- Explain total internal reflection and apply this concept for optical fibre and its uses in Medical field and Communication.

DETAILED CONTENTS

1. Wave motion and its applications (12 periods)

    1.1 Wave motion, transverse and longitudinal wave motion with examples, sound and light waves, relationship among wave velocity, frequency and wave length and its application

1.2 Wave equation y = r sin wt, phase, phase difference, principle of superposition of waves

1.3 Simple Harmonic Motion (SHM): definition and characteristic, expression for displacement, velocity, acceleration, time period, frequency in S.H.M., Energy of a body executing S. H. M., simple pendulum, concept of simple harmonic progressive wave,

1.4 Free, Damped and forced oscillations, Resonance with examples, Q-factor

1.5 Definition of pitch, loudness, quality and intensity of sound waves, intensity level, Echo and reverberation, Sabine formula for reverberation time(without derivation), coefficient of absorption of sound, methods to control reverberation time and their applications, Accoustics of building defects and remedy.

1.6 Ultrasonics –production, detection, properties and applications in engineering and medical applications.

2. Wave Optics (6 periods)

2.1 Dual nature of light, wave theory of light, laws of reflection and refraction, Snell's law, Power of lens, magnification.

2.2 ,Two-Source Interference, Double-Slitinterference, Interference dueto thin films, Fresnel's biprism.

2.3 use of interference making highly efficient solar panel.

2.4 diffraction, Single Slit diffraction, Intensity calculation etc

2.5 Polarization of electromagnetic waves,polarizing sheets, polarizing by Reflection (Brewser's law), Malus law, use of polariods.

3. Electrostatics (12 periods)

3.1 Concept of charge, Coulombs law, Electric field of point charges, Electric lines of force and their properties, Electric flux, Electric potential and potential difference.

3.2 Gauss law of electrostatics: Application of Gauss law to find electric field intensity of straight charged conductor, plane charged sheet and charged sphere.

3.3 Capacitor and its working principle, Capacitance and its units. Capacitance of parallel plate capacitor. Series and parallel combination of capacitors (numericals), charging and discharging of a capacitor.

3.4 Dielectric and its effect on capacitance, dielectric break down.

3.5 Application of electrostatics in electrostatic precipitation of microbes and moisture separation from air and gases in industry for pollution control (Brief explanation only)

4. Current Electricity (12 periods)

4.1 Electric Current, Resistance, Specific Resistance, Conductance, Specific Conductance, Series and Parallel combination of Resistances. Factors affecting Resistance, Colour coding of carbon Resistances, Ohm's law. Superconductivity.

4.2 Kirchhoff's laws, Wheatstone bridge and its applications (meter bridge and slide wire bridge)

4.3 Concept of terminal potential difference and Electro motive force (EMF), potentiometer.

4.4 Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy

4.5 Examples of application of DC circuits in various electrical and electronics equipment such as C.R.O, T.V., Audio-Video System, Computers etc.

5. Magneto Statics and Electromagnetism (12 periods)

5.1 Magnetic poles, force on a moving charge, circulating charges, force on a current carrying wire, Hall effect, torque on a current loop.

5.2 Magnetic field due to moving charge(Biot-Savart Law), due to current (Biot-Savart Law), parallel currents, field of a solenoid, Ampere's law.

5.3 Faraday's law, Lenz' law, motional emf, induced electric fields.

5.4 Magnetic dipole and force on a magnetic dipole in a non-uniform field, Magnetization, Gauss' law for magnetism.

5.5 Types of magnetic materials. Dia, para and ferromagnetic materials with their properties,

5.6 Application of electromagnetism in ac/dc motors and generators.

6. Semiconductor physics (8 periods)

6.1 Types of materials (insulator, semi conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction diode and its V-I characteristics

6.2 Diode as rectifier – half wave and full wave rectifier (centre taped),

6.3 Semiconductor transistor, pnp and npn (concepts only)

6.4 Application of semiconductor diodes (Zener, LED) and that of transistor as amplifier and oscillator.

7. Modern Physics (8 Periods)

7.1 Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; laser and its characteristics, population inversion, Types of lasers; Ruby and He-Ne lasers, engineering and medical applications of lasers.

7.2 Fibre optics: Total internal reflection and its applications, Critical angle and conditions for total internal reflection, introduction to optical fibers, light propagation, types, acceptance angle and numerical aperture, types and applications of optical fibre in communication.

7.3 Introduction to nanotechnology, nanoparticles and nano materials,

LIST OF PRACTICALS (To perform minimum six experiments)

1. To determine the velocity of sound with the help of resonance tube.
2. To find the focal length of convex lens by displacement method.
3. To find the refractive index of the material of given prism using spectrometer.
4. To find the wavelength of sodium light using Fresnel's biprism.
5. To verify laws of resistances in series and parallel combination
6. To verify ohm's laws by drawing a graph between voltage and current.

7. To measure very low resistance and very high resistances using Slide Wire bridge
8. Conversion of Galvanometer into an Ammeter and Voltmeter of given range.
9. To draw hysteresis curve of a ferromagnetic material.
10. To draw characteristics of a pn junction diode and determine knee and break down voltages.
11. To find wave length of the laser beam.
12. To find numerical aperture of an optical fiber.

INSTRUCTIONAL STATREGY

Teacher may use various teaching aids like live models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

MEANS OF ASSESSMENT

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Model Making,
- Actual Lab & Practical Work,
- Viva-Voice

RECOMMENDED BOOKS

1. Text Book of Physics (Part-I, Part-II); N.C.E.R.T., Delhi
2. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3. A Text Book of Optics, Subramanian and BrijLal, S Chand & Co., New Delhi
4. Practical Physics, by C. L. Arora, S Chand publications
5. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
6. Modern Engineering Physics by SL Gupta, Sanjeev Gupta, DhanpatRai Publications.
7. Physics Volume 2, 5th edition, HalidayResnick and Krane, Wiley publication
8. Fundamentals of Physics by Haliday, Resnick& Walker 7th edition, Wiley publication
9. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	12	18
2	6	8
3	12	18
4	12	16
5	12	16
6	8	12
7	8	12
Total	**70**	**100**

2.3 BASICS OF INFORMATION TECHNOLOGY

L	T	P
-	-	6

RATIONALE

Information technology has great influence on all aspects of life. Primary purpose of using computer is to make the life easier. Almost all work places and living environment are being computerized. The subject introduces the fundamentals of computer system for using various hardware and software components. 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 using MS Office/Open Office/Libre 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:

Explanation of Introductory part should be demonstrated with practical work. Following topics may be explained in the laboratory along with the practical exercises. There will not be any theory examination.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Identify Computer Hardware Components, Network Components and Peripherals.
- Explain the role of an Operating System.
- Install System and Application Software.
- Explain the function of the system components including Processor, Motherboard and Input-output devices.
- Use Word Processing Software to prepare document.
- Use Spreadsheet Software to create workbooks and automate calculation.
- Use Presentation Software to create interactive presentation.
- Perform fundamental tasks common to most application software including print, scan, save, edit, cut, copy, paste, format, spell and grammar check.
- Find and evaluate information on the Web.
- Install Antivirus.
- Safeguard against Online Frauds, threats and crimes.
- Use online office tools(Google suits)

TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION

1. Introduction to Computers and Peripherals.

   Components of Computer, Types of Computer, CPU, RAM, ROM, Hard disk, USB, Flash drive, CD, DVD,Blue ray, Keyboard, Mouse, Monitor, LCD, Printer, Plotter, Scanner, Modem, Sound Cards, Speakers, CMOS battery, Sharing of Printers.

2. Operation System and Application Software

   System Software, Application Software, Virtualization Software, Utility Software, MS Office/Open Office/Libreoffice, Working with window, Desktop components, Menu bars, creating shortcut of program. Installation of Application softwares, Antivirus and Drivers.

3. Word Processing, Spreadsheet and Presentation

   Usage and creation of word document, spreadsheets and presentation, Google Suits (Google drive, google sheet, google doc. Google presentation)

.

4. Internet

   Basics of Networking – LAN, WAN, Wi-Fi technologies, Concept of IP Addrsses, DNS, Search Engines, e-mail, Browsing and cyber laws.

LIST OF PRACTICAL EXERCISES

1. Identify various components, peripherals of computer and list their functions.
2. Installation of various application software and peripheral drivers
3. Installation of operating system (windows/linux/others)
4. Creation and Management (Rename, delete, search of file and folders)
5. Installation of Antivirus and remove viruses
6. Scanning and printing documents
7. Browsing, Downloading, Information using Internet
8. E-Mail ID creation, comparing, sending and receiving e-mail. Attaching a file with e-mail message.

. 9. Word Processing (MS Office/Open Office)

   a) 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

   b) Page set up:
   - Setting margins, tab setting, ruler, indenting

c) Editing a document:
- Entering text, cut, copy, paste using tool- bars

d) 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, autotext
- Inserting date, time, special symbols, importing graphic images, drawing tools

e) 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

f) Using Tools like:
- Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelops and lables
- Using shapes and drawing toolbar,
- Working with more than one window.

10. Spread Sheet Processing (MS Office/Open Office/Libre Office)

a) Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, save worksheet, switching between different spread sheets

b) Menu commands:
Create, format charts, organise, manage data, solving problem by analyzing data. Programming with Excel Work Sheet, getting information while working

c) 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
Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet, conditional formatting

d) 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

e) Retrieve data with query:
Create a pivot table, customizing a pivot table. Statistical analysis of data
f) Exchange data with other application:
Embedding objects, linking to other applications, import, export document.

11. PowerPoint Presentation (MS Office/Open Office/Libre office)

a) Introduction to PowerPoint
- How to start PowerPoint
- Working environment: concept of toolbars, slide layout & templates.
- Opening a new/existing presentation
- Different views for viewing slides in a presentation: normal, slide sorter.

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 organizational chart
- Editing objects
- Working with Clip Art

d) Formatting slides
- Using slide master
- Text formatting
- Changing slide layout
- Changing slide colour scheme
- Changing background
- Applying design template

12. Google Suits
Using Google drive, Google shut, Google docs, Google slides.

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts, peripherals, connections and proficient in making use of MS Office/Open Office/Libre office/Google Suit in addition to working on internet. The student should be made capable of working on computers independently.

MEANS OF ASSESSMENT

- Class Tests/Quiz
- Software Installation and Use
- Viva-Voce
- Presentation

RECOMMENDED BOOKS

1. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Information Technology for Management by Henery Lucas, Tata McGraw Hills, New Delhi
3. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
4. Computers Today by SK Basandara, Galgotia publication Pvt Ltd. Daryaganj, New Delhi.
5. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
6. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, 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 AnushkaWirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
10. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar
11. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

Online Resources

1. www. tutorialspoint..com
2. www.sf.net
3. Gsuite.google.com
4. Spoken-tutorial.org
5. Swayam.gov.in

2.4 ELECTRICAL ENGINEERING-I

L	T	P
4	-	4

RATIONALE

The objective of this subject is to impart fundamental knowledge and skills regarding basic electrical engineering, which diploma holders will come across in their professional life. This course will provide the student to understand the basic concept and principles of dc and ac fundamentals, electromagnetism, batteries, electrical materials, electrical safety etc.

LEARNING OUTCOMES

After undergoing the subject, the student will be able to:

- Classify various materials into conductor, semiconductor and insulator.
- Describe the properties of conducting, insulating and magnetic materials.
- Understand Kirchhoff's laws to solve simple DC circuit.
- Understand various network theorems such as Thevenin's theorem, Norton theorem, and superposition theorem to solve simple circuit problems.
- Understand AC Circuit Theory.
- Understand construction, rating & safety measures for batteries.

DETAILED CONTENTS

1. Classification (2 Periods)

   Classification of materials into conducting materials, insulating materials and Semi-conducting materials with reference to their atomic structures.

2. Conducting Materials (6 Periods)

   2.1 Resistivity and factors affecting resistivity such as temperature, alloying and mechanical stressing.

   2.2 Classification of conducting materials into low resistivity and high resistivity materials. Some examples of each and their typical applications.

3. Insulating Materials (10 Periods)

   3.1 Electrical Properties:

   Volume resistivity, surface resistance, Dielectric loss, Dielectric strength (Break down voltage) and Dielectric constant.

3.2. Chemical Properties:
Solubility, Chemical resistance and Weatherability.

3.3 Physical Properties:
Hygroscopicity, Tensile and Compressive strength, Abrasive resistance, Brittleness.

3.4 Thermal Properties:
Heat resistance, classification according to permissible temperature rise, Effect of electrical overloading on the life of an electrical appliance.

3.5 Plastic Insulating Materials:
Classification into thermoplastic and thermosetting categories, example of each and their typical applications.

4. Magnetic Materials (4 Periods)
   - 4.1 Ferromagnetism, Domains, permeability, hysteresis loop-(including coercive force and residual magnetism) and magnetic saturation.
   - 4.2 Soft and Hard magnetic materials, their examples and typically applications.
5. Electro Magnetism (8 Periods)
   - 5.1 Concept of mmf, flux, reluctance and permeability.
   - 5.2 Energy stored in a magnetic field and an inductor.
   - 5.3 Solution of problems on magnetic circuits.
   - 5.4 Faraday's laws of electromagnetic induction, Lenz's law, Physical explanation of self and mutual inductance.
   - 5.5 B-H curve, Hysteresis, Eddy currents-elementary ideas and significance.
   - 5.6 Growth and decay of current in an inductive circuit.
   - 5.7 Force between two parallel current carrying conductors and its significance.
   - 5.8 Current carrying conductors in magnetic field and its significance

6. D.C Circuits (11 Periods)
   - 6.1 Ohm's law, resistivity, effect of temperature on resistances, heating effect of electric current, conversion of mechanical units into electrical units.
   - 6.2 Kirchhoff's laws, application of Kirchhoff laws to solve simple dc circuits.
   - 6.3 Thevenin's theorem, maximum power transfer theorem, Norton's theorem and super position theorem, simple numerical problems.

7. A.C Theory (11 Periods)
   - 7.1 Concept of alternating voltage and current, difference between AC and DC .
   - 7.2 Generation of alternating voltage, equation of sinusoidal waveform.
   - 7.3 Definition and concept of cycle, frequency, Time period, amplitude, instantaneous value, average value, RMS value, peak value, form factor, Peak factor.
   - 7.4 Phase and phase difference, representation of alternating quantities by phasor, addition and subtraction of alternating quantities.

8. Batteries (4 Periods)

8.1 Construction of lead acid and nickel cadmium batteries.
8.2 Charging and maintenance of batteries.
8.3 Rating of batteries.
8.4 Back up batteries (Lithium & Silver Oxide batteries).
8.5 Shelf life of batteries.

LIST OF PRACTICALS

1. Ohm's law verification.

2. To verify the laws of series and parallel connection of resistance i.e. to verify:-

   i. Total resistance in series connections.

   $R_T = R_1 + R_2 + R_3 \ldots\ldots$
   Where R_T is total resistance and R_1, R_2, R_3 etc. are the resistances connected in series.

   ii. Total resistance in parallel connections.

   $1/R_T = 1/R_1 + 1/R_2 + 1/R_3 \ldots\ldots\ldots$
   Where R_T is total resistance and R_1, R_2, R_3 etc. are the resistances connected in parallel circuit.

3. To verify the laws of series and parallel connection of capacitance i.e. to verify:-

   i. Total capacitance in series connections.

   $1/C_T = 1/C_1 + 1/C_2 + 1/C_3 \ldots\ldots\ldots$
   Where C_T is total capacitance and C_1, C_2, C_3 etc. are the capacitances connected in series.

   ii. Total capacitance in parallel connections.

   $C_T = C_1 + C_2 + C_3 \ldots\ldots$
   Where C_T is total capacitance and C_1, C_2, C_3 etc. are the capacitances connected in parallel.

4. To verify Kirchhoff's following laws:-
   i. The algebraic sum of the currents at a junction is zero.

   ii. The algebraic sum of the emf in any closed circuit is equal to the algebraic sum of IR products (drops) in that circuit.

5. To measure the resistance of an ammeter and a voltmeter and to conclude that ammeter has very low resistance whereas voltmeter has very high resistance.
6. To verify Thevenin's and maximum power transfer theorems.
7. To find the ratio of inductance values of a coil having air core and iron core respectively and thus see that by the introduction of magnetic material inside the coil, the induction value of coil is substantially increased.

8. To test a battery for charged and discharged condition and to make connections for its charging.
9. To show that the range of an ammeter (dc and ac) and a voltmeter (dc and ac) can be extended with the use of shunts and multipliers.
10. To convert the given galvanometer into voltmeter and an ammeter.

INSTRUCTIONAL STRATEGY

The teachers should give emphasis on understanding of concept and various terms used in the Electrical Engineering. Practical exercises will reinforce various concepts.

ASSESSMENT TOOLS

- Class Tests
- Home Assignments
- Attendance
- Sessional Test

RECOMMENDED BOOKS

1. Electrical Technology by B L Thareja; S Chand & Co.
2. Basic Electrical Engineering by J B Gupta; S K Kataria and Sons, New Delhi
3. Basic Electrical Engineering by J S Katre; Technical Max. Publication Pune
4. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	No. of Periods	Marks (%)
1.	02	04
2.	06	11
3.	10	18
4.	04	07
5.	08	13
6.	11	20
7.	11	20
8.	04	07
Total	**56**	**100**

2.5 ELECTRONIC COMPONENTS & DEVICES

L	T	P
6	-	6

RATIONALE

Knowledge of Electronic components & devices is quite essential for a student of electronic engineering diploma programme. With the knowledge of these active and passive components he will work successful in every field of the branch. Therefore a diploma student in electronics engineering must be equipped with the fundamental knowledge about electronic components, voltage and current source, semi conductor diode, transistors and FET for successful handling of industrial problems.

LEARNING OUTCOMES

After undergoing the subject, the student will be able to:

- Indentify and distinguish between active components (BJT, FET etc) and passive components (Resistor, Capacitor, inductor etc).
- Understand voltage and current sources as well as their interconversions.
- Understand the working and application of semiconductor diode including half wave rectifier & Full wave rectifier.
- Understand the working of BJT and hence able to design amplifier using it.
- Compare various transistors biasing circuit and stabilize their operating points.
- Understand the working of FET and hence able to design amplifier using it.
- Compare BJJT, JFET, MOSFET & CMOS.

DETAILED CONTENTS

1. Introduction to Electronics (06 Periods)
   - 1.1 Application of electronic in different fields.
   - 1.2 Brief introduction to active components and devices.
2. Passive Components (12 Periods)
   - 2.1. Resistor- Working characteristics/properties, Resistors-Carbon film, metal-film, carbon composition, wire wound and variable type (presets and potentiometers) constructional details, characteristics (size, voltage, tolerance temperature and frequency dependence) , noise consideration, specification, Testing, mutual comparison and typical applications, Voltage Dependent Resistor (VDR).
   - 2.2. Capacitors- Working characteristics/properties, Capacitors-polyester, Metalized polyester, ceramic paper mica and electrolytic tantalum and solid aluminium types; construction details and testing, specifications, mutual comparison & typical applications.
   - 2.3. Inductors, Transformers and RF coils- Working characteristics/properties Methods of manufacture of inductors, RF coils and small power and AF transformer and their testing, Properties of cores, Needs and type of shielding.
3. Voltage And Current Sources (06 Periods)
   - 3.1. Concept of constant voltage sources, symbol and graphical representation, characteristics of ideal and practical voltage sources.

3.2. Concept of constant current source, symbol and graphical representation, characteristics of ideal and practical current sources.
3.3 Conversion of voltage sources into a current sources and vice-versa.
3.4 Concept of floating and grounded D.C. supplies.

4. Semiconductor Diode (12 Periods)

4.1. P-N junction diode, Mechanism of current flow in P-N junction, drift and diffusion currents, depletion layer, potential barriers, P-N junction diode characteristics, Zener& avalanche breakdown, Concept of junction capacitance in forward & reverse bias conditions.
4.2. Semiconductor diode characteristics, dynamic resistance & their calculation from diode characteristics, dynamic resistance of diode in terms of diode current, Variation of leakage current and forward voltage with temperature (No derivations).
4.3 Diode (P-N Junction) as rectifier, Half wave rectifier, full wave rectifier including bridge rectifier, relationship between D.C output voltage and A.C input voltage, rectification efficiency and ripple factor for rectifier circuits, filter circuits- shunt capacitor, series inductor, bleeder resistance, working of the filter and typical application of each type
4.4. Different types of diodes, characteristics and typical application of power diodes, zener diodes, varactor diodes, point contact diodes, tunnel diodes, LEDs and photo diodes
4.5. Important specification of rectifier diode and zener diode.

5. Introduction to Bipolar Transistor: (12 Periods)

5.1. Concept of bipolar transistor as a two junction three terminal device having two kinds of charge carriers, PNP an NPN transistor, their symbol and mechanism of current flow, explanation of fundamental current relations, Concept of leakage current, effect of temperature on leakage current, Standard notation for current and voltage polarity.
5.2. CB, CE and CC configurations.
   a. Common base configuration (CB): input and output characteristics, determination of transistor parameters (input and output) dynamic resistance, current amplification factor.

   b. Common emitter configuration (CE): current relations in CE configuration, collector current in term of base current and leakage current (I_{CEO}) relationship between the leakage current in CB and CE configuration , input and output characteristics, determination of dynamic input and output resistance and current amplification factor β from the characteristics.

   c. Common collector configuration (CC): Expression for emitter current in terms of base current and leakage current in CC configuration.

5.3. Comparison of CB and CE configuration with regards to dynamic input and output resistance, current gain and leakage current performance of CE configuration for low frequency voltage amplification, Typical application of CB configuration in amplification.

5.4. Transistor as an amplifier in CE configuration.

a. DC load line, its equation and drawing it on collector characteristics.

b. Determination of small signal voltage and current gain of basic transistor amplifier using CE output characteristics and DC load line, Concept of power gain as a product of voltage gain and current gain.

6. Transistor Biasing And Stabilization Of Operating Point (09 Periods)

6.1. Different transistor biasing circuits for fixing the operating points, effect of temperature on operating point.
Need and method for stabilization of operating point.
Effect of fixing operating point in cut-off or saturation region on performance of amplifier

6.2. Calculation of operating point for different biasing circuits, use of Thevenin's theorem in analyzing potential divider biasing circuit.

6.3. Simple design problems on potential divider biasing circuits.

7. Single Stage Transistor Amplifier (09Periods)

7.1. Analysis of Single Stage CE, CB and CC amplifier.

7.2. Single stage CE amplifier circuits with proper biasing components.

8. Field Effect Transistor (Fet) (06 Periods)

8.1. Construction, operation, characteristics and Biasing of Junction FET.

8.2. Analysis of Single Stage CS,CG and CD amplifiers. (Only Brief Idea)

9. MOSFET (06 Periods)

9.1 Construction, operation, Characteristics and Biasing of MOSFET in both depletion and enhancement modes.

9.2 Analysis of Single Stage CS, CG and CD amplifiers. (Only Brief Idea)

10. CMOS (06 Periods)

10.1 Construction, operation and Characteristics of CMOS in both depletion and enhancement modes.

10.2 Use of CMOS as Invertor, Different application of CMOS, CMOS IC.

10.3 Comparison of JEET, MOSFET and Bipolar Transistor.

LIST OF PRACTICALS

1. Identification of types of packages, terminals and noting different ratings using data books for various types of semiconductor diodes (Germanium, point contact, silicon low power, high power and switching diode).
2. Familiarization with lab instruments (Multi-meter/CRO), etc.
3. Testing of various passive and active components.

4. Plotting of forward V-1 characteristics for a point contact and P-N junction diode (Silicon & Germanium diode).
5. To Plot forward and reverse V-I characteristics for a zener diode.
6. Rectifier circuits using semiconductor diode, measurement of input and output voltage and plotting of input and output wave shapes.
   i) Half wave rectifier
   ii) Full wave rectifier (centre tapped and bridge rectifier circuits)
7. To Plot wave shapes of a full wave rectifier with shunt capacitor, series inductor and filter circuit.
8. To Plot the input and output characteristics and calculation of parameters of a transistor in common base configuration
9. To Plot input and output characteristics and calculation of parameters of a transistor in common emitter configuration.
10. Transistor Biasing circuits
    i) Measurement of operating point (Ic&Vce) for a fixed bias circuit.
    ii) Potential divider biasing circuits.
    (Measurement can be made by changing the transistor in the circuits by another of a same type number).
11. Plot the FET characteristics and determination of its parameters from these characteristics.
12. Measurement of voltage gain at 1 KHZ for different load resistance for a BJT amplifier circuit.
13. Measurement of voltage gain for a JFET amplifier circuit.
14. Measurement of voltage gain for a MOSFET amplifier circuit.

INSTRUCTIONAL STRATEGY

Electronic Components & Devices being a fundamental subject, it needs to be handled very carefully and in a manner such that students develop clear understanding of the related concepts and principles. The teacher may lay more emphasis on laboratory work and give home assignments to students to inculcate self study and problem solving abilities amongst them.

MEANS OF ASSESSMENT

- Class Tests
- Home Assignments
- Attendance
- Sessional Test

RECOMMENDED BOOKS

1. Bhargava, Kulshreshttha& Gupta – "Basic Electronics& Linear Circuits" – Tata Mc-graw-Hill.
2. Malvino, A. P.-"Electronics Principles" –Tata Mcgraw-Hill
3. Robert.L.Boylestad – "Electronic Devices & Circuits Theory" – Pearson Publication.
4. V.K.Mehta- "Principles of electronics" – S.Chand Publication.
5. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Period Allotted	Marks Allotted (%)
1.	6	7
2.	12	14
3.	6	7
4.	12	14
5.	12	15
6.	9	11
7.	9	11
8.	6	7
9.	6	7
10.	6	7
Total	**84**	**100**

2.6 GENERAL WORKSHOP PRACTICE –II

(For Electronics Engineering)

L	T	P
-	-	8

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 hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

LEARNING OUTCOMES

After completing the course, the students will be able to:

- Identify tools and equipment used and their respective functions.
- Identify different types of materials and their basic properties.
- Use and take measurements with the help of basic measuring tools/equipment.
- Select proper tools for a particular operation.
- Select materials, tools, and sequence of operations to make a job as per given specification/drawing.
- Prepare simple jobs independently and inspect the same.
- Follow safety procedures and precautionary measures.
- Use safety equipment and Personal Protection Equipment.

DETAILED CONTENTS (PRACTICAL EXERCISES)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus:

1. Carpentry Shop
2. Painting and Polishing Shop
3. Electroplating Shop
4. Computer Shop

1. CARPENTRY SHOP

1.1 General Shop Talk

1.1.1 Name and use of raw materials used in carpentry shop : wood & alternative materials

1.1.2 Names, uses, care and maintenance of hand tools such as different types of Saws, C-Clamp, Chisels, Mallets, Carpenter's vices, Marking gauges, Try-squares, Rulers and other commonly used tools and materials used in carpentry shop by segregating as cutting tools, supporting tools, holding tools , measuring tools etc.

1.1.3 Specification of tools used in carpentry shop.

1.1.4 Different types of Timbers, their properties, uses & defects.

1.1.5 Seasoning of wood.

1.2. Practice

1.2.1 Practices for Basic Carpentry Work

1.2.2 Sawing practice using different types of saws

1.2.3 Assembling jack plane — Planning practice including sharpening of jack plane cutter

1.2.4 Chiselling practice using different types of chisels including sharpening of chisel

1.2.5 Making of different types of wooden pin and fixing methods. Marking measuring and inspection of jobs.

1.3 Job Practice

Job 1	Marking, sawing, planning and chiselling and their practice
Job II	Half Lap Joint (cross, L or T – any one)
Job III	Mortise and Tenon joint (T-Joint)
Job IV	Dove tail Joint (Lap or Bridle Joint)

1.4. Demonstration of job showing use of Rip Saw, Bow saw and Tenon saw, method of sharpening various saws.

2. PAINTING AND POLISHING SHOP

2.1. Introduction of paints, varnishes, Reason for surface preparation, Advantages of Painting, other method of surface coating ie. Electroplating etc.

2.2. Job Practice

Job 1: To prepare a wooden surface for painting apply primer on one side and to paint the same side. To prepare french polish for wooden surface and polish the other side.

Job II: To prepare metal surface for painting, apply primer and paint the same.
Job III: To prepare a metal surface for spray painting, first spray primer and paint the same by spray painting gun and compressor system.

The sequence of polishing will be as follows:

i) Abrasive cutting by leather wheel
ii) Polishing with hard cotton wheel and with polishing material
iii) Buffing with cotton wheel or buff wheel.

3. ELECTROPLATING SHOP

3.1. Use of personal protective equipments and safety precautions while working.
3.2. Introduction and demonstration of machines and equipment used in electroplating shop
3.3 Practice Job
Job I : Electroplating practice i.e. Nickel plating

4. COMPUTER SHOP

4.1 Keyboard
- 4.1.1 Types of Keyboards
- 4.1.2 Interfacing (PS2, USB port, DIN connector)
- 4.1.3 Working

4.2 Mouse
- 4.2.1 Types of Mouse
- 4.2.2 Interfacing (serial, PS2, USB)
- 4.2.3 Working

4.3 Printers
- 4.3.1 Types (Dot matrix, Inkjet, Laserjet)
- 4.3.2. Interfacing (parallel port, USB port, Networking)
- 4.3.3. Working
- 4.3.4. Maintenance (cartridge change etc)
- 4.3.5 Installation of printers
- 4.3.6 Troubleshooting (Driver compatibility, Paper jam, printing problems due to uncleaned drum in laserjet printers, belt related problems in inkjet printer, jets choking problem in inkjet printer, color alignment problem).
- 4.3.7 Tracing network printer and sharing it.

4.4 Scanner
- 4.4.1 Types
- 4.4.2 Interfacing
- 4.4.3 Scanning a document

4.5 Monitor
- 4.5.1 Types and Interfacing

4.5.2 Fault finding and repairing

4.6 CPU

4.6.1. Motherboard connection (dimensions, processor, chipset, BIOS, EFI (Extended Firmware Interfacing), UFI (Unified Firmware Interfacing).

4.6.2 SMPS-AT

- Working
- Voltage levels

MEANS OF ASSESSMENT

- Workshop jobs
- Report writing, presentation and viva voce

RECOMMENDED BOOKS

1. Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
6. Workshop Technology by B.S. Raghuwanshi; DhanpatRai and Co., New Delhi
7. Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi.
8. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

3.1 APPLIED MATHEMATICS –III

L	T	P
5	-	-

RATIONALE

Contents of this course provide understanding of some elementary and advanced mathematics algorithms and their applications of solving engineering problems. Content of this course will enable students to use some advanced techniques like Beta-Gamma function, Fourier series, Laplace transform and probability distributions in solving complex engineering problems.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Understand matrix operations and uses of matrix in different problems.
- Apply elementary row and column operations in finding inverse of a matrix.
- Find Eigen values, Eigen vectors of a matrix and their different properties.
- Understand degree/order of differential equations and their solution techniques.
- Use differential equations in engineering problems of different areas.
- Find Fourier series expansion of a function
- Apply Laplace transform and their applications in solving engineering problems.
- Understand concept of probability distribution and their applications.

DETAILED CONTENTS

1. Matrices (16 Periods)

    1.1 Algebra of Matrices, Inverse

Addition, Multiplication of matrices, Null matrix and a unit matrix, Square matrix, Symmetric, Skew symmetric, Hermitian, Skew hermition, Orthagonal, Unitary, diagonal and Triangular matrix, Determinant of a matrix.

Definition and Computation of inverse of a matrix.

1.2 Elementry Row/Column Transformation

Meaning and use in computing inverse and rank of a matrix.

1.3 Linear Dependence, Rank of a Matrix

Linear dependence/independence of vectors, Definition and computation of rank of matrix. Computing rank through determinants, Elementary row transformation and through the concept of a set of independent vectors, Consistency of equations.

1.4 Eigen Pairs, Cayley-Hamilton Theorem

Definition and evaluation of eign values and eign vectors of a matrix of order two and three, Cayley-Hamilton theorem (without Proof)and its verification, Use in finding inverse and powers of a matrix.

2. Differential Calculus (15 Periods)

2.1 Function of two variables, identification of surfaces in space, conicoids

2.2 Partial Differentiation

Directional derivative, Gradient, Use of gradient f, Partial derivatives, Chain rule, Higher order derivatives, Euler's theorem for homogeneous functions, Jacobians.

2.3 Vector Calculus

Vector function,Introduction todouble and triple integral,differentiation and integration of vector functions, gradient, divergence and curl, differential derivatives.

3. Differential Equation(15 Periods)

3.1 Formation, Order, Degree, Types, Solution

Formation of differential equations through physical, geometrical, mechanical and electrical considerations, Order, Degree of a differential equation, Linear, nonlinear equation.

3.2 First Order Equations

Variable seperable, equations reducible to seperable forms, Homogeneous eqution, equations reducible to homogeneous forms, Linear and Bernoulli form exact equation and their solutions.

3.3 Higher Order Linear Equation :

Property of solution, Linear differential equation with constant coefficients (PI for $X= e^{ax}$, Sinax, Cosax, X^n, $e^{ax}V$, XV

3.4 Simple Applications

LCR circuit, Motion under gravity, Newton's law of cooling, radioactive decay, Population growth, Force vibration of a mass point attached to spring with and without damping effect. Equivalence of electrical and mechanical system

4. Integral Calculus-II (12 Periods)

4.1 Beta and Gamma Functions
Definition, Use, Relation between the two, their use in evaluating integrals.
4.2 Fourier Series
Fourier series of f(x),-n<x<n, Odd and even function,Half range series.
4.3 Laplace Transform
Definition, Basic theorem and properties, Unit step and Periodic functions,inverse laplace transform, Solution of ordinary differential equations

5. Probability and Statistics (12Periods)

5.1 Probability
Introduction, Addition and Multiplication theorem and simple problem.

5.2 Distribution
Discrete and continuous distribution, Bionimal Distribution, Poisson distribution, Normal Distribution.

INSTRUCTONAL STRATEGY

The content of this course is to be taught on conceptual basis with plenty of real world examples. The basic elements of Laplace transform, Differential equations and Applications of differential equations can be taught with engineering applications of relevant branch.

MEANS OF ASSESSMENT

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests
- Model/Prototype Making

RECOMMENDED BOOKS

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3 Applied Mathematics-III by Chauhan and Chauhan, Krishna Publications, Meerut.
4. Applied Mathematics-II by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut.
5. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	16	24

2.	15	20
3.	15	20
4	12	18
5	12	18
Total	**70**	**100**

3.2 ELECTRICAL ENGINEERING-II

L	T	P
4	-	4

RATIONALE

Electricity is said to be the life of industries. We cannot think of an industry without using electricity. Theelectrical appliances commonly used for industrial application are Transformers, D.C. and A.C. motors and generators. Therefore basic knowledge of these appliances should be known to the student to facilitate him in routine working.

LEARNING OUTCOMES

After undergoing this subject, the students will be able to:

- understand the concept of AC theory and phasor diagram
- understand one elementary idea of 3-phase supply
- demonstrate the operation of transformers
- acquire the knowledge of DC machines and starters for DC machine.
- understand the working principle of alternators and synchronous motors.
- understand the working principle of single phase induction motor.

DETAILED CONTENTS

1 A.C.Theory (10 Periods)

1.1 Representation of sinusoidal quantities by phasors.

1.2 Physical explanation of the phase relationship between voltage and current when sinusoidal alternating voltage is applied across:-
(a) Pure resistance,
(b) Pure inductance and
(c) Pure capacitance.

1.3 Explanation of inductive reactance, capacitive reactance and their significance.

1.4 Relationship between voltage and current when alternating voltage is applied to
(a) Resistance and inductance in series,
(b) Resistance and capacitance in series.

1.5 Power in pure resistance, inductance and capacitance; power in combination of R-L-C circuits; power factor.

1.6 Active and reactive currents and their significance; practical importance of power factor.

1.7 Series and parallel resonance in R-L-C circuits, Q-factor of coils and capacitance.

2. Three Phase Supply (10 Periods)

2.1 Elementary idea about 3-phase supply.
2.2 Star and delta connection. Relationship between phase and line voltage and currents.
2.3 Power and power factor in three phase system and their measurement.
2.4 Comparison between three phase and single phase supply.

3. Transformers (10 Periods)

3.1 Principle of operation.
3.2 E.M.F equation, Voltage & Current relations.
3.3 Construction and applications of small transformers used in electronics and communication engg., construction of auto transformers, constant voltage transformer.
3.4 Phasor diagram of a transformer on load; Definition of regulation and efficiency; Elementary idea of losses in transformer, open circuit and short circuit test.

4. D.C. Machines (10 Periods)

4.1 D. C. Generator:
Working principle, constructional details, e.m.f equation, types of generators and their applications.
4.2 D. C. Motor:
Working principle, back e.m.f., types of D. C. motor and elementary idea of their characteristics, torque equation, methods of speed control (Description only).
4.3 Starters for D.C. Machines

5. Induction Motors (06 Periods)

5.1 Single Phase Induction Motor
Principle of operation and constructional details of single phase FHP induction motors (Split phase, capacitor start capacitor run, shaded pole, reluctance start, A.C. series, universal, hysterisis, servo and stepper motors their applications).
5.2 Starters for Induction motors

6. Synchronous Machines (10 Periods)

6.1 Alternators

Working principle, types of alternators, (brief description)

6.2 Synchronous Motors:

Working principle, construction details, vector diagram, effect of excitation on armature current and power factor, synchronous condenser.

6.3 Application of synchronous machines.

LIST OF EXPERIMENTS

1. To verify that in an A.C. circuit, the phasor sum (not the algebraic sum) of currents at any junction is zero.
2. To find the voltage-current relationship in a R-L series circuit and to measure power and power factor of the circuit.
3. To measure power and power factor in three phase system by two wattmeter method.
4. To determine the efficiency and regulation of a transformer by performing direct loading.
5. To measure the induced emf of separatly excited D.C. generator as a function of field current.
6. To measure the terminal voltage of a D.C. shunt generator as a function of load current.
7. To measure the speed of a separately excited D.C. motor as a function of load torque at rated armature voltage.
8. To observe the difference in the starting current at switching on single phase capacitor start induction motor with :-
   (a) The capacitor disconnected and
   (b) The capacitor connected.
   Also to determine how to reverse the direction of rotation.
9. To determine V curves of a synchronous motor.

INSTRUCTIONAL STRATEGY

The teacher should lay stress on the concept of single phase and three phase supplies. The students must be aware of transformers and DC machines, induction motor and its starters must be learned in depth by students.

MEANS OF ASSESSMENT

- Class test/quizzes
- Home assignments
- Attendance

- Sessional Test
- Practical Tasks

RECOMMENDED BOOKS

1. A Text book of Electrical Technology by B.L. Thereja, A.K Theraja by S. Chand Publication.
2. Basic Electrical Engineering by V.K Mehta, Rohit Mehta, S. Chand Publication.
3. Electrical Engineering by J. B. Gupta; S.K Kataria& Sons Publication.
4. E-books/e-tools to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	10	17
2.	10	17
3.	10	17
4.	10	17
5.	06	15
6.	10	17
Total	**56**	**100**

3.3 ENVIRONMENTAL STUDIES

L	T	P
3	-	2

RATIONALE

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the ecosystem and controlling pollution by various control measures. He should also be aware of environmental laws related to the control of pollution. He should know how to manage the waste. Energy conservation is the need of hour. He should know the concept of energy management and its conservation.

LEARNING OUTCOMES

After undergoing the subject, the student will be able to:

- Comprehend the importance of ecosystem and sustainable
- Demonstrate interdisciplinary nature of environmental issues
- Identify different types of environmental pollution and control measures.
- Take corrective measures for the abatement of pollution.
- Explain environmental legislation acts.
- Define energy management, energy conservation and energy efficiency
- Demonstrate positive attitude towards judicious use of energy and environmental protection
- Practice energy efficient techniques in day-to-day life and industrial processes.
- Adopt cleaner productive technologies
- Identify the role of non-conventional energy resources in environmental protection.
- Analyze the impact of human activities on the environment

DETAILED CONTENTS

a. Introduction (04 Periods)

1.1 Basics of ecology, eco system- concept, and sustainable development, Resources renewable and non renewable.

2. Air Pollution (04 Periods)

2.1 Source of air pollution. Effect of air pollution on human health, economy, plant, animals. Air pollution control methods.

3. Water Pollution (08 Periods)

3.1 Impurities in water, Cause of water pollution, Source of water pollution. Effect of water pollution on human health, Concept of dissolved O_2, BOD, COD. Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.

4. Soil Pollution (06 Periods)

4.1 Sources of soil pollution

4.2 Types of Solid waste- House hold, Hospital, From Agriculture, Biomedical, Animal and human, excreta, sediments and E-waste

4.3 Effect of Solid waste

4.4 Disposal of Solid Waste- Solid Waste Management

5. Noise pollution (06 Periods)
Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimize noise pollution.

6. Environmental Legislation (08 Periods)
Introduction to Water (Prevention and Control of Pollution) Act 1974, Introduction to Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board and National Green Tribunal (NGT), Environmental Impact Assessment (EIA).

7. Impact of Energy Usage on Environment (06 Periods)
Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain. Eco-friendly Material, Recycling of Material, Concept of Green Buildings.

LIST OF PRACTICALS

1. Determination of pH of drinking water
2. Determination of TDS in drinking water
3. Determination of TSS in drinking water
4. Determination of hardness in drinking water
5. Determination of oil & grease in drinking water
6. Determination of alkalinity in drinking water
7. Determination of acidity in drinking water
8. Determination of organic/inorganic solid in drinking water
9. Determination of pH of soil
10. Determination of N&P (Nitrogen & Phosphorus) of soil
11. To measure the noise level in classroom and industry.
12. To segregate the various types of solid waste in a locality.
13. To study the waste management plan of different solid waste
14. To study the effect of melting of floating ice in water due to global warming

INSTRUCTIONAL STRATEGY

In addition to theoretical instructions, different activities pertaining to Environmental Studies like expert lectures, seminars, visits to green house,effluent treatment plant of any industry,rain water harvesting plant etc. may also be organized.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests,
- Mid-term and end-term written tests

RECOMMENDED BOOKS

1. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.

2. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
3. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi
4. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.
5. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Co. (P) Ltd. Delhi.
6. Environmental Studies by ErachBharucha; University Press (India) Private Ltd., Hyderabad.
7. Environmental Engineering and Management by Suresh K Dhamija; S K Katariaand Sons, New Delhi.
8. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	04	10
2	04	10
3	08	20
4	06	14
5	06	14
6	08	20
7	06	12
Total	**42**	**100**

3.4 ELECTRONIC DEVICES AND CIRCUITS

L	T	P
6	-	6

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.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- demonstrate the concept of single stage amplifiers and multistage amplifier.
- describe the operation of large signal amplifiers.

- demonstrate the concept of negative and positive feedback.
- understand the operation of oscillators (Hartley, Colpitt, Wein Bridge)
- describe the various types of tuned voltage amplifiers
- design various wave-shaping circuits
- describe the concept of multi-vibrators and operational amplifiers
- understand the concept of regulated DC supplies.

DETAILED CONTENTS

1. Single and Multistage Amplifiers (10 Periods)

- Introduction to h-parameter in two port network
- Transistor hybrid low frequency model in CE configuration and its characteristics
- Need for multistage amplifier
- Gain of multistage amplifier
- Different types of multistage amplifier like RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth

2. Large Signal Amplifier (10 Periods)

- Difference between voltage and power amplifiers
- Importance of impedance matching in amplifiers
- Class A, Class B, Class AB, and Class C amplifiers,
- Single ended power amplifiers, Graphical method of calculation (without derivation) of output power; heat dissipation curve and importance of heat sinks. Push-pull amplifier, and complementary symmetry push-pull amplifier

3. Feedback Amplifiers (09 Periods)

- Basic principles and types of feedback
- Derivation of expression for gain of an amplifier employing feedback

- Effect of feedback (negative) on gain, stability, distortion and bandwidth of an amplifier
- RC coupled amplifier with emitter bypass capacitor
- Emitter follower amplifier and its application

4. Sinusoidal Oscillators

(09 Periods)

- Use of positive feedback
- Barkhausen criterion for oscillations
- 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 (09 Periods)

- Series and parallel resonant circuits and bandwidth of resonant circuits.
- Single and double tuned voltage amplifiers and their frequency response characteristics

6. Clipper and Clamper Circuit

(08 Periods)

- Introduction to Clipper
- Series and shunt Clipper, positive and negative peak Clipper, Bias Clipper using diode
- Clipper using Zener diode
- Introduction to Clamper
- Clamper Circuit analysis

7. Operational Amplifiers

(10 Periods)

- Characteristics of an ideal operational amplifier and its block diagram
- IC-741 and its pin configuration, equivalent circuit of OPAMP.

- Definition of differential voltage gain, CMRR, PSRR, slew rate and input offset current, offset voltage, Bias current
- Operational amplifier as an inverter, scale changer, adder, subtractor, differentiator, and integrator, log amplifiers, anti-log amplifier, comparator, Schmitt triggers, sample and hold circuit.

8. Multivibrator Circuits and IC Timer (09 Periods)

- Working principle of transistor as switch
- Concept of multi-vibrator: astable, monostable, and bistable and their applications
- Basic idea of ICs, fabrication of IC
- Block diagram of IC555 and its working and applications
- Monostable, Bistable and Astablemultivibrator by using IC-555

9. Regulated Power Supplies

- Basic regulated circuit by using Zener diode
- Concept of DC power supply. Line and load regulation
- Concept of fixed voltage, IC regulators (like 78XX, 79XX) and variable voltage regulator like (IC 723)

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 Colpitt's Oscillator
5. Plot the frequency response curve of phase shift and Wein bridge Oscillator
6. Use of IC 555 as monostable multivibrator and observe the output for different values of RC
7. Use of IC 555 as astablemultivibrator and observe the output at different duty cycles
8. To use IC 741 (op-amplifier) as
   i) Inverter, ii) Adder, iii) Subtractor iv) Integrator
9. To realize positive and negative fixed voltage DC power supply using three terminal voltage regulator IC (7805, 7812, 7905)
10. Observation of output waveform of different type of Clipper and Clamper Circuit

Class Project: Fabricate any simple operational amplifier circuit (Inverter, Adder, Subtractor etc.) and test it.

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. 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 apart from the list provided.

MEANS OF ASSESSMENT

- Class Test
- Home Assignment
- Attendance
- Quiz
- Sessional Test
- Practical Tasks

RECOMMENDED BOOKS

1. Basic Electronics and Linear Circuits by NN Bhargava; Tata McGraw Hill, New Delhi
2. Operational Amplifiers and Linear Integrated Circuits by Ramakant A. Gaykwad
3. Malvino A. P- Electronics principles "Tata McGraw- Hill"
4. Electronics Devices and Circuits by Robert L. Boylestad and L:ovis Nasherslay- Pearson Publication
5. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	10	12
2.	10	12
3.	09	11
4.	09	11
5.	09	11
6.	08	08
7.	09	11
8.	10	12

9.	10	12
Total	**84**	**100**

3.5 ELECTRONICS WORKSHOP

L T P
- - 6

PART-A ELECTRICAL WORKSHOP

LEARNING OUTCOMES:-

After completing this course the learner will be able to:

- Plan and Wire a small domestic building for a given load requirement.
- Specify the wiring plans of semi-industrial installations with three phase supply and a maximum of 5 KVA load.

Exercises to be Performed

1. Identification and study of commonly used electrical materials such as wires, cables, switches, fuses, coiling, roses, battens, cleats and allied items.
2. Identification and study of various tools used in Electrical Workshop and safety measures.
3. Making connection of single lamp and three pin plug socket to supply using batten wiring.
4. Making Electrical connection for staircase wiring.
5. Making of extension board with proper supply.

PART-B ELECTRONICS WORKSHOP

LEARNING OUTCOMES:-

After completion of instruction in this subject the student will:-

- Develop skill in selection and use of commonly used tools, equipment, components in a given situation.
- Develop skill in wiring, soldering and desoldering works.
- Develop skill in tracing circuits of simple (analog and digital) electronic assembly.

Exercise to be Performed

1. Name and function of different tools and accessories including Tapes, Solders, Solders tips, Fluxes; De-soldering wick, Solder cleaning fluids, Sleeves, Tags.

2. Demonstrate the correct use of accessories mentioned in (1) above.
3. Given different type of power supply mention in (c), the student should be able to find out the operating range and regulate the power supplies Equipment Type.
4. Test waveform Generator :- Audio oscillator, Function, Generator, Signal Generator, Spectrum Analyzer.
5. Measurement Equipment ; Single beam CRO, Double beam/Dual trace CRO, electronic and Digital multimeters, Transistor tester/Curve tracer, IC tester etc.
6. Power Supply - UPS, Invertor, different types of DC/AC power supplies
7. Various types of Single/Multicored, Insulated screened, Power type/ Audio/ Video/ General purpose wires and cables
8. Exercises to be performed
9. Study and testing of different types of Resistor, Capacitor, Inductor, Diode, Transistor (BJT, FET, MOS, CMOS) and ICs (All Popular Families).
10. Study of different processes by performing in assembling- Soldering, Desoldering, Cutting, Stripping and connecting.
11. Making of different types of mini electronic projects

PART-C PREPARATION OF PRINTED CIRCUIT BOARDS

LEARNING OUTCOMES:-

After completion of this Course, the learners will be able to prepare printed Circuit boards.

Exercise to be performed:-

Study of different types of PCB circuit in order to:

1. Acquire skill in silk screen printing techniques for the purpose of making the printed circuits boards.
2. Exposure to Non dry-method of PCB making using photoprocessing techniques.
3. Prepare, check, drill and store PCBs.

3.6 DIGITAL ELECTRONICS

L	T	P
4	-	4

RATIONALE

This course 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.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- explain the importance of digitization.
- verify and interpret truth tables for all logic gates.
- realize all logic functions with NAND and NOR gates
- design and demonstrate adder and subtractor circuits
- verify and interpret truth tables of multiplexer, demultiplexer, encoder and decoder ICs
- design and realize different sequential circuit(Flip flops, counters and shift registers)
- verify performance of different A/D and D/A converters.
- explain the features and applications of different memories

DETAILED CONTENTS

1. Introduction (03 Periods)

   1.1 Distinction between analog and digital signal.
   1.2 Applications and advantages of digital signals.

2. Number System (03 Periods)

   2.1 Binary, octal and hexadecimal number system: conversion from decimal and hexadecimal to binary and vice-versa.
   2.2 Binary addition and subtraction including binary points. 1's and 2's complement method of addition/subtraction.

3. Codes and Parity (04 Periods)

   3.1 Concept of code, weighted and non-weighted codes, examples of 8421, BCD, excess-3 and Gray code.
   3.2 Concept of parity, single and double parity and error detection

4. Logic Gates and Families (06 Periods)

   4.1 Concept of negative and positive logic
   4.2 Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates, NAND and NOR as universal gates.
   4.3 SSI, MSI, LSI, VLSI (Definition)
   4.4 Propagation delay, Noise Margin, Fan in, Fan out, Power dissipation.

4.5 Comparison between TTL, CMOS, ECL, MOS on basis of diff parameter.
4.6 Introduction to Bipolar logic, MOS, ECL, TTL and CMOS logic families
4.7 Basic logic gate using NMOS, PMOS, CMOS

5. Logic Simplification (06 Periods)

5.1 Postulates of Boolean algebra, De Morgan's Theorems. Implementation of Boolean (logic) equation with gates
5.2 Karnaugh map (upto 4 variables) and simple application in developing combinational logic circuits

6. Arithmetic circuits (03 Periods)

6.1 Half adder and Full adder circuit, design and implementation.
6.2 Half subtractor and Full subtractor or Circuit, design and implementation.

7. Combinational Circuit (06 Periods)
7.1 Introduction to combinational circuit
7.2 Multiplexer, De-multiplexer, Encoder, Decoder block diagram and Circuit.
7.3 7 segment decoder
7.4 BCD Encoder Circuit

8. Introduction to Sequential circuit (06 Periods)
8.1 Introduction to Sequential
8.2 Copmparison between combinational and sequential circuit
8.3 Concept and types of latch with their working and applications
8.4 Operation using waveforms and truth tables of RS, T, D, Master/Slave JK flip flops.
8.5 Difference between a latch and a flip flop

9. Counters (06 Periods)
9.1 Introduction to Asynchronous and Synchronous counters
9.2 Binary counters
9.3 Divide by N ripple counters, Decade counter, Ring counter and twisted Ring counter.

10. Shift Register (05 Periods)

10.1 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) Universal shift register

11. A/D and D/A Converters (04 Periods)
11.1 Working principle of A/D and D/A converters
11.2 Brief idea about different techniques of A/D conversion and study of :
- Simultaneous or flash type A/D converter

- Successive Approximation A/D Converter
- Single Slope A/D converter
- Dual Slope A/D converter

11.3 Brief idea of :

- Binary Weighted D/A converter
- R/2R ladder D/A converter

11.4 Applications of A/D and D/A converter.

12. Semiconductor Memories (04 periods)

Memory organization, classification of semiconductor memories (RAM, ROM, PROM, EPROM, EEPROM), static and dynamic RAM.

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. - Design of a half adder using XOR and NAND gates and verification of its operation
   - Construction of a full adder circuit using XOR and NAND gates and verify its operation
4. 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).
5 Verification of truth table for encoder and decoder ICs, Mux and DeMux
6. To design a 4 bit SISO, SIPO, PISO, PIPO shift registers using JK/D flip flops and verification of their operation.
7. To design a 4 bit ring counter and verify its operation.
8. Use of Asynchronous Counter ICs (7490 or 7493)

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

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), A/D, D/A Converters and other topics. Help may be taken in the form of charts, simulation packages to develop clear concepts of the subject. Programming exercises other than the tested in circulation may be given to the students.

MEANS OF ASSESSMENT

- Class test/quizzes
- Home assignments
- Attendance
- Sessional Test
- Practical Tasks

RECOMMENDED BOOKS

1. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi
2. Digital Electronics by RP Jain, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Digital Electronics by BR Gupta, Dhanpat Rai & Co., New Delhi
4. Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi
5. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	03	07
2.	03	07
3.	04	07
4.	06	09
5.	06	11
6.	03	11
7.	06	11
8.	06	05
9	06	11
10.	05	11
11.	04	07
12	04	07
Total	**56**	**100**

3.7 Universal Human Values

L-T-P
2-0-1

Course Objectives

This introductory course input is intended

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature

Thus, this course is intended to provide a much needed orientational input in value education to the young enquiring minds.

Course Methodology

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. It is free from any dogma or value prescriptions.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
5. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

The syllabus for the lectures is given below:

- After every two lectures of one hour each, there is one hour practice session.
- The assessment for this subject is as follows:
- Sessions Marks (Internal): 20
- Practical Marks (External): 30
- Total Marks: 50

UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations

4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

UNIT 2: Understanding Harmony in the Human Being - Harmony in Myself!

1. Understanding human being as a co-existence of the sentient 'I' and the material the Body'
2. Understanding the needs of Self ('I') and 'Body' - *Sukh* and *Suvidha*
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensure *Sanyam* and *Swasthya*

-Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

1. *Understanding Harmony in the family – the basic unit of human interaction*
2. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;
   a. Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship
3. Understanding the meaning of *Vishwas*; Difference between intention and competence
4. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
5. Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva*as comprehensive Human Goals
6. Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj),* Universal Order (*SarvabhaumVyawastha)*- from family to world family!

-Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature
3. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space
4. Holistic perception of harmony at all levels of existence

-Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct

3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in professional ethics:
   a) Ability to utilize the professional competence for augmenting universal human order
   b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
   c) Ability to identify and develop appropriate technologies and management patterns for above production systems.
5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
b) At the level of society: as mutually enriching institutions and organizations

7. To inculcate Human Values among Students:The Role of self ,Parents and Teachers
   -Practice Exercises and Case Studies will be taken up in Practice Sessions.

Practical Session also Includes Different Yogic Exercises and Meditation Session

INSTRUCTONAL STRATEGY

The content of this course is to be taught on conceptual basis with plenty of real world examples.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests,
- Mid-term and end-term written tests
- Practical assessment

Reference Material

The primary resource material for teaching this course consists of

a. The text book (Latest Edition)

R.R Gaur, R Asthana, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi.

b. The teacher's manual (Latest Edition)

R.R Gaur, R Asthana, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi.

In addition, the following reference books may be found useful for supplementary reading in connection with different parts of the course:

1. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
3. Sussan George, 1976, *How the Other Half Dies,* Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, *Energy & Equity,* The Trinity Press, Worcester, and HarperCollins, USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III,

1972, limits to Growth, Club of Rome's Report, Universe Books.

6. Subhas Palekar, 2000, *How to practice Natural Farming,*Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, *Jeevan Vidya ekParichay,*Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if peoplemattered*, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.

Relevant websites, movies and documentaries

1. Value Education websites, http://uhv.ac.in, *http://www.aktu.ac.in*
2. Story of Stuff, *http://www.storyofstuff.com*
3. Al Gore, *An Inconvenient Truth*, Paramount Classics, USA
4. Charlie Chaplin, *Modern Times*, United Artists, USA
5. IIT Delhi, *Modern Technology–the Untold Story*
6. Case study Hevade Bazar Movie
7. RC Shekhar , Ethical Contradiction ,Trident New Delhi
8. *Gandhi A., Right Here Right Now, Cyclewala Production*

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (Periods)	Marks Allotted (%)
1	08	20
2	08	20
3	08	20
4	08	20
5	10	20
Total	**42**	**100**

4.1 COMMUNICATION SKILLS – II

L	T	P
4	-	2

RATIONALE

Knowledge of English Language plays an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Frame correct sentences with illustrations
- Comprehend the language correctly
- Interpret the language correctly
- Use given material in new situations.
- Correspond effectively using various types of writings like letters, memos etc.
- Communicate effectively in English with appropriate body language making use of correct and appropriate vocabulary and grammar in an organised set up and social context.

DETAILED CONTENTS

1. Functional Grammar (16 periods)
   - 1.1 Prepositions

1.2 Framing Questions
1.3 Conjunctions
1.4 Tenses

2 Reading (16 periods)

2.1 Unseen Passage for Comprehension (Vocabulary enhancement - Prefixes, Suffixes, one word substitution, Synonym and Antonym) based upon the passage should be covered under this topic.

3 Writing Skill (24 periods)

3.1. Correspondence
a) Business Letters- Floating Quotations, Placing Orders, Complaint Letters.
b) Official Letters- Letters to Government and other Offices
3.2. Memos, Circular, Office Orders
3.3. Agenda & Minutes of Meeting
3.4. Report Writing

LIST OF PRACTICALS

Note: Teaching Learning Process should be focused on the use of the language in writing reports and making presentations.
Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project oriented manner where the learning happens as a byproduct.

Speaking and Listening Skills

1. Debate
2. Telephonic Conversation: general etiquette for making and receiving calls
3. Offering- Responding to offers.
4. Requesting – Responding to requests
5. Congratulating
6. Exploring sympathy and condolences
7. Asking Questions- Polite Responses
8. Apologizing, forgiving
9. Complaining
10. Warning
11. Asking and giving information
12. Getting and giving permission
13. Asking for and giving opinions

INSTRUCTIONAL STRATEGY

Students should be encouraged to participate in role play and other student-centered activities in class rooms and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

RECOMMENDED BOOKS

1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh.
2 Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.
3 High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

1. http://www.mindtools.com/ page 8.html – 99k
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	16	28
2	16	28
3	24	44
Total	**56**	**100**

4.2 INDUSTRIAL ELECTRONICS AND TRANSDUCERS

L	T	P
4	-	4

RATIONALE

Measurement of different parameters in required in industries to maintain the product within specified limits. The measurement can be done by direct or indirect method. Transducers are used as sensing elements in indirect system of measurements. The students equipped with knowledge about thyristors will prove useful in the world of work.

LEARNING OUTCOME

After undergoing the subject, the students will be able to:

- understand the thyristor family such as SCR, DIAC, TRIAC etc
- describe the application of thyristor such as AC Phase control using SCR
- understand the working principle of Induction and dielectric heating.
- understand basic idea and principle of transducer such as thermistor and piezoelectric crystal
- demonstrate how the weak transducer signals are processed.

DETAIL CONTENTS

1. Thyristors families (14 Periods)

   1.1 Name, symbol and typical applications of members of thyristor family.

   1.2 SCR, Triac and Diac-Basic structure, operation, V-I characteristics and ratings, gate circuits, ratings, triggering process and triggering circuits, turn off methods and circuits, selections of heat sinks, mounting of thyristor on heat sinks, basic idea of protection of thyristor circuits.

   1.3 Operation, V-I characteristics, equivalent circuit and parameters of an UJT: Description of UJT relaxation oscillator, use of UJT relaxation oscillator for triggering thyristors.

2. Thyristor Applications (14 Periods)

   2.1 Single phase, various type of phase controlled rectifiers using SCR for resistive and inductive load explanation using wave shapes and appropriate mathematical equation (No derivation).

2.2 A.C. phase control using SCRs and triacs, Application of phase controlled rectifiers and A.C, phase control circuits in illumination control. Temperature control, variable speed derives using D.C.. motors and small A.C. machines

2.3 Half wave,. Full wave (including bridge) using SCRs; explanation using wave shapes and formula (no derivation)

2.4 Principle of operation of basic inverter circuits, basic series and parallel commutated inverters, principle of operation of cycloconverter, choppers and dual converter. Basic idea of U.P.S and SMPS.

3. Induction and Dielectric Heating (04 Periods)

Principles and Applications of Induction and Dielectric Heating (No Mathematical Treatment)

4. Transducers (16 Periods)

Basic idea and principle of operation of the following types of transducers and their applications in measuring physical parameters.

4.1 Variable Resistance Type: Potentiometric Resistance, strain gauge, Resistance Thermometer, Resistance Temperature detector, Thermistors.

4.2 Variable Capacitance Type : Variable capacitance pressure guage, Capacitor microphone, Dilectricguage

4.3 Variable Inductance Type : Differential Transformer.

4.4 Piezoelectric Type : Crystal Microphone, Crystal Oscillator

5. Processing of Transducer Signals (08 Periods)

5.1 Characteristic of instrumentation amplifiers in respect of input impedance, output impedance, drift, dc offset, noise, gain common mode rejection, frequency response.

5.2 Introduction to AC and DC signal conditioning (only Block diagram)

LIST OF PRACTICALS

1. Identification of various types of packages and terminals of various low and high power thyristors (SCR and Triac).
2. To determine and plot firing characteristic voltage.
   a) By varying the anode to chathode voltage.
   b) By varying the gate current.
3. Observing voltage wave shapes at various points of UJT relaxation oscillator circuit.

4. Observation of wave shapes at relevant points of the circuit of a single phase controlled rectifier using SCR and UJT relaxation oscialltor.
5. Test of A. C. phase control circuit using triac and observe wave shapes and voltages at relevant points in circuits (while using for lamp intensity control and/or A. C. fan speed control).
6. To study the working of a single phase SCR/transistor inverter circuit by observing wave shapes at input and output.
7. To measure force and pressure by using strain guage transducer.
8. To observe the working of Piezo crystal as transducer.

RECOMMENDED BOOKS

1. Power Electronics by M. D. Singh and K.B Khanchandani; McGraw Hill Publication
2. Industrial Electronics and Control by SK. Bhattacharya, S. Chatterjee, TTTI, Chandigarh.
3. Electrical and Electronic Measurement by A. K. Sawhney.
4. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

INSTRUCTIONAL STRATEGY

The teacher should lay stress on the thyristor family such as SCR, DIAC and TRIAC used in Industrial electronics. The students most learn how one form of energy has been transformed into another form by using transducers. The teachers should also give emphasis on how weak signals are processed using instrumentation amplifiers.

MEANS OF ASSESSMENTS

- Class Test/Quizzes
- Home Assignments
- Attendance
- Sessional and end semester Examination.
- Practical Tasks

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	14	25
2.	14	25
3.	04	06
4.	16	30
5.	08	14

SUGGESTED	Total	56	100

DISTRIBUTION OF MARKS

4.3 NETWORK FILTERS AND TRANSMISSION LINES

L	T	P
4	-	4

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.

LEARNING OUTCOMES

After completion of the course, the students will be able to:

- describe the concept of symmetrical, asymmetrical, balanced, unbalanced, T, PI, ladder, lattice, L and Bridge T networks
- demonstrate the operation of attenuators and filters.
- understand the concept and applications of transmission lines.
- measure standing wave ratio and characteristic impedance of the line

DETAILED CONTENTS

1. Networks (16 Periods)

- 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

- Symmetrical Network:
  - Concept and significance of the terms characteristic impedance, propagation constant, attenuation constant, phase shift constant and insertion loss.
  - T-network and π Network (No Derivation)

- Asymmetrical Network
  - Concept and significance of iterative impedance, image impedance,

- The half section (L-section); symmetrical T and π sections into half sections (No Derivation)

2. Attenuators (10 Periods)

- Units of attenuation (Decibels and Nepers): General characteristics of attenuators
- Analysis and design of simple attenuator of following types; Symmetrical T and π type, L type.

3. Filters (16 Periods)

- Brief idea of the use of filter networks in different communication systems, concept of low pass, high pass, band pass and band stop filters.

- Prototype Filter Section:
  - Impedance characteristics vs frequency characteristics of a low and high pass filter and their significance

  - Simple design problems of prototype low pass section.

- M-Derived Filter Sections
  Limitation of prototype filters, need of m-derived filters
- Crystal Filters
  Crystal and its equivalent circuits, special properties of piezoelectric filters and their use
- Active Filters
  Basic concept of active filters and their comparison with passive filters.

4. Transmission Lines (14 Periods)

- Transmission Lines, their types and applications.
- Distributed constants, T and π representation of transmission line section.
- Concept of infinite line
- Condition for minimum distortion and minimum attenuation of signal on-the-line and introduction to loading methods.
- Concept of reflection and standing waves, definition of reflection coefficient, SWR &VSWR and their relation (no derivation).
- Concept of transmission lines at high frequencies.
- Introduction to stubs. (single, open and short stubs).
- HVDC (High Voltage DC transmission) – Concept and Advantage, Disadvantage and areas of application.

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:

   - Determine the characteristic impedance experimentally
   - 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/ filler 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.

MEANS OF ASSESSMENT

- Class test/quizzes
- Home assignments
- Attendance
- Sessional Test

– Practical Tasks

RECOMMENDED BOOKS

1. Network Filters and Transmission Lines by AK Chakarvorty; Dhanpat Rai and Co. Publication, New Delhi
2. Network Analysis by Soni and Gupta; Dhanpat Rai and Co. Publication, New Delhi
3. Network Filters and Transmission Line by Yash Pal; Ishan Publications, Ambala City
4. Electrical and Electronics Measuring instrumentation, A.K Sawhney; Dhanpat Rai and Co. Publication, New Delhi
5. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:
http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1	16	29
2	10	18
3	16	29
4	14	24
Total	**56**	**100**

4.4 ELECTRONIC INSTRUMENTS AND MEASUREMENT

L	T	P
4	-	4

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.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- describe the specifications of measuring instruments.
- demonstrate the working principle voltage, current and resistance measurement along with their applications.
- understand the working of various parts of CRT.
- measure frequency, voltage, time period and phase using CRO and DSO
- demonstrate the working of RF signal generator, pulse generator and analysers
- understand the working principle of DC/AC bridges and meters.

DETAILED CONTENTS

1. Basics of Measurements (10 Periods)

- Measurement, method of measurement, types of instruments
- 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 (08 Periods)

- Principles of measurement of DC voltage, DC current, AC voltage, AC current,
- Principles of operation and construction of permanent magnet moving coil (PMMC) instruments and Moving iron type instruments,

3. Cathode Ray Oscilloscope (12 Periods)

- Construction and working of Cathode Ray Tube(CRT)
- 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
- Digital storage oscilloscope (DSO) : block diagram and working principle
- Working Principle of spectrum analyser

4 Impedance Bridge Q Meters (08 periods)

- Wheat stone bridge
- AC bridges: Maxwell's induction bridge, Hay's bridge, De-Sauty's bridge, Schering bridge and Anderson bridge
- Bock diagram description of laboratory type RLC bridge, specifications of RLC bridge.
- Block diagram and working principle of Q meter.

5 Signal Generators and Analytical Instruments (08 Periods)

- Explanation of block diagram specifications of low frequency and RF generators, pulse generator, function generator
- Distortion factor meter
- Instrumentation amplifier: its characteristics, need and working

6. Digital Instruments (10 Periods)

- Comparison of analog and digital instruments
- Working principle of ramp, dual slope and integration type digital voltmeter
- Block diagram and working of a digital multi-meter
- Specifications of digital multi-meter and their applications
- Limitations of digital multi-meters.

- Working principle of logic probe, logic pulser, logic analyzer and signature analyzer.

LIST OF PRACTICALS

1 Measurement of voltage, resistance, frequency using digital multimeter

2 Measurement of voltage, frequency, time period and phase using CRO
3 Measurement of voltage, frequency, time and phase using DSO
4 Measurement of Q of a coil
5 Measurement of resistance and inductance of coil using RLC Bridge
6 Measurement of impedance using Maxwell Induction Bridge
7 To find the value of unknown resistance using Wheat Stone Bridge
8 Measurement of distortion using Distortion Factor Meter

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.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making
- Actual laboratory and practical work
- Model/prototype making
- Assembly and disassembly exercises
- Viva-Voce

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 Instrumentation by JB Gupta, Satya Prakashan, New Delhi
4. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No	**Time Allotted (Periods)**	**Marks Allocation (%)**
1.	10	18
2.	08	14
3.	12	22
4.	08	14
5.	08	14
6.	10	18
Total	**56**	**100**

4.5 PRINCIPLES OF COMMUNICATION ENGINEERING

L	T	P
4	-	4

RATIONALE

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

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Explain the concept and need of modulation and demodulation
- Measure the modulation index of the Amplitude Modulated wave and frequency deviation of FM.
- Use different types of modulators and demodulators.
- Obtain modulating signal from an AM Detector Circuit and FM detector
- Use different types of Pulse Modulation Techniques (PAM, PPM, PWM and PCM)
- Classify different radio transmitters and radio receivers.

DETAILED CONTENTS

1. Introduction (04 Periods)

   1.1 Need for modulation, modulation and demodulation in communication systems
   1.2 Basic scheme of a communication system.

2. Amplitude modulation (06 Periods)

   2.1 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.

2.2 Elementary idea of DSB-SC, SSB-SC, SSB and VSB modulations, their comparison, and areas of applications

3. Frequency modulation (05 Periods)

3.1 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 of FM signals, Carson's rule.

3.2 Effect of noise on FM carrier. Noise triangle, Role of limiter, Need for pre-emphasis and de-emphasis, capture effect.

3.3 Comparison of FM and AM in communication systems

4. Phase modulation (04 Periods)

4.1 Derivation of expression for phase modulated wave, modulation index, comparison with frequency modulation.

5. Principles of AM Modulators (04 Periods)
Circuit Diagram and working operation of:

a) Collector and Base Modulator
b) Square Low Modulator
c) Balanced Modulator

6. Principles of FM Modulators (04 Periods)

6.1 Working principles and applications of reactance modulator, varactor diode modulator, VCO and Armstrong phase modulator.
6.2 Stabilization of carrier using AFC (Block diagram approach).

7. Demodulation of AM Waves (04 Periods)

7.1 Principles of demodulation of AM wave using diode detector circuit

8. Demodulation of FM Waves (05 Periods)

8.1 Basic principles of FM detection using slope detector

8.2 Principle of working of the following FM demodulators

i. Foster-Seeley discriminator

ii. Ratio detector

iii. Block diagram of Phase locked Loop (PLL) FM demodulators (No Derivation)

9. Pulse Modulation (05 Periods)

9.1 Basic concepts of time division multiplexing (TDM) and frequency division multiplexing (FDM)

9.2 Pulse Amplitude Modulation (PAM), Pulse Position Modulation (PPM), Pulse Width Modulation (PWM).

10. Pulse Code Modulation (05 Periods)

10.1 Basic concept of sampling theorem, quantization, coding and Shanon's theorem.

10.2 Types of PCM system and its application(Basic idea only)

10.3 Digital modulation techniques.
(ASK, FSK,PSK, DPSK (Brief idea only)

11. Radio Transmitter (05 Periods)

11.1 Classification of transmitters on the basis of power, frequency and modulation.

11.2 Block diagram of an AM transmitters and working of each stage. Low level and High level modulation.

11.3 Block diagram and working principle of reactance tube and Armstrong FM transmitters

12. Radio Receiver. (05 Periods)

12.1 Brief description of crystal and TRF radio receivers; Need for and principles of super heterodyne radio receiver.

12.2 Block diagram of super- heterodyne AM receiver, function of each block and typical waveforms at the input and output of each block.

12.3 Block diagram of an FM receiver, function of each block and wave/forms at input and output at different blocks.

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 measure the modulation index of the obtained wave form.

3. To obtain an FM wave and measure the frequency deviation for different modulating signals.

4. To obtain modulating signal from FM detector.
5. 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.
6. To observe and note the pulse amplitude modulated signal (PAM) and compare them with the corresponding analog input signal
7. To observe PPM and PWM signal and compare it with the analog input signal
8. To observe wave form of different modulation Technique (ASK, FSK, DPSK)

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.

MEANS OF ASSESSMEN T

- Class test/quizzes
- Home assignments
- Attendance
- Sessional Test
- Practical Tasks

RECOMMENDED BOOKS

1. An Introduction to Analog and Digital Communication by Simon Haykin, Wiley Student Edition.
2. Electronics Communication System by Kennedy, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Principle of communication Engineering by Taub, TMH Publication.
4. E-books/e-tools to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:
http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	04	07
2.	06	11
3.	05	09
4.	04	07
5.	04	07
6.	04	07
7.	04	07
8.	05	09
9.	05	09
10.	05	09
11.	05	09
12.	05	09
Total	**56**	**100**

4.6 ENERGY CONSERVATION

L	T	P
3	-	2

RATIONALE

The requirement of energy has increased manifolds in last two decades due to rapid urbanization and growth in industrial/service sector. It has become challenging task to meet ever increasing energy demands with limited conventional fuels and natural resources. Due to fast depletion of fossil fuels and a tremendous gap between supply and demand of energy, it is essential to adopt energy conservation techniques in almost every field like industries, commercial and residential sectors etc. Energy conservation has attained priority as it is regarded as additional energy resource. Energy saved is energy produced. This course covers the concepts of energy management and its conservation. It gives the insight to energy conservation opportunities in general industry and details out energy audit methodology and energy audit instruments.

LEARNING OUTCOMES

After undergoing this subject, the students will be able to:

- define principles and objectives of energy management and energy audit.
- understand Energy Conservation Act 2001 and its features.
- understand various forms & elements of energy.
- identify electrical and thermal utilities. Understand their basic principle of operation and assess performance of various equipments.
- identify areas of energy conservation and adopt conservation methods in various systems.
- evaluate the techno economic feasibility of the energy conservation technique adopted.

DETAILED CONTENTS

1. Basics of Energy
   - 1.1 Classification of energy- primary and secondary energy, commercial and non-commercial energy, non-renewable and renewable energy with special reference to solar energy, Capacity factor of solar and wind power generators.
   - 1.2 Global fuel reserve
   - 1.3 Energy scenario in India and state of U.P. Sector-wise energy consumption (domestic, industrial, agricultural and other sectors)
   - 1.4 Impact of energy usage on climate

2. Energy Conservation and EC Act 2001
   - 2.1 Introduction to energy management, energy conservation, energy efficiency and its need

2.2 Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation.

2.3 Standards and Labeling: Concept of star rating and its importance, Types of product available for star rating

3. Electrical Supply System and Motors

3.1 Types of electrical supply system

3.2 Single line diagram

3.3 Losses in electrical power distribution system

3.4 Understanding Electricity Bill: Transformers Tariff structure, Components of power (kW, kVA and kVAR) and power factor, improvement of power factor, Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)

3.5 Transformers: Introduction, Losses in transformer, transformer Loading, Tips for energy savings in transformers

3.6 Electric Motors

Types of motors, Losses in induction motors Features and characteristics of energy efficient motors, Estimation of motor loading, Variation in efficiency and power factor with loading, Tips for energy savings in motors

4. Energy Efficiency in Electrical Utilities

4.1 Pumps: Introduction to pump and its applications, Efficient pumping system operation, Energy efficiency in agriculture pumps, Tips for energy saving in pumps

4.2 Compressed Air System: Types of air compressor and its applications, Leakage test, Energy saving opportunities in compressors.

4.3 Energy Conservation in HVAC and Refrigeration System: Introduction, Concept of Energy Efficiency Ratio (EER), Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems.

5. Lighting and DG Systems

5.1 Lighting Systems: Basic definitions- Lux, lumen and efficacy, Types of different lamps and their features, Energy efficient practices in lighting

5.2 DG Systems: Introduction, Energy efficiency opportunities in DG systems, Loading estimation

6. Energy Efficiency in Thermal Utilities

6.1 Thermal Basics: Thermal energy, Energy content in fuels, Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE)

6.2 Energy Conservation in boilers and furnaces : Introduction and types of boilers, Energy performance assessment of boilers, Concept of stoichiometric air and excess air for combustion, Energy conservation in boilers and furnaces, Do's and Don'ts for efficient use of boilers and furnaces

6.3 Cooling Towers: Basic concept of cooling towers, Tips for energy savings in cooling towers

6.4 Efficient Steam Utilization

7. Energy Conservation Building Code (ECBC)

7.1 ECBC and its salient features

7.2 Tips for energy savings in buildings: New Buildings, Existing Buildings

8. Waste Heat Recovery and Co-Generation

8.1 Concept, classification and benefits of waste heat recovery

8.2 Concept and types of co-generation system

9. General Energy Saving Tips

Energy saving tips in:

9.1 Lighting
9.2 Room Air Conditioner
9.3 Refrigerator
9.4 Water Heater
9.5 Computer
9.6 Fan, Heater, Blower and Washing Machine
9.7 Colour Television
9.8 Water Pump
9.9 Cooking
9.10 Transport

10. Energy Audit

10.1 Types and methodology
10.2 Energy audit instruments
10.3 Energy auditing reporting format

PRACTICAL EXERCISES

1. To conduct load survey and power consumption calculations of small building.
2. To check efficacy of different lamps by measuring power consumption and lumens using lux meter.

3. To measure energy efficiency ratio (EER) of an air conditioner.
4. To measure effect of valve throttling and variable frequency drive (VFD) on energy consumption by centrifugal pump.
5. To measure and calculate energy saving by arresting air leakages in compressor.
6. To measure the effect of blower speed on energy consumed by it.

STUDENT ACTIVITIES ON ENERGY CONSERVATION/ENERGY EFFICIENCY

- Presentations of Case Studies
- Debate competitions
- Poster competitions
- Industrial visits
- Visual Aids

INSTRUCTIONAL STRATEGY

Teachers are expected to lay considerable stress on understanding the basic concepts in energy conservation, principles and their applications. For this purpose, teachers are expected to give simple problems in the class room so as to develop necessary knowledge for comprehending the basic concepts and principles. As far as possible, the teaching of the subject must be supplemented by demonstrations and practical work in the laboratory. Visits to industries must be carried out. Expert from industry must be invited to deliver talks on energy conservation to students and faculty.

RECOMMENDED BOOKS

1. Guide book on General Aspects of Energy Management and Energy Audit by Bureau of Energy Efficiency, Government of India. Edition 2015
2. Guide book on Energy Efficiency in Electrical Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
3. Guide book on Energy Efficiency in Thermal Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
4. Handbook on Energy Audit & Environmental Management by Y P Abbi & Shashank Jain published by TERI. Latest Edition

Important Links:

(i) Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India. www.beeindia.gov.in.

(ii) Ministry of New and Renewable Energy (MNRE), Government of India. www.mnre.gov.in.

(iii) Uttar Pradesh New and Renewable Energy Agency (UPNEDA), Government of Uttar Pradesh. www.upneda.org.in.
(iv) **Central Pollution Control Board (CPCB),** Ministry of Environment, Forest and Climate Change, Government of India. www.cpcb.nic.in.
(v) Energy Efficiency Sevices Limited (EESL). www.eeslindia.org.
(vi) Electrical India, Magazine on power and electrical products industry. www.electricalindia.in.

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 4 weeks duration to be organised during the semester break starting after second year i.e. after 4th 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. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An external assessment of 50 marks has been provided in the study and evaluation scheme of 5th 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.

Teachers and students are requested to see the footnote below the study and evaluation scheme of 4th semester for further details.

The teacher along with field supervisors will conduct performance assessment of students. The components of evaluation will include the following:

a)	Punctuality and regularity	15%
b)	Initiative in learning new things	15%
c)	Presentation and VIVA	15%
d)	Industrial training report	55%

5.1 INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

L	T	P
5	-	-

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mindset with managerial skills helps the student in the job market. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

LEARNING OUTCOMES

After undergoing this course, the students will be able to :

- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- Explain the principles of management including its functions in an organisation.
- Have insight into different types of organizations and their structures.
- Inculcate leadership qualities to motivate self and others.
- Manage human resources at the shop-floor
- Maintain and be a part of healthy work culture in an organisation.
- Use marketing skills for the benefit of the organization.
- Maintain books of accounts and take financial decisions.
- Undertake store management.

- Use modern concepts like TQM, JIT and CRM.

DETAILED CONTENTS

SECTION – A

ENTREPRENEURSHIP

1. Introduction (04 Periods)

   1.1 Concept /Meaning and its need
   1.2 Qualities and functions of entrepreneur and barriers in entrepreneurship

   1.3 Sole proprietorship and partnership forms and other forms of business organisations
   1.4 Schemes of assistance by entrepreneurial support agencies at National, State, District –level, organisation: NSIC, NRDC, DC, MSME, SIDBI, NABARD, NIESBUD, HARDICON Ltd., Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks

2. Market Survey and Opportunity Identification/Ideation (04 Periods)

   2.1 Scanning of the business environment
   2.2 Salient features of National and Haryana State industrial policies and resultant business opportunities
   2.3 Types and conduct of market survey
   2.4 Assessment of demand and supply in potential areas of growth
   2.5 Identifying business opportunity
   2.6 Considerations in product selection
   2.7 Converting an idea into a business opportunity

3. Project report Preparation (06 Periods)

   3.1 Preliminary project report
   3.2 Detailed project report including technical, economic and market feasibility
   3.3 Common errors in project report preparations
   3.4 Exercises on preparation of project report
   3.5 Sample project report

SECTION –B

MANAGEMENT

4. Introduction to Management (06 Periods)

4.1 Definitions and importance of management
4.2 Functions of management: Importance and process of planning, organising, staffing, directing and controlling
4.3 Principles of management (Henri Fayol, F.W. Taylor)
4.4 Concept and structure of an organisation
4.5 Types of industrial organisations and their advantages
4.6 Line organisation, staff organisation
4.7 Line and staff organisation
4.8 Functional Organisation

5. Leadership and Motivation (08 Periods)

5.1 Leadership: Definition and Need, Qualities and functions of a leader, Manager Vs leader, Types of leadership, Case studies of great leaders
5.2 Motivation: Definition and characteristics, Importance of self motivation, Factors affecting motivation, Theories of motivation (Maslow, Herzberg, Douglas, McGregor)

6. Management Scope in Different Areas (14 Periods)

6.1 Human Resource Management: Introduction and objective, Introduction to Man power planning, recruitment and selection, Introduction to performance appraisal methods
6.2 Material and Store Management: Introduction functions, and objectives, ABC Analysis and EOQ

6.3 Marketing and sales: Introduction, importance, and its functions, Physical distribution, Introduction to promotion mix, Sales promotion

6.4 Financial Management: Introductions, importance and its functions, knowledge of income tax, sales tax, excise duty, custom duty, VAT, GST

7. Work Culture (08 Periods)

7.1 Introduction and importance of Healthy Work Culture in organization
7.2 Components of Culture

7.3 Importance of attitude, values and behavior

7.4 Behavioural Science – Individual and group behavior.

7.5 Professional ethics – Concept and need of Professional Ethics and human values.

8. Basic of Accounting and Finance (10 Periods)

8.1 Basic of Accounting:Meaning and definition of accounting, Double entry system of book keeping, Trading account, PLA account and balance sheet of a company

8.2 Objectives of Financial Management: Profit Maximization v/s Wealth Maximization

9. Miscellaneous Topics (10 Periods)

9.1 Total Quality Management (TQM): Statistical process control, Total employees Involvement, Just in time (JIT)
9.2 Intellectual Property Right (IPR) : Introduction, definition and its importance, Infringement related to patents, copy right, trade mark

INSTRUCTIONAL STRATEGY

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

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/Prototype making.

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)

2. Entrepreneurship Development and Management by J.S.Narang; Dhanpat Rai & Sons, Delhi.
3. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
4. Handbook of Small Scale Industry by PM Bhandari
5. Entrepreneurship Development and Management by MK Garg
6. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

Websites for Reference:
http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	04	06
2	04	06
3	06	08
4	06	08
5	08	12
6	14	20
7	08	12
8	10	14
9	10	14
Total	**70**	**100**

5.2 MICROPROCESSORS AND PERIPHERAL DEVICES

L	T	P
4	-	4

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 the students face-to-face with mainframe enabling them to get 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.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- understand the concept of microcomputer system
- describe Architecture and pin details of 8085
- write assembly language program using mnemonics
- interface various peripheral devices with microprocessor.
- use various data transfer techniques
- describe architecture and pin detail of 8086
- describe the idea of advance microprocessors like Pentium series and dual core.

DETAILED CONTENTS

1. Evolution of Microprocessor (05 Periods)

   Typical organization of a microcomputer system and functions of its various blocks. Microprocessor, its evolution, function and impact on modern society

2. Architecture of a Microprocessor (05 periods)
   (With reference to 8085 microprocessor)
   Concept of Bus, bus organization of 8085, Functional block diagram of 8085 and function of each block, Pin details of 8085 and related signals, Demultiplexing of

address/data bus generation of read/write control signals, Steps to execute a stored programme

3. Instruction Timing and Cycles (05 periods)

Instruction cycle, machine cycle and T-states, Fetch and execute cycle, Timing cycle diagram.

4. Programming (with respect to 8085 microprocessor) (09 periods)

Brief idea of machine and assembly languages, Machines and Mnemonic codes. Instruction format and Addressing mode. Identification of instructions as to which addressing mode they belong. Concept of Instruction set. Explanation of the instructions of the following groups of instruction set. Data transfer group, Arithmetic Group, Logic Group, Stack, I/O and Machine Control Group. Programming exercises in assembly language. (Examples can be taken from the list of experiments).

5. Memories and I/O interfacing (06 periods)

Concept of memory mapping, partitioning of total memory space. Address decoding, concept of peripheral mapped I/O and memory mapped I/O. Interfacing of memory mapped I/O devices.

6. Interrupts (06 periods)

Concept of interrupt, Maskable and non-maskable, Edge triggered and level triggered interrupts, Software interrupt, Restart interrupts and its use, Various hardware interrupts of 8085, Servicing interrupts, extending interrupt system

7. Data Transfer Techniques (06 periods)

Concept of programmed I/O operations, sync data transfer, async data transfer (hand shaking), Interrupt driven data transfer, DMA, Serial output data, Serial input data

8. Peripheral devices (06 periods)

8255 PPI, 8253 PIT and 8257 DMA controller

9. Architecture of 8086 Microprocessor (06 periods)
   - Block diagram
   - Minimum and Maximum mode
   - Pin and Signals
   - Addressing Modes
10. Advance Microprocessors (02 periods)
   - Introduction to Pentium series processors and core 2 duo, dual core (core i3, i5, i7)

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 exercise on 8253 programmable interval timer
9. Interfacing exercise on 8279 programmable KB/display interface like to display the hex code of key pressed on display
10. Writing and execution of different ALP for 8086 (any four)
11. Generation of square wave of desired frequency using 8255.

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.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual laboratory and practical work, exercises
- Viva-voce

RECOMMENDED BOOKS

1. Microprocessor Architecture, Programming and Applications with 8080/8085 by Ramesh S Gaonker, Willey Eastern Ltd. New Delhi
2. Microprocessor and Applications by Badri Ram: Tata McGraw Hill Education Pvt Ltd , New Delhi
3. Microprocessor programming & applications.by sudhir Goyal, North Publication.
4. Microprocessor and interfacing by Douglas.V.Hall, McGraw Hill Higher Education, New Delhi.

5. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:
http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	05	09
2.	05	09
3	05	09
4	09	14
5.	06	11
6.	06	11
7.	06	11
8.	06	11
9.	06	11
10.	02	04
Total	56	100

5.3 OPTICAL FIBER COMMUNICATION

L T P
4 - 6

RATIONALE

Progressing from communication over copper wire to today's fiber 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 fiber 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 for optical fiber communication system.

LEARNING OUTCOMES

After completion of the subject, the students will be able to:

- understand various components and light propagation methods in optical fiber communication.
- demonstrate various types of optical fibers
- identify and test losses in optical fibers
- explain and demonstrate characteristics of optical source and optical detector
- connect and provide joints in optical fibers
- components and tools used in optical fiber
- compare various optical amplifiers

DETAILED CONTENTS

1. **Introduction** (06 Periods)

   1.1 Historical perspective, basic communication systems, optical frequency range, advantages of optical fiber communication, application of fiber optic communication
   1.2 Electromagnetic spectrum used, Advantages and disadvantages of optical communication, optical windows.
   1.3 Principle of light penetration, reflection, critical angle, numerical aperture, acceptance angle.

2. **Optical Fibers** (05 Periods)

   2.1 Constructional details of various optical fibers, multimode and mono-mode fibers, step index and graded index fibers, acceptance angle and types of optical fiber cables.

3. Losses in Optical Fiber Cable: (10 Periods)

3.1 Absorption Losses: Scattering Losses, Radiation losses, Connector losses, Bending loses.
3.2 Dispersion: Types and its effect on data rate.
3.3 Testing of losses using OTDR(Optical Time Domain Reflectometer).

4. Optical Sources (11 Periods)

Characteristics of light sources (LED and LASER) used in optical communication, principle of operation of LED, different types of LED structures used and their brief description, Injection laser diode, principle of operation, different injection laser diodes, comparison of LED and ILD.

5. **calll Optical Detectors** (11 Periods)

Characteristics of photo detectors used in optical communication; PN-photo diode, PIN diode and avalanche photo diode (APD),brief idea of Noise in detectors

6. Connectors and splicers (05 Periods)

6.1 Optical Fibers cable connectors and splicing techniques (Mechanical, fusion)

7. **Optical Amplifiers** (08 Periods)

Types of optical amplifiers, semiconductor & fiber optical amplifiers, principle of operation of SOA, types of SOA. EDFA, Raman amplifiers. Comparison of SOA, EDFA and Raman Amplifiers.

LIST OF PRACTICALS

1. To identify and use various components and tools used in optical fiber communication

2. To set up fiber analog link
3. To set up optic digital link
4. To measure bending losses in optical fibers
5. To observe and measure the splice or connector loss
6. To measure and calculate numerical aperture of optical fiber
7. To observe characteristics of optical source
8. To observe characteristics of optical detector
9. To splice the available optical fiber
10. To connect a fiber with connector at both ends

INSTRUCTIONAL STRATEGY

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

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making
- Actual laboratory and practical work
- Model/prototype making
- Assembly and disassembly exercises
- Viva-Voce

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. E-books/e-tools to be used as recommended by AICTE/NITTTR, Chandigarh.
   Websites for Reference:
   http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	06	10
2	05	09
3	10	18
4	11	20
5	11	20

6	05	09
7	08	14
Total	**56**	**100**

5.4 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. This in-turn will develop in them capabilities of assembling, fault diagnosis and rectification in a systematic way.

LEARNING OUTCOMES

After completion of the subject, the students will be able to:

- understand the various type of microphones and loud speakers.
- to identify the various digital and analog signal.
- describe the basis of television and composite video signal.
- describe the various kind of colour TV standards and system.
- compare the various types of digital TV system.
- understand the various type of consumer goods.

DETAILED CONTENTS

1. Audio Systems (12 Periods)

   1.1. Microphones and Loudspeakers
   - a) Carbon, moving coil, cordless microphone
   - b) Direct radiating and horn loudspeaker
   - c) Multi-speaker system
   - d) Hi-Fi stereo and dolby system.

   1.2 Concept to fidelity, Noise and different types of distortion in audio system.

2. Digital Audio Fundamentals (08 Periods)

   Audio as Data and Signal, Digital Audio Processes Outlined, Time Compression and Expansion.

3. Television (14 Periods)

   3.1. Basics of Television
   - Elements of TV communication system
   - Scanning and its need
   - Need of synchronizing and blanking pulses, VSB
   - Composite Video Signal

   3.2 Colour Television
   - Primary, secondary colours
   - Concept of Mixing, Colour Triangle
   - Camera tube

- PAL TV Receiver
- NTSC, PAL, SECAM (brief comparison)

4. Digital Transmission and Reception (12 Periods)

- Digital satellite television, Direct-To-Home(DTH) satellite television, Introduction to :Video on demand, CCTV, High Definition(HD)-TV.

  Introduction to Liquid Crystal and LED Screen Televisions Basic block diagram of LCD and LED Television and their comparison.

5. Introduction to different type of domestic/commercial appliances (10 Periods)

- Operation of Micro-wave oven
- Food Processors
- Digital Electronic Lock
- Vacuum cleaner
- Xerox Machine
- Scanner

LIST OF PRACTICALS

1. To plot the directional response of a Microphone
2. To plot the directional response of a Loud Speaker
3. To study public address system and its components.
4. To perform fault identification in TV.
5. Installation of Dish Antenna for best reception.
6. Installation of CCTV system.
7. To study the various parameters in the Smartphone and Tablet, PC

MEANS OF ASSESSMENT

– Assignments and quiz/class tests
– Mid-term and end-term written tests
– Model/prototype making

RECOMMENDED BOOKS

1. Modern Television Practice by R. R. Gulai; New Age International Publishers.
2. Audio Video Systems by R. G. Gupta; McGraw Hill Education System.
3. Audio Video Systems Principles Practices and Troubleshooting by Bali & Bali; Khanna Publishing Company
4. Consumer Electronics by S. P. Bali; Pearson Education, New Delhi

5. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	12	21
2	08	15
3	14	25
4	12	21
5	10	18
Total	**56**	**100**

5.5 PROGRAMMING USING C

L	T	P
4	-	4

RATIONALE

Computers play a vital role in present day life, more so, in the professional life of technician engineers. People working in the field of computer industry, use computers in solving problems more easily and effectively. In order to enable the students use the computers effectively in problem solving, this course offers the modern programming language C along with exposition to various applications of computers. The knowledge of C language will be reinforced by the practical exercises.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- understand the concepts of C programming language
- install C software on the system and debug the programme
- identify a problem and formulate an algorithm for it.
- identify various control structures and implement them.
- identify various types of variables.
- use pointer in an array and structure.
- implement the language control structure
- understand and execute member functions of C in the programme
- implement array concept in C programme
- execute pointers

DETAILED CONTENTS

1. Algorithm and Programming Development (06 Periods)

   1.1 Steps in development of a program
   1.2 Flow charts, Algorithm development
   1.3 Programme Debugging
   1.4 Basis of C programming

2. Program Structure (09 Periods)

   2.1 I/O statements, assign statements
   2.2 Constants, variables and data types
   2.3 Operators and Expressions
   2.4 Standards and Formatted IOS
   2.5 Data Type Casting

3. Control Structures (09 Periods)

3.1 Introduction
3.2 Decision making with IF – statement
3.3 IF – Else and Nested IF
3.4 While and do-while, for loop
3.5 Break. Continue, goto and switch statements

4. Pointers (10 Periods)

4.1 Introduction to Pointers
4.2. Address operator and pointers
4.3 Declaring and Initializing pointers,
4.4 Single pointer,

5. Functions (11 Periods)

5.1 Introduction to functions
5.2 Global and Local Variables
5.3 Function Declaration
5.4 Standard functions
5.5 Parameters and Parameter Passing
5.6 Call - by value/reference
5.7 Recursion

6. Arrays (11 Periods)

6.1 Introduction to Arrays
6.2 Array Declaration, Length of array
6.3 Single and Multidimensional Array.
6.4 Arrays of characters
6.5 Passing an array to function
6.6 Pointers to an array

LIST OF PRACTICALS

1. Programming exercises on executing and editing a C program.
2. Programming exercises on defining variables and assigning values to variables.
3. Programming exercises on arithmetic and relational operators.
4. Programming exercises on arithmetic expressions and their evaluation.
5. Programming exercises on formatting input/output using printf and scanf and their return type values.
6. Programming exercises using if statement.
7. Programming exercises using if – Else.
8. Programming exercises on switch statement.
9. Programming exercises on do – while, statement.
10. Programming exercises on for – statement.
11. Programs on one-dimensional array.

12. Programs on two-dimensional array.
13. (i) Programs for putting two strings together.
    (ii) Programs for comparing two strings.
14. Simple programs using structures.
15. Simple programs using pointers.
16. Simple programs using union.

INSTRUCTIONAL STRATEGY

The subject is totally practical based. Students should be given clear idea about the basic concepts of programming. In practical session student should be asked to draw flow chart write algorithm and then write program for the algorithm and run on computer. It is required that students should maintain records (files with printouts).

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual laboratory and practical work
- Exercises
- Software installation
- Operation
- Development
- Viva-Voce

RECOMMENDED BOOKS

1. Let us C by Yashwant Kanetkar
2. Programming in ANSI C by E Balaguruswami, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Programming in C by Reema Thareja; Oxford University Press, New Delhi

4. Programming in C by Gottfried, Schaum Series, , Tata McGraw Hill Education Pvt Ltd , New Delhi
5. Exploring C by Yashwant Kanetkar; BPB Publications, New Delhi
6. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	06	12
2	09	15
3	09	15
4	10	18
5	11	20
6	11	20
Total	**56**	**100**

5.6 MINOR PROJECT WORK

L	T	P
-	-	6

LEARNING OUTCOMES

After undergoing this subject, the student will be able to:

- Use effectively oral, written and visual communication
- Demonstrate skill and knowledge of current information and technological tools and techniques specific to the professional field of study.
- Identify, analyze and solve problems creatively through sustained critical investigation.
- Develop co-worker and leadership abilities.
- Apply fundamental and disciplinary concepts and methods in ways appropriate to their areas of study.

Minor project work aims at exposing the students to various industries dealing with computers. It is expected from them to get acquainted with computer environment. For this purpose, student during middle of the course are required to be sent for a period of two to four weeks at a stretch in different establishments. Depending upon the interest of students they are sent for exposure to:

1. Industrial practices in installation and maintenance of computers and computer networks
2. Fabrication of computers
3. Fault diagnosis and testing of computers
4. Industrial practices in respect of documentation and fabrication
5. A variety of computers and peripherals in assembly organizations
6. Software package development organizations
7. Maintenance of database
8. Write procedure or functions which can be attached as the library objects to the main projects
9. Write a procedure function to convert number of words.
10. Write a procedure function to convert all data function (create your own) Database connectivity, (SQL server, Oracle, Access), Library classes in C++ (same application).,
11. design web applications using PHP

Note: The teachers may guide /help students to identify their minor project work and check out their plan of action well in advance.

As a minor project activity each student is supposed to study the operations at site and prepare a detail project report of the observations/processes/activities by him/her. The students should be guided by the respective subject teachers. Each teacher may guide a group of 4 to 5 students.

The teachers along with field supervisors/engineers will conduct performance assessment of students. Criteria for assessment will be as follows:

Criteria	Weightage
Attendance and Punctuality	15%
Initiative in performing tasks/creating new things	30%
Relation with people	15%
Report Writing	40%

6.1 MICROWAVE AND RADAR ENGINEERING

L	T	P
4	-	4

RATIONALE

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

LEARNING OUTCOMES

After completion of the course, the students should be able to:

- identify and demonstrate operating principles and typical applications of tubes and diodes.
- understand the various types and propagation modes of wave guides
- describe the various types of antennas and wave propagation techniques
- know the basic principle of radar and interpret the various parameters used in radar equations
- measure VSWR of a given load
- identify the block diagram and explain the operating principles of CW(Doppler), FMCW, MTI radar
- interpret radar display PPI
- describe the working principles of microwave communication link

DETAILED CONTENTS

1. **Introduction to Microwaves** (12 Periods)

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

Microwave Devices

Characteristics, operating principles and typical applications of the following devices (No mathematical treatment)

- Multi cavity klystron
- Reflex klystron
- Multi-cavity magnetron
- Traveling wave tube
- Gunn diode
- IMPATT diode
- TRAPATT diode
- PIN diode

2. **Wave guides** (10 Periods)

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.

3. **Antenna and Wave Propagation** (12 Periods)

- Physical concept of radiation electromagnetic energy from an antenna, relationship between the direction of electric and magnetic fields with direction of propagation; concept of polarization of EM waves.
- Electromagnetic spectrum and its various range VLF, LF, HF, VHF, UHF, Micro wave, Optical waves etc.
- Definition and physical concepts of the terms used with antennas like point source, gain, power gain, directivity aperture, effective area, radiation pattern, (field strength power and phase) beam angle, beam width and radiation resistance.
- Types of antennas- Brief description, characteristics and typical applications of medium wave antenna, shortwave antenna, HF antenna, VHF, UHF and Microwave antenna e.g., half wave dipole, ground plane, yagi and ferrit rod antenna in transistor receiver. Brief idea about rhombic antenna, dish antenna, Horn, Parabolic reflector and Lens antenna.
- Antenna arrays-Brief description of broad side and end fire arrays their radiation pattern and application (without analysis)
- Basic idea about different modes of radio wave propagation- ground wave propagation, space wave propagation and sky wave propagation, their characteristics and typical areas of application. (e.g. medium wave, short wave, TC communication.)
- Explanation of the terms-critical frequency, maximum usable frequency (MUF) and skip distance.

4. Radar Systems (10 Periods)

– Introduction to radar, its various applications, radar range equation (no derivation) and its applications.

5. Satellite Communication (12 Periods)

- Basic idea passive and active satellites.
- Meaning of the terms Orbit, Apogee and Perigee
- Geo- stationary satellite and its need.
- Block diagram and explanation of a satellite communication link.
- Differentiate between various types of satellites.

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 plot radiation pattern of horn antenna in horizontal and vertical plane.
4. To plot VI characteristics of GUNN-Diode.
5. To determine the frequency and wavelength of a rectangular waveguide working in TE_{10} mode.
6. To study and test various parameters such as gain, noise, bandwidth and voltage at different point of a microwave amplifier.
7. To measure the power gain and beam width of a microwave dish antenna.

NOTE

Visit to the appropriate sites of microwave station/tower 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 engineering is 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.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Microwave Devices and Components by Sylio; Prentice Hall of India, New Delhi
2. Electronics Communication by Roddy and Coolen; Pearson Publishers.
3. Electronics Communication System by KS Jamwal; Dhanpat Rai and Sons, Delhi
4. Microwave Engineering by Das; Tata McGraw Hill Education Pvt Ltd , New Delh
5. Microwave & Radar Engineering by Navneet Kaur; Ishan Publications, Ambala City
6. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	12	22
2.	10	18
3.	12	22
4.	10	18
5.	12	20
Total	**56**	**100**

6.2 MICROCONTROLLERS & EMBEDDED SYSTEM

L	T	P
6	-	6

RATIONALE

The study of microcontrollers in terms of architecture, software and interfacing techniques leads to the understanding of working of microcontrollers and applications of microcontroller in electronic industries. Microcontroller is the heart of the programmable devices. Embedded systems and Micro-controllers have also assumed a great significance in the electronic and consumer goods industry and are a very vital field. Students of electronics and related engineering branches often use microcontroller to introduce programmable control in their projects, automation and fault finding in industry. The subject aims expose students to the embedded systems besides giving them adequate knowledge of micro controllers.

LEARNING OUTCOMES

After completion of the subject, the learner should be able to:

- understand the working of microcontrollers
- understand the Instruction set and programming related to microcontrollers
- describe embedded system
- explain embedded operating systems
- program PIC microcontroller and AVR microcontroller
- interface sensors with microcontroller

DETAILED CONTENTS

1. Microcontroller series (MCS) (14 Periods)

   1.1 Architecture of 8051Microcontroller
   1.2 Pin details
   1.3 I/O Port structure
   1.4 Memory Organization
   1.5 Special Function Registers (SFRs)
   1.6 External Memory

2. Instruction Set for Microcontroller Programming (16 Periods)

   2.1 Instruction Set of 8051
   2.2 Addressing Modes,
   2.3 Types of Instructions
   2.4 Timer operation
   2.5 Serial Port operation

2.6 Interrupts

3. Introduction to Embedded System (08 Periods)

Embedded system, history of embedded systems, embedded system architecture, Functional structure of embedded system

4. Embedded operating systems (10 Periods)

Real-time operating system, factors affecting embedded systems, applications of embedded systems, embedded systems characteristics and features,

5. Introduction of PIC microcontroller, block diagram, function of each block. Introduction of AVR microcontroller, block diagram, function of each block. (10 Periods)

6. Programming concepts of microcontrollers. Basic introduction of Software used in microcontrollers. How to transfer C or ASM code in microcontrollers. (10 Periods)

7. Input/output interface (08 Periods)
   - Sensors, 7-segemtn display, LCD, LED and relay

8. Internet of Things (08 Periods)
   - Introduction to Internet of things
   - Application, architecture, protocols
   - Functional blocks of IoT, Characteristics of IoT
   - Brief idea of Arduino IDE

LIST OF PRACTICALS

1. Familiarization with Micro-controller Kit and its different sections
2. Programming to interface switches and LEDs
3. Programming and interface of Seven Segment and LCD.
4. Programming for A/D converter, result on LCD.
5. Programming for D/A converter, result on LCD.
6. Programming for serial data transmission from PC to Kit or Vice versa.
7. Programming and interfacing of RELAY and Buzzer
8. Design PIC based Security System
9. Design AVR based Temperature indicator cum controller.

Practical using Arduino-interfacing sensors

1. Interfacing Light Emitting Diode(LED)- Blinking LED
2. Interfacing Button and LED – LED blinking when button is pressed
3. Interfacing Light Dependent Resistor (LDR) and LED, displaying automatic night lamp
4. Interfacing Relay module to demonstrate Bluetooth/wifi based home automation application. (using Bluetooth/wifi and relay).

INSTRUCTIONAL STRTEGY

Instruction should be given to students by showing them actual microcontrollers in the class room so that they can develop the concept. Exercise on programming should be done by taking simple examples like interfacing of switch, LED and relay.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual laboratory and practical work
- Model making
- Viva-Voce

RECOMMENDED BOOKS:-

1. Fundamentals of Microprocessor and Microcontroller by B. Ram , Dhanpat Rai Publications.
2. Microcotroller and Embedded Systems using Assembly And C by Muhammad Ali Mazidi, RolinMckinlay, Janice GilispieMazidi: Pearson
3. PIC Microcontroller and Embedded Systems : Using assembly and C by Muhammad Ali Mazidi, RolinMckinlay, Danny Causey; Pearson
4. Microcotroller and Embedded Systems using Assembly and C by Muhammad Ali Mazidi, RolinMckinlay, Janice GilispieMazidi, Pearson
5. Embedded Systems - Architecture, Programming, Design, by Kamal, R. Tata McGraw Hill, New Delhi
6. YashavantKanetkar, ShrirangKorde, “21 Internet Of Things (IOT) Experiments”
7. NeerparajRai , “Arduino Projects For Engineers”
8. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	14	16
2	16	18
3	08	10
4	10	12
5	10	12
6.	10	12
7.	08	10
8.	08	10
Total	**84**	**100**

6.3 WIRELESS AND MOBILE COMMUNICATION

L	T	P
4	-	6

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 within very short period, almost everybody will be using mobile communication. Technology is also changing very fast. Therefore, the students should know the functioning of wireless/mobile system/equipment to keep themselves abreast of this latest application of communication.

LEARNING OUTCOMES

After completion of the course, the students will be able to:

- identify and explain the features, specification and working of cellular mobile
- measure and analyze signal strength at various points from a transmitting antenna with mobile phone.
- understand generation of cellular phones.
- describe and analyze different Multiple Access Techniques for Wireless Communication (FDMA, TDMA and CDMA)
- describe different Mobile Communication Systems(GSM and CDMA)
- demonstrate call processing on a GSM and CDMA trainer Kit
- demonstration of SIM, LTE, Vo-LTE and mobile network
- describe the idea of LAN, MAN, WAN

DETAILED CONTENTS

1. Wireless Communication (10 Periods)

    1.1 Basics
    1.2 Advantages of wireless communication
    1.3 Electromagnetic waves.
    1.4 Frequency Spectrum used.
    1.5 Cellular Network Systems.

2. Cellular Concept (10 Periods)

2.1. Introduction to 1G, 2G, 3G, 4G, and 5G
2.2 Cell area
2.3. Cell Site Structure
2.4. Capacity of cell
2.5. Frequency Reuse (Concept)
2.6 Interference (Co-channel, Adjacent channel)
2.7 Power Control for reducing Interference
2.8 Fundamentals of cellular network planning
a) Coverage planning
b) Capacity planning
c) Cell splitting and sectoring

3 Multiple Access Techniques for Wireless Communication (10 Periods)

3.1 Introduction to Multiple Access.
3.2 Frequency Division Multiple Access (FDMA)
3.3 Time Division Multiple Access (TDMA)
3.4 Distinction between TDMA FDD and TDMA TDD
3.5 Code Division Multiple Access (CDMA), WCDMA

4. Introduction to Bluetooth technology and Wifi Technology (02 Periods)

5. Mobile Communication Systems (14 Periods)
5.1 Introduction of Global Systems for Mobile Communication (GSM) and its architecture, Introduction of CDMA System, comparison of CDMA and GSM Systems and frequency bands.
5.2 Introduction to GPRS and EDGE
5.3 Introduction to Architecture and Features of UMTS
5.4 HSPA (High Speed Packet Access)
5.5 Features and Architecture of LTE (Long Term Evolution), Vo-LTE(Voice Over Long Term Evolution)
5.6 Brief description of Y-Max technology and SIM, IMIE
5.7 Introduction to GPS(Global Position System)

6. Digital and Data Communication (10 Periods)

6.1 Data Transmission Basics: Review of digital data anlog modulation and digital formats. Data rates, Baud Rates, Channel capacity, Mediums for communication, Synchronous and ashnchronous data communication.
6.2 ISO-OSI model and TCP/IP model of network, Protocols and services. Connection oriented and connectionless services.

6.3 IEEE 208 standards for computer networks.
6.4 Internet and ISDN services.

LIST OF PRACTICALS

1. Study the features, specification and working of cellular mobile
2. Measurement of signal strength at various points from a transmitting antenna
3. Demonstration of Base Trans Receiver(BTS) with nearby cellular tower
4. Observing call processing of GSM trainer kit.
5. Repair of a GSM mobile phone
6. Troubleshooting GSM Mobile Phone
   - Assembling and dissembling of GSM phone
   - Study parts of Mobile Phone
   - Testing of various parts

INSTRUCTIONAL STRATEGY

Wireless and Mobile Communication is having significant impact in Electronics Market. For the proper awareness of this subject, it is must to provide the students the detailed functioning of wireless/mobile system/equipment. For 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 to mobile companies

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making
- Actual laboratory and practical work
- Assembly and disassembly exercises
- Viva-Voce

RECOMMENDED BOOKS

1. Wireless Communications, Principles and Practice, by ThedoreS.Rappaport.
2. Wireless Communications and Networking, by William Stallings.
3. Mobile and Personal Communication Systems and Services, by Raj Pandya, Prentice Hall of India, New Delhi
4. Wireless and Mobile Communication VK Sangar, Ishan Publication, Ambala.
5. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	10	18
2.	10	18
3.	10	18
4.	02	03
5.	14	25
6.	10	18
Total	**56**	**100**

6.4.1 CONTROL SYSTEM

L	T	P
4	-	2

RATIONALE

A diploma holder when employed in automation industry such as automated power stations will be required to know the basics of control system and process variables. Early automation systems were mechanical in design, the timing and sequencing being affected by gears and cams. Now these design concepts were replaced by electrical drives and are controlled by PI of PID controllers. Diploma holders in industry are responsible to design, modify and troubleshoot such control circuits. Looking at the industrial application of control system in the modern industry, this subject finds its usefulness in the present curriculum.

LEARNING OUTCOMES

After completion of courses the learner should be able to:

- understand the concept of open loop and close loop system
- understand various types of signals in control system
- determine Transfer function of a Control System
- explain various parameter of first order and second order Control System
- determine the stability of a Control System
- understand use of various controller in a Control System
- apply controllers in various industrial applications

DETAIL CONTENT

1. Introduction to Control System (12 Periods)

    1.1 Open loop Control System, block diagram and its elements, properties and application
    1.2 Close app Control System, block diagram and its elements, properties and application (with example)
    1.3 Block diagram of feedback Control System and its elements
    1.4 Comparison between open and close loop Control System
    1.5 Definition and Explanation of the following Control System
        a) Linear and Non linear System
        b) Continuous and Discrete System
        c) Static and dynamic System

2. Basic Signals (04 Periods)

2.1 Basic idea of impulse signal, unit step, ramp, and its Laplace transform

3. Transfer Function (08 Periods)

3.1 Definition of Transfer function and its use in Control System
3.2 Transfer function of the following:
3.3 Open loop and Close loop System
3.4 Simple RC low pass and High pass filter
3.5 Characteristic Equation
3.6 Pole-Zero Concept of Transfer Function
3.7 Initial value and final value theorem.

4. Time Domain Analysis (12 Periods)

4.1 Time response of first order system with unit step input
4.2 Time response of second order system with unit step input
4.3 Basic idea of delay time, rise time, setting time, steady state error, max overshoot, Damping ratio (No Derivation)
4.4 Over damped, under damped, critically damped, un damped system (basic idea only) and Pole-zero representation, Nature of transit response, Damping ration (No Derivation)

5. Stability Theory (10 Periods)

5.1 Basic concept of stability analysis by Routh-Hurwitz Criterion

6. Basic Controller (10 Periods)
6.1 Introduction,
6.2 Need of controller
6.3 Type of controller (Basic idea and Mathematical expression only)
a) On-off controller
b) Proportional controller
c) PD controller
d) PI controller
e) PID controller

LIST OF PRACTICALS

1. To obtain a transient response of first order system with unit step input
2. To obtain a transient response of second order system with unit step input

3. To observe the output waveform of a under damped system with unit step input
4. To observe the output waveform of a over damped system with unit step input
5. To observe the output waveform of a critically damped system with unit step input
6. To observe the output waveform of a undamped system with unit step input
7. To observe the output waveform of a plant controlled by P, PI and PID controllers.

INSTRUCTIONAL STRATEGY

The subject requires more emphasis on closed loop controlled system. Visit to instrumentation and communication industries most be carried out, so as to make students understand where and how various instruments are used in the industry.

MEANS OF ASSESMENT

- **Class test/Quiz**
- **Home Assignments**
- **Attendance**
- **Sessional and end semester examination**

RECOMMENDED BOOKS

1. **Modern Control Engineering by K. Ogata; PHI Publications.**
2. **Control System Engineering by I. J Nagrath and M.Gopal; New Age International Publishers.**
3. **Linerar Control System by B.S Manke; Knanna Publishers**
4. **E-book/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.**

Websites for Reference:
http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	12	22
2.	04	06
3.	08	14
4.	12	22
5.	10	18
6.	10	18
Total	**56**	**100**

6.4.2. MEDICAL ELECTRONICS

L	T	P
4	-	2

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.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- describe various medical electronics equipment and their uses
- use electrodes for various purposes
- identify different types of bio-medical transducers
- understand the working of biomedical recorders
- measure various parameters required for patient monitoring system
- use modern imaging system
- identify the various patient safety standards.

DETAILED CONTENTS

1. Overview of Medical Electronics, classification of medical Equipments, application and specifications of diagnostic, therapeutic and clinical laboratory equipment, method of operation of these instruments, typical waveforms & signal characteristics (06 Periods)

2. Electrodes (08 Periods)

   Origin of Bioelectric signals, Bio electrodes, Electrode tissue interface, contact impedance, Types of Electrodes, Biological Amplifiers, Gelies, Electrodes used for ECG , EEG, EMG.

3. Bio Transducers & Biosensors (08 Periods)

   Typical signals from physiological parameters, Classification of Bio transducers, pressure transducer, Photoelectric transducer, Transducer for body temperature measurement, pulse sensor, respiration sensor.

4. Bio Medical Recorders (12 Periods)

   Block diagram description and application of following instruments
   4.1 Electrocardiograph (ECG) Machine

4.2 Electroencephalograph (EEG) Machine
4.3 Electromyography (EMG) Machine
4.4 Phonocardiogram (PCG)
4.5 Vector cardiogram (VCG)
4.6 Digital Stethoscope

5. Patient Monitoring Systems (10 Periods)

5.1 Heart rate measurement
5.2 Pulse rate measurement
5.3 Respiration rate measurement
a. Blood pressure measurement
b. Need of defibrillator and Cardiac Pace maker
c. Bedside patient monitoring System

6. Modern Imaging System (08 Periods)

6.1 X-Ray Machine
6.2 Magnetic Resonance Imaging System
6.3 Ultrasonic Imaging System

7. Patient Safety (04 Periods)

7.1 Electric shock hazards
7.2 Leakage currents
7.3 Electrical safety analyser
7.4 Safety standards.
7.5 CT-Scan

Note: Students must be taken for a visit to hospital for exposure of various medical electronics related equipments like ventilator, boyles apparatus, pulse ox meters, defibrillators, bedside monitor and x-ray equipment etc.

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 that 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.

LIST OF PRACTICALS

1 . To operate and familiarization with:

a) B.P. Apparatus
b) ECG Machine

2. To operate and familiarization with:
   a) Ventilator
   b) Incubator
3. To measure the concentration of blood sugar with Glucometer (fasting, P.P., Random)
4. To measure
   a) Respiration rate and interface to PC
   b) Pulse rate
5. To Measure The EMG Signals and interface with PC
6. Body Temperature measurement and recording in excel form in pc.
7. Installation of medical equipment in laboratories of Hospital precautions to be taken.
8. Operation and use of Electro-physiotherapy

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making
- Actual laboratory and practical work
- Assembly and disassembly exercises Viva-Voce

RECOMMENDED BOOKS

1. Handbook of Biomedical Instrumentation by RS Khandpur;Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Biomedical Instrumentation by Cromwell PHL
3. Modern Electronics Equipment by RS Khandpur; TMH, New Delhi
4. Introduction to Biomedical Electronics by Edward J. Perkstein; Howard Bj, USA
5. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1	06	12
2	08	16
3	08	16
4	12	20
5	10	16
6	08	12
7	04	8
Total	**56**	**100**

6.4.3 COMPUTER NETWORKS

L	T	P
4	-	2

RATIONALE

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

LEARNING OUTCOMES

After completion of the course, the learner should be able to

- recognize physical topology and cabling (coaxial, OFC, UTP, STP) of a network.
- recognize various types of connectors RJ-45, RJ-11,BNC and SCST.
- demonstrate various types of networking models and protocol suites.
- install and configure a network interface card in a workstation.
- identify the IP address of a workstation and the class of the address and configure the IP Address on a workstation.
- configure routers.
- demonstrate sub netting of IP address.
- identify connectivity troubleshooting using PING, IPCONFIG, IFCONFIG.
- explain concept of wireless networking.
- configure different Network devices.
- understand network security management and configuration.

DETAILED CONTENTS

1. Networks Basics (08 Periods)

    1.1 What is network
    1.2 Peer-to –peer Network
    1.3 Server Client Network
    1.4 LAN, MAN and WAN
    1.5 Network Services
    1.6 Network Topologies
    1.7 Switching Techniques

2. OSI Model (08 Periods)

    2.1 Standards
    2.2 OSI Reference Model

2.3 OSI Physical layer concepts and application
2.4 OSI Data-link layer concepts and application
2.5 OSI Networks layer concepts and application
2.6 OSI Transport layer concepts and application
2.7 OSI Session layer concepts and application
2.8 OSI presentation layer concepts and application
2.9 OSI Application layer concepts and application

3. Introduction to TCP/IP (08 Periods)

3.1 Concept of physical and logical addressing
3.2 Different classes of IP addressing, special IP address
3.3 Sub netting and super netting
3.4 Loop back concept
3.5 IPV4 and IPV6 packet Format
3.6 Configuring IPV4 and IPV6

4. Cables and Connectors (08 Periods)

4.1 Types of Cables(Coaxial, Twisted Pair), Shielded and Unshielded Pair of Cables, fiber optic cable.
(Straight through Cable, Cross Over Cables) with colour coding.
4.2 Ethernet Specification and Standardization:
10 Mbps (Traditional Ethernet), 100 Mbps (Fast Ethernet) and 1000 Mbps (Gigabit Ethernet),Leased lines.
4.3 Use of RJ45, RJ11, BNC,SCST.

5. Network Connectivity (09 Periods)

5.1 Network connectivity Devices
5.2 NICs
5.3 Hubs
5.4 Bridges
5.5 Repeaters
5.6 Switches
5.7 Routers and Routing Protocols, Routing Algorithm
5.8 Configuring of Routers.
5.9 VOIP and Internet Telephony

6. Network Administration / Security (09 Periods)

6.1 Client/Server Technology
6.2 Server Management

6.3 RAID management and mirroring
6.4 Cryptography
6.5 Ethical Hacking

7. Wireless Networking (06 Periods)

Basics of Wireless: Wireless MAN, Networking, Wireless LAN, Wi-Fi, WiMax (Broad-band Wireless) and Li-Fi.

LIST OF PRACTICALS

1. Configure local area network using topologies.
2. Configure different network devices used in LAN- hub/switch/routers/bridges.
3. Create different types of cables for straight through and cross over cable
4. Configure Ethernet network
5. Install NIC and locate MAC address
6. Configure TCP/IP addressing
7. Install Network printer and sharing content

INSTRUCTIONAL STRATEGY

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

MEANS OF ASSESSMENT

– Assignments and quiz/class tests
– Mid-term and end-term written tests
– Model/prototype making
– Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

5. Computer Networks by Tanenbaum, Prentice Hall of India, New Delhi
6. Data Communications and Networking by Forouzan, (Edition 2nd and 4th),Tata McGraw Hill Education Pvt Ltd , New Delhi
7. Data and Computer Communication by William Stallings, Pearson Education, New Delhi
8. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

6.5

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	08	15
2.	08	15
3.	08	14
4.	08	14
5.	09	15
6.	09	15
7.	06	12
Total	**56**	**100**

PROJECT WORK

L T P
- - 8

RATIONALE

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.

LEARNING OUTCOMES

After undergoing the project work, the students will be able to:

- Apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project.
- 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
- Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
- Develop firsthand 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.
- Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc.
- Assemble/fabricate and test an electronics gadget.

General Guidelines

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 ON line/OFF line UPS of different ratings and inverters
8. Design, fabrication and testing of different types of experimental boards
9. Repair of oscilloscope, function generator
10. Microprocessor/Microcontroller based solar tracking system
11. GSM based car or home security system
12. Bank token display using microcontroller
13. Microprocessor/Microcontroller Based A/D converter
14. Microprocessor/Microcontroller Based D/A converter
15. Simulation of half wave and full wave rectifiers using Simulation Software

16. Simulation of class A, Class B, Class AB and Class C amplifiers
17. Simulation of different wave forms like sine, square, triangular waves etc.
18. GPS based vehicle tracking system
19. Calculate BER(Bit Error Rate) of various modulation techniques
20. Electronic Weighing Machines
21. Setting up home security system using biometrics and video recording
22. Making an overhead tank water level controller using a pump and control system

23. PLC based water level controller/sequential motor starter/bottling plant/traffic light control.

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 criterion 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**				
			Excellent	**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
i)	More than 80	Excellent
ii)	79 <> 65	Very good
iii)	64 <> 50	Good
iv)	49 <> 40	Fair
v)	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 200 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 other 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.

10. RESOURCE REQUIREMENT

10.1 PHYSICAL RESOURCES

(A) Space requirement

Norms and standards laid down by All India Council for Technical Education (AICTE) are to be followed to work out space requirement in respect of class rooms, tutorial rooms, drawing halls, laboratories, space required for faculty, student amenities and residential area for staff and students.

(B) Equipment requirement:

Following Laboratories/Shops are required for Diploma Programme in Electronics Engineering:

- Communication Skills Lab
- Applied Physics Lab
- Applied Chemistry Lab
- Engineering Drawing
- Electrical Engineering Lab
- Basics of IT Lab/Computer Lab
- Carpentry Shop
- Painting and Polishing Shop
- Fitting and Plumbing Shop
- Sheet Metal Shop
- Welding Shop
- Electronic Lab
- Digital Electronic and Microprocessor
- Communication Lab
- Instrumentation and Control Lab
- Computer Lab
- Electrical Engineering Lab
- Environmental Engineering Lab , Energy Conservation Lab

Note: Some of the laboratories can be clubbed by keeping in mind best utilisation of space and equipment, the above mentioned laboratories after clubbing reduce to 10 laboratories which are given below:

EQUIPMENT REQUIRED FOR ELECTRONICS ENGINEERING

Sr. No.	Description	**Qty**	**Total Price (Rs)**
COMMUNICATIONSKILLS LABORATORY			
1.	Stools	40	10,000
2.	Display Board/Screen	2	6,000
3.	Sound recording and playing system	1	6,000
4.	Audio cassettes	60	2,000
5.	Overhead Projector	1	5,000
6.	Transparencies slides	100	500
7.	TV, VCR and camera for video recording	1 each	20,000
8.	English spoken course	1	2,000
9.	A Quiz room equipped with two way audio system, back projection system and slide projector	1	30,000
10.	Miscellaneous	LS	1,500
APPLIED PHYSICS LABORATORY			
1.	Vernier calipers Working length 160 mm, Internal and external dia with locking arrangement	12	2,000
2.	Screw Gauges Working length 15 mm, pitch 0.5 mm, least count .005 mm	12	2,000
3.	Spherometers Distance between legs 2.5 mm, pitch 0.5 mm, least count .005 mm.	12	2,000
4.	Mirrors (convex, concave)	5 Each	1,500
5.	Pendulum Setup	02	4,000
6.	Gravesand's Apparatus	02	3,000
7.	Inclined Plane Setup	02	2,000
8.	Flywheel Setup	02	4,000
9.	Prism	05	1,500
10.	Spectrometer	02	25,000
Sr. No.	Description	**Qty**	**Total Price (Rs)**
11.	DC Ammeters Moving coil weston-type ammeter with ebonite stand	10	3,500
12.	DC Miliammeters	2	1,000
13.	DC Microammeters	2	700
14.	DC voltmeters	10	700
15.	DC Millivoltmeters	10	2,000
16.	Sensitivity Galvanometer	2	800
17	Student Galvanometers	10	4,000
18.	Demonstration type DC Ammeters Range; 0 to 1 Amp.	2	1,000
19.	D type DC Voltmeter Range : 0 to 1 Volt	2	1,000
20.	D type Galvanometers Sensitivity : 20 microamperes per scale division,	8	8,000
21.	Resistance boxes (dial type) assorted	8	8,000
22.	Rheostats	10	4.000
23.	Miscellaneous items (Spring, Pan, Glycerine, Optic fibre, Ferromagnetic material)	LS	2,000
24.	Fortin's Barometer (Wall type)	2	20,000

25.	Stoke's Apparatus	2	10,000
26.	Gumther's Apparatus	2	16,000
27.	Resonance Tube Apparatus with accessories and Tuning fork set	2	14,000
28.	Sodium Lamp setup with Biprism	2	10,000
29.	Ohmic resistance coil	10	5,00
30.	Slide wire bridge	2	8,000
31.	PN Junction diode Apparatus	2	10,000
32.	Laser (as per requirement)	1	1,00,000
33.	Numerical aperture setup	1	25,000
34.	Miscellaneous	LS	3,000
Sr. No.	Description	**Qty**	**Total Price (Rs)**
APPLIED CHEMISTRY LABORATORY			
	Digital Balance	1	80,000
	Burette 50ml	30	3,000
	Pipette 25ml	60	4,000
	Beakers 100ml	60	4,000
	Burette stand	30	30,000
	Glazed tile	30	1,000
	Conical flask 50ml (Titration flask)	60	4,000
	Standard (Measuring) flask (to prepare standard solution) 250ml/100ml	30	6,000
	Able's Flash Point apparatus	2	10,000
	(1/10)°C thermometer	06	6,000
	Candles	20	100
	Crucible with lid	06	2,000
	Muffle furnace	1	18,000
	Decicators	06	8,000
	Pair of tongue (small and big)	24 (small) 2 (big)	2,000
	Chemicals EDTA-1 kg Eriochrome Black-T(solochrome black T)-200g Buffer solution (NH_3 - 2.5 ltr, NH_4Cl – 1 kg) Zinc sulphate- 500g H_2SO_4- 2.5 ltr Phenolphthalein indicator (as per requirement) Methyl orange indicator (as per requirement) Charcoal (as per requirement) Kerosene- 1 ltr	LS	20,000
	Miscellaneous	LS	2,000
Sr. No.	Description	**Qty**	**Total Price (Rs)**
ENGINEERING DRAWING			

1.	Drawing Boards (700 x 500mm)	60	25,000
2.	Draughtsman Tables	60	1,80,000
3.	Draughtsman Stools	60	40,000
4.	Computer Aided Drawing (CAD) Software	30 User	5,00,000
5.	Model of different wooder joints	1	1,000
6.	Model of different screw threads	1	1,000
7.	Model of various locking devices	1	1,000
8.	Model of various joints	1	1,000
9.	Cut section Model of various couplings	1	3,000
10.	Miscellaneous	LS	5,000
ELECTRICAL ENGINEERING LABORTORY			
1.	Voltmeter	5	7,500
2.	Ammeter	5	10,000
3.	CRO	1	15,000
4.	Wattmeter	5	10,000
5.	Multimeter	1	4,000
6.	Resistive load	1	4,000
7.	Regulated supply	1	8,000
8.	Signal generator	1	5,000
9.	Rheostat	2	2,500
10.	Lead acid battery	1	4,000
11.	Cables, Coils, Lamp (as per requirements)	LS	1,500
12.	Resistance, Inductor, Capacitor (as per requirements)	LS	1,500
13.	Miscellaneous	LS	1,500

Sr. No.	Description	**Qty**	**Total Price (Rs)**
BASICS OF IT LABORATORY/COMPUTER LABORATORY			
1.	Computer System with latest configuration	30	8,00,000
2	Printer (MFP)	1	25,000
3	Printer (Laser)	1	35,000
4.	Plotter	1	75,000
5.	Digitiser	1	50,000
6.	Antivirus Software	LS	10,000
7.	Internet Facility on Computers	LS	2,00,000
8.	LCD Projector	1	35,000
9.	UPS	60	1,20,000
10.	Software (latest windows, latest MS Office)	1	1,00,000
11.	Scanner	1	10,000
12.	Miscellaneous	LS	5,000
CARPENTRY SHOP			
1	Work benches fitted with carpenter vices	5	20,000
2.	Circular saw grinder	1	6,000
3.	Wood cutting band saw-vertical	1	10,000
4.	Bench grinder	1	5,000
5.	Drilling machine	1	8,000
6.	Wood turning lathe	1	40,000
7.	Wood Planner	1	20,000

8.	Tool accessories measuring and marking Instruments	25	25,000
9.	Band saw blade brazing unit	1	10,000
10.	Miscellaneous	LS	1,500

Sr. No.	Description	**Qty**	**Total Price (Rs)**
PAINTING AND POLISHING SHOP			
1.	Spray gun with hose pipe	1	1,000
2.	Paint brushes	20	2,000
3.	Paint/Varnish	LS	2,000
4.	Air Compressor with 2 hp motor	1 set	10,000
5.	Miscellaneous	LS	2,000
FITTING AND PLUMBING SHOP			
1.	Work benches with vices (4 vices on each bench)	5	30,000
2.	Marking tables with scribers	4	24,000
3.	Surface plates	5	20,000
4.	Accessories like calipers, V blocks, height, gauges steel rules and scribers	25	50,000
5.	Tool kits – taps, dies, drills	25	40,000
6.	Tool kits – chiesels, hammers, files, hacksaw	25	25,000
7.	Drilling machine	2	12,000
8.	Pipe vice	4	1,000
9.	Chain wrenches	5	1,250
10.	Ring spanner set	5	600
11.	Pipe die set 2”	2 set	1,000
12.	Pipe bending device	1	5,000
13.	Various plumbing fittings	LS	2,000
14.	Miscellaneous	LS	1,500
SHEET METAL SHOP			
1.	Hammers	8	3,000
2.	Mallets (Hard & Soft)	5	2,000
3.	Sheet and wire Ganges	LS	8,00
4.	Shearing Machine	1	20,000

Sr. No.	Description	**Qty**	**Total Price (Rs)**
5.	Bar folding Machine	1	20,000
6.	Burring machine	1	10,000
7.	Various sheet (black plain, galvanized iron, corrugated, Aluminium)	1 Each	1,000
8.	Hand Shears/Snippers	4	2,000
9.	Nuts, Bolts, Rivets, Screw	LS	5,00
10.	Miscellaneous	LS	1,000
WELDING SHOP			
1.	Electrical welding transformer set with accessories	3	30,000
2.	Gas Cutting Unit	1	3,000
3.	Work benches with vices	3	5,000
4.	Welding generator set	1	10,000
5.	Oxy acetylene welding set with accessories	1	7,000
6.	Acetylene generating set	1	6,000
7.	Electric welder tool kit	10	10,000
8.	Projection welding machine	1	15,000
9.	Brazing equipment with accessories	1	10,000

10.	Soldering irons	3	1,000
11.	Pedestal grinder	1	10,000
12.	Metal spraying gun	1	10,000
13.	Spot welder	1	25,000
14.	TIG welding set	1	1,00,000
15.	MIG welding set	1	1,00,000
16.	Welding Partition Screen	5	2,500
17.	Miscellaneous	LS	3,000

Sr. No.	Detail of Instrument	**Qty.**	**Approximate Cost (in Rs) Per Unit**
ELECTRONICS LABORATORY			
1.	DC regulated low voltage variable power supply	10,	25,000
2.	DC regulated multiple output power supply	4	12,000
3.	Audio oscillator	4	16,000
4.	Wide band RC Oscillator	4	10,000
5.	RF Signal Generator	2	8,000
6.	Pulse Generator	2	10,000
7.	Function Generator	4	20,000
8.	Single trace CRO with accessories	4	60,000
9.	Dual trace CRO with accessories	4	1,00,000
10.	Electronic Multimeter DC and AC with different ranges	8	30,000
11.	Electronics digital Multimeter three and a half digit	8	25,000
12.	Digital LCR- Q meter	2	20,000
13.	Transistor tester type 911	1	5,000
14.	Audio output power meter	2	6,000
15.	Mains Voltage stabilizer(3 KVA)	1	10,000
16.	AC Millivoltmeters	4	16,000
17.	DC Millivoltmeters	2	6,000
18.	Voltmeter	5	3,000
19.	DC Ammeter	5	3,000
20.	Battery of different voltage and Ampere hour	2	3,000
21.	Single Phase variac	3	6,000
22.	Rheostat of different wattage and resistance	5	3,000
23.	Servo stabilizer power supply	1	8,000
24.	IC Bread Boards	20	10,000
25.	Distortion factor meter	1	10,000
26.	Decade resistance, capacitance and inductance (four each)	12	12,000

Sr. No.	Detail of Instrument	**Qty.**	**Approximate Cost (in Rs) Per Unit**
27.	Transducers: Pressure type, thermocouple, LVDT, opto Pick-up, electromagnetic pick-up, ultrasonic pick-up and potentiometer etc	LS	30,000
28.	Thyristor control experimental kits Instrumentation/Transducer experimental kit. Basic electronic experiment kit	LS	2,50,000
29.	Digital Panel meters	6	3,000

30.	Digital thermometer	1	4,000
31.	Stroboscope cum motor drive disc	1	10,000
32	Digital load indicator with load Cells	1	10,000
33.	Digital Lux meter	1	8,000
34	CROs 20 MHz (Scientific Make)	6 Nos.	22,000
35	Function Generators Audio Frequency	6 Nos.	7,500
36	Regulated Power Supply	6 Nos.	3,600
37	Multimeter (Digital)	10 Nos.	2,000
38	Rectifier Kits	6 Nos.	2,200
39	Filter Circuit Kit	6 Nos.	2,200
40	Bread Boards	12 Nos.	2,800
41	Transistor Kits CB CE	 6 Nos. 6 Nos.	 2,400 2,400
42	FETs	6 Nos.	2,400
43.	Operational Amplifier Kits	6 Nos.	3,000
44.	Raw Materials	LS	20,000
45	Kit for clamping Circuits	05	
46	Kit for clipping Circuits	05	
47	Kit for Monostable MV	05	
48	Kit for Astable MV (555)	05	
Sr. No.	Detail of Instrument	**Qty.**	**Approximate Cost (in Rs) Per Unit**
49	Kit for i) Hackling Oscillator ii) Cal pelt Oscillator iii) Weir Bridge Oscillator iv) RC Phase shift Oscillator v) Crystal Oscillator	5 each	
50	Kit to plot V-I characteristics of i) P-N Junction Diode ii) Zenor Diode iii) BJT iv) FET	05	
51	Kit for CB, CE, CC Configurations	05	
COMMUNICATION ENGINEERING LABORATORY(Basic)			
1.	DC regulated low voltage variable Power Supply	6	12,000
2.	RF Signal Generator	3	15,000
3.	Electronic Multimeter with different voltage ranges	6	22,000
4.	Electronic Digital Multimeter	6	20,000
5.	Standard Signal Generator	2	50,000
6.	Facsimile(Fax)-transmitter receiver	1	20,000
7.	Radio Receiver Trainer Kits/Deconstruction Models	2	10,000
8.	AM/FM signal generator	2	20,000
9.	Super heterodyne Receiver radio Demonstration model	1	4,000
10.	Communication receiver	1	5,000
11.	Optical fibre bench	2	25,000
	CRO 25 MHz	3	80,000
	Digital frequency meter	2	10,000
	50 MHz CRO/DSO	3	50,000
	Modems, opto coupler different types of microphones and other accessories	LS	10,000
	Advanced Communication Trainer	2	1,00,000
Sr.	Detail of Instrument	**Qty.**	**Approximate**

No.			**Cost (in Rs) Per Unit**
	Cellular Mobile Kit	2	10,000
	Pulse Modulation and Demodulation	6	20,000
	Pulse Amplitude Modulation and Demodulation	6	18,000
	Pulse Width Modulation and Demodulation	6	18,000
	Data Formatting and Carrier Modulation Transistor Trainer Model	6	25,000
	Carrier Demodulation of Data Reformatting Receiver Trainer Kit	6	25,000
	AM Transmitter Trainer Model	6	20,000
	AM Receiver Trainer Model	6	20,000
	FM Communication Trainer Model	6	25,000
	Sampling Reconstruction Trainer	6	11,000
	Pulse Code Modulation Transmitter	6	25,000
	Pulse Code Modulation Receiver	6	25,000
	Delta Adaptive Delta Sigma Modulation and Demodulation Trainer	6	30,000
	Antenna Trainer to plot the radiation pattern of different types of Antenna	02	
COMMUNICATION SYSTEM LABORATORY – II (Advanced)			
1.	Kit - IF Amplifier Transistor based	6 Nos.	1,500
2.	Kit – Amplitude Modulation Demodulation (DSB)	6 Nos.	2,500
3.	Kit – Double Balanced Modulator/Demodulator	6 Nos.	4,500
4.	Kit – Frequency Modulator Demodulator (Transistorized)	6 Nos.	2,200
5.	Kit – Computer and locking range of PLL	6 Nos.	1,600
6.	Kit – Frequency Demodulation (IC Based)	6 Nos.	1,600
7.	Kit –Sample and Hold (S/H) function for Digital Study	6 Nos.	2,600
8.	IF Amplifer (IC Based)	6 Nos.	1,600
9.	Frequency Synthesizer	6 Nos.	1,600
10	Kit to measure characteristic impedance of symmetrical T & π Network.	5 Nos	

Sr. No.	Detail of Instrument	**Qty.**	**Approximate Cost (in Rs) Per Unit**
11	Kit to measure Image Impedance of Asymmetrical T & π Network.	5 Nos	
12	Kit to Plot the attenuation characteristic		
13	Kit for LPF, HPF, BPF	5 each	
14	Kit for measurement of SWR of Line	2 Nos	
15	Kit for Plotting attenuation characteristics of crystal filter	5 Nos.	
ELECTRONIC DESIGN AND SIMULATION TECHNIQUES			
1.	Computers	20	
2.	Softwares:- DIP Trace /ORCAD/LAB VIEW/WIN SPICE etc.		
TELEVISION / AUDIO-VIDEO LABORATORY			
	DC regulated low voltage variable power supply	3	10,500
	DC regulated low voltage variable power supply	1	6,000
	Audio signal generator	4	16,000
	RF Oscillator	4	20,000
	Electronic multimeter Analog	6	22,000
	Electronic digital multimeter	4	12,000
	AF output power meter	2	6,000
	Signal tracer	2	3,000
	Signal Injector	2	500
	Colour TV training model	2	80,000

	CCTV System PAL Based	1 set	40,000
	Field Strength meter	1	5,000
	Satellite Receiver, Mixer Amplifier	2	10,000
	TV receiving antenna-Yagi,Uda turnstile	2 each	1,000
	Dish Antenna with LNB	1	10,000
	RF power meter	1	7,000
	Cassette tape recorder Trainer	1	10,000

Sr. No.	Detail of Instrument	**Qty.**	**Approximate Cost (in Rs) Per Unit**
	Compact Disc player system Trainer	1	10,000
	PA system with microphone	2	5,000
	Microphone	4	6,000
	Loud Speaker	2	2,000
	Audio Test System	1	12,000
	Digital Frequency Counter	1	5,000
	CRO Dual Trace	3	90,000
	RF Sweep Generator for TV Alignment	2	25,000
	Pattern generator	2	5,000
	Video Projector System	1	1,00,000
	TV Trainer Kit (B/W)	2 Nos.	13,000
	TV Trainer Kit (Colour)	2 Nos.	33,000
	Digital Storage Oscilloscope	5 Nos.	34,000
	Pattern Generators Colour	2Nos.	8,000
ELECTRONICS WORKSHOP			
1.	Hand Tools Set	5	5,000
2.	Soldering Set`	5,	5,000
3.	Hand Drill	1	3,000
4.	PCB Etching Machine	2	2,500
5.	Silk Screen Printing	2 set	50,000
6.	Drafting Equipment	1 set	15,000
7.	PCB Drilling Machine	1	10,000
8.	Sheet metal folding and binding machine	1	20,000
9.	Sheet metal cutting machine	1	5,000
10.	Centre Lathe	1	15,000
11.	Grinder	1	6,000
12.	Circular saw	1	6,000
13.	DC regulated low voltage variable power supply	2	12,000

Sr. No.	Detail of Instrument	**Qty.**	**Approximate Cost (in Rs) Per Unit**
14.	Audio Oscillator	2	6,000
15.	RF Signal generator	2	8,000
16.	Digital LCR-Q meter	2	10,000
17.	Digital multi-meter	4	12,000
18.	Dual trace/DSo	4	25,000
19.	AC Milivoltmeter	2	3,500
20.	IC Bread boards	6	3,000
21.	Soldering stations temperature controlled	0	10,500
22.	Solder suckers with accessories	10	500

23	Digital IC Tester	02	5000
DIGITAL ELECTRONICS AND MICROPROCESSORS LABORATORY .			
1.	DC regulated low voltage variable power supply	6	15,000
2.	DC regulated multiple output power supply	3	9,000
3.	Digital IC power supply	8	10,000
4.	Electronic Digital Multimeter	6	9,000
5.	CRO Dual trace, 25 MHz	4	1,00,000
6.	Digital frequency meter/universal Counter timer	2	20,000
7.	Pulse Generator	2	10,000
8.	Logic probes (TTL and CMOS)	10	2,500
9.	Digital logic trainer (TTL)	4	20,000
10.	Logic Trainer Boards	10	10,000
11.	Microprocessor trainer Kits 8085	10	50,000
12.	Microprocessor Trainer Kits 8086	2	60,000
13.	Computer Trainer	1	30,000
14.	Interfacing Cards	5	2,50,000
15.	Micro-controller Kit 8051 based	10	1,00,000
16.	Digital IC Tester	1 No.	50,000
17	Universal Programmer	2No.	7,000

Sr. No.	Detail of Instrument	**Qty.**	**Approximate Cost (in Rs) Per Unit**
18	Digital Multimeter	10 No.	60,000
19.	EPROM Programme	2	10,000
20.	EPROM Eraser	2	1,500
21	Additional cards	LS	50,000
22	Ink jet Printers	2	6,000
23.	Laser Printers	2	12000
24	Scanners	2	5000
25	Copier	1	3000
26	Scanner cum Copier cum Printer, Fax	1	4500
MEASUREMENT LABORATORY			
1.	Light Measurement (Photocells) Kit	4 Nos.	15,000
2.	LVDT Kit	4 Nos.	8,000
3.	Pressure Measurement Kit	4 Nos.	9,500
4.	Strain Measurement Kit	4 Nos.	14,000
5.	Water Level Measurement Kit	4Nos.	11,500
6.	RPM Measurement Kit	4Nos.	5,000
7.	Temperature Measurement Kit	4Nos.	5,000
8.	Maxwell's Bridge Kit	4Nos.	7,500
9.	Wein's Bridge Kit	4 Nos.	4,500
10.	Anderson Bridge Kit	4 Nos.	5,000
11.	Flux Meter (Digital) Kit	4 Nos.	5,000
12.	Q. Meter (Digital) Kit	4 Nos.	5,000
13	pH meter kit	4 Nos.	
14	Wheat stone bridge kit	4 Nos.	
ELECTRICAL MACHINE LABORATORY			
1.	Ammeter, Voltmeter, Wattmeter and Energy Meters (3- phase and 1- phase)	8 each	40,000

2.	3-Phase Resistive load	4 Nos.	16,000

Sr. No.	Detail of Instrument	**Qty.**	**Approximate Cost (in Rs) Per Unit**
3.	LCR/Q Bridge	1	5,000
4.	Tong tester	4	12,000
5.	Transformer (single phase)	2	16,000
6.	Watt meter, Volt meter, Ammeter,	2 each	10,000
7.	DC Shunt Motor,2 hp with loading arrangement	1	20,000
8.	Induction Motor (Single phase)	2	10,000
9.	Induction Motor (Three phase)	2	10,000
10.	Slipring Induction Motor 3 HP with loading facility	1	25,000
11.	Alternator and Load for Alternators	1	25,000
12.	DC generator with prime-mover motor	2	25,000
13.	DC Regulated Power Supply	2	6,000
14.	Starters (DOL and Star Delta)	2 each	8,000
15.	Rheostats	4	12,000
16.	Tacho meters (digital)	2	15,000
17.	Maggar (Insulation Tester)	2	5,000
18.	Earth Tester	2	10,000
19.	Digital Multi-meter	10	32,000
20.	Rectifier, Inverter Set	1	10,000
POER ELECTRONICS LABORATORY **(Electronics)**			
1.	Chopper Kit	6 Nos.	5,000
2.	Series Inverter	2 Nos.	8,000
3.	Parallel Inverter	2 Nos.	8,000
4.	Speed Control of dc motor (Thyristorized)	6 Nos.	5,000
5.	Single Phase Cyclo Convertor with Thyristors	2 Nos.	20,000
6.	SCR Characteristics	6 Nos.	1,500
7.	Gate Triggering Characteristics of SCR	6 Nos.	10,000
8	AC Phase Control Trainer Kit	6 Nos.	6,000
9.	Kit to Study 3-phase Control Bridge Convertor	6 Nos.	17,500

Sr. No.	Detail of Instrument	**Qty.**	**Approximate Cost (in Rs) Per Unit**
10.	UJT Characteristics and its Application as Relaxation Oscillator	6 Nos.	1,500
11	Kit for Plotting VI characteristics of SCR	5	
12	Kit for Plotting VI characteristics of TRIAL	5	
13	Kit for Plotting VI characteristics of DIAL	5	
14	Kit for Plotting VI characteristics of UJT	5	
15	Kit of UJT Based Relaxation Oscillator	5	
16	Kit for Single Phase half wave controlled Rectifier	5	
17	Kit for single phase full wave controlled Rectifier	5	
18	Kit for Triac Based AC Phase control	5	
19	Demonstration Kit of Off-line and On-line UPS	2 each	
MEDICAL ELECTRONICS			

1.	Medical test bench	LS	1,00,000
CONTROL CIRCUIT LAB			
1.	Equipment Required for Control Circuit Lab Instrumentation and Control Circuit Trainer Equipment Having hardware and software for checking Proportional, Integral and Derivative functions (configurable as P,I,D, PI, PD,PID) and ON/OFF control Having Square and triangular wave with variable frequency for testing PID. Having Variable DC for set point and error detector with inbuilt power supply and function generator, dead zone and disturbance generator	2 Sets	60,000/-

ENVIRONMENT ENGINEERING LABORATORY			
	pH Meter	01	500
	Turbidity Meter	01	5000
	Oven with Temperature Controller and Forced Air Circulation Type	01	20000
	B.O.D. Incubator	01	25000
	Water Analysis Kit	01	5000
	High Volume Sampler	01	40000
	Electrical Balance for weighing upto 1/10 of milligram (capacity)	01	1000
ENERGY CONSERVATION LABORATORY			
1	Clamp meter	02	5000
2	Multimeter	02	2000
3	Power Analyser	01	20000
4	Different types of lamps (LS) 60 W lamp, 230 V , 100 V 200 W lamp 500 W lamp 100 W lamp, 110 V, 150 V	10	500
5	Lux meter	02	5000
6	Centrifugal pump, 1 kW	1	15,000
7	Standard window A.C.	01	20000
8	Anemometer	02	5000
9	Thermometer	03	2000
10	Flow meter	02	10000
11	Pumping set with at least two pumps of different capacity.	1 set	10000
12	Pressure gauge fitted on discharge lines	1 set	2000
13	Variable Frequency Drive	02	50000
14	A small compressor with a small network of pipe line fitted with suitable pipeline, pressure gauge, safety valve and loading / unloading pressure switch.	1	3000
15	Stop watch	2	1000
16	Small blower (1.5 kW motor) with inlet and outlet ducts of approximately one meter length on both sides	1	10000
17	Black Box (for checking lamp efficacy including stand and luxmeter)	1	25000

NOTE:

In addition to the above, laboratories in respect of physics, chemistry, Computer Centre etc will be required for effective implementation of the course. Provision for photocopiers, PC facilities along with LCD Projection System etc. has also to be made.

(C) Furniture Requirement

Norms and standards laid down by AICTE be followed for working out furniture requirement for this course.

10.2 Human Resources Development:

Weekly work schedule, annual work schedule, student teacher ratio for various group and class size, staffing pattern, work load norms, qualifications, experience and job description of teaching staff workshop staff and other administrative and supporting staff be worked out as per norms and standards laid down by the AICTE.

11. EVALUATION STRATEGY

11.1 INTRODUCTION

Evaluation plays an important role in the teaching-learning process. The major objective of any teaching-learning endeavor is to ensure the quality of the product which can be assessed through learner's evaluation.

The purpose of student evaluation is to determine the extent to which the general and the specific objectives of curriculum have been achieved. Student evaluation is also important from the point of view of ascertaining the quality of instructional processes and to get feedback for curriculum improvement. It helps the teachers in determining the level of appropriateness of teaching experiences provided to learners to meet their individual and professional needs. Evaluation also helps in diagnosing learning difficulties of the students. Evaluation is of two types: Formative and Summative (Internal and External Evaluation)

Formative Evaluation

It is an on-going evaluation process. Its purpose is to provide continuous and comprehensive feedback to students and teachers concerning teaching-learning process. It provides corrective steps to be taken to account for curricular as well as co-curricular aspects.

Summative Evaluation

It is carried out at the end of a unit of instruction like topic, subject, semester or year. The main purpose of summative evaluation is to measure achievement for assigning course grades, certification of students and ascertaining accountability of instructional process. The student evaluation has to be done in a comprehensive and systematic manner since any mistake or lacuna is likely to affect the future of students.

In the present educational scenario in India, where summative evaluation plays an important role in educational process, there is a need to improve the standard of summative evaluation with a view to bring validity and reliability in the end-term examination system for achieving objectivity and efficiency in evaluation.

11.2 STUDENTS' EVALUATION AREAS

The student evaluation is carried out for the following areas:

- Theory
- Practical Work (Laboratory, Workshop, Field Exercises)

- Project Work
- Professional Industrial Training

A. Theory

Evaluation in theory aims at assessing students' understanding of concepts, principles and procedures related to a course/subject, and their ability to apply learnt principles and solve problems. The formative evaluation for theory subjects may be caused through sessional /class-tests, home-assignments, tutorial-work, seminars, and group discussions etc. For end-term evaluation of theory, the question paper may comprise of three sections.

Section-I

It should contain objective type items e.g. multiple choice, matching and completion type. Total weightage to Section-1 should be of the order of 20 percent of the total marks and no choice should be given in this section. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

Section-II

It should contain short answer/completion items. The weightage to this section should be of the order of 40 percent of the total marks. Again, no choice should be given in section-II

Section-III

It may contain two to three essay type questions. Total weightage to this section should be of the order of 40 percent of the total marks. Some built-in, internal choice of about 50 percent of the questions set, can be given in this section

Table II : Suggested Weightage to be given to different ability levels

Abilities	Weightage to be assigned
Knowledge	10-30 percent
Comprehension	40-60 percent
Application	20-30 percent
Higher than application i.e. Analysis, Synthesis and Evaluation	Upto 10 percent

B. Practical Work

Evaluation of students performance in practical work (Laboratory experiments, Workshop practicals/field exercises) aims at assessing students ability to apply or practice learnt concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work related attitudes. Formative and summative evaluation may comprise of weightages to performance on task, quality of product, general behaviour and it should be followed by viva-voce.

C. Project Work

The purpose of evaluation of project work is to assess students ability to apply, in an integrated manner, learnt knowledge and skills in solving real life problems, manipulative skills, ability to observe, record, creativity and communication skills. The formative and summative evaluation may comprise of weightage to nature of project, quality of product, quality of report and quality of presentation followed by viva-voce.

D. Professional Industrial Training

Evaluation of professional industrial training report and viva-voce/ presentation aims at assessing students' understanding of materials, industrial processes, practices in the industry/field and their ability to engage in activities related to problem-solving in industrial setting as well as understanding of application of learnt knowledge and skills in real life situation. The formative and summative evaluation may comprise of weightages to performance in testing, general behaviour, quality of report and presentation during viva-voce.

12. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION

This curriculum document is a Plan of Action 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. class-room, laboratory, library and field and execute them in right perspective. It is emphasized that a proper mix of different teaching methods in all these places of instruction only can bring the changes in stipulated students behaviour as in the 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 teacher to read them carefully, comprehend and start using them.

(A) Broad Suggestions:

1. Curriculum implementation takes place at programme, course and class-room 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. An academic plan needs to be prepared and made 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.

3. HOD of every Programme Department along with HODs and incharges of other departments are required to prepare academic plan at department level referring to 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 class room level and their success in achieving course level objectives lies in 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 time. It is essential for them to use the given time judiciously 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 and courses to be taught.

2. Teachers are required to prepare lesson plan for every theory class. This plan may comprise of contents to be covered, learning material 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 planned subject content, check desired learning outcomes 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 guided library exercises by identification of course specific experience requirement, setting time, assessment, etc. The assignments and seminars can be thought of as terminal outcome of library experiences.

5. Concept and content based field visits may be planned and executed for such content of course which 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 feed back to every student

8. The student centred activities may be used to develop generic skills like task management, problem solving, 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. Teachers may take initiative in establishing liaison with industries and field organizations for imparting field experiences to their students.

11. Students be made aware about issues related to ecology and environment, safety, concern for wastage of energy and other resources etc.

12. Students may be given relevant and well thought out project assignments, which are purposeful and develop practical skills. This will help students in developing creativity and confidence for their gainful employment.

13. A Project bank may be developed by the concerned department of the polytechnics in consultation with related Industry, research institutes and other relevant field organizations in the state.

13. LIST OF PARTICIPANTS

The following experts participated in the workshop for Developing the Curricula Structure and Contents of Diploma Programme in Electronics Engineering for UP State on 5-6 April, 2018 at NITTTR, Chandigarh:

1. Sh. Pankaj Yadav, Assistant Director, Directorate of Technical Education, Kanpur
2. Sh. Lal Ji Patel, Text Book Officer/CDC Officer, IRDT, Kanpur
3. Mohd. Qamruzzaman, Lecturer English, Government Polytechnic, Kanpur
4. Sh. Anjani Kumar Sharma, HOD, Chemical Engg. Government Polytechnic, Chandari
5. Dr. Balram, Lecturer Maths, Government Polytechnic, Lucknow
6. Sh. Sanjay Kumar Singh, Lecturer, Electrnics, Government Polytechnic, Aurai, Bhadohi, UP.
7. Sh. Nirdosh Kumar, Lecturer, Electrical Engg. Government Polytechnic, Naraini, Banda
8. Sh. Vinod Sonthwal, Lecturer, Civil Engg. NITTTR, Chandigarh
9. Sh. Vikas Choudhary, Lecturer, Civil Engg. Government Polytechnic, Changipur, Bijnor
10. Sh. Ashish Kumar, Head, Mechanical Engg. Government Polytechnic, Narwana Khurd, Meerut
11. Sh. Gopal Chandra Nayak, Assistant Professor, Regional Institute of English, Sector 32-C, Chandigarh.
12. Sh. Amit Doegar, Assistant Professor, Computer Science and Engg. NITTTR, Chandigarh
13. Dr. Kanika Sharma, Assistant Professor, ECE, NITTTR, Chandigarh
14. Mrs. Shano Solanki, Assistant Professor, Computer Science and Engg. NITTTR, Chandigarh
15. Dr.Lini Mathew, Associate Professor, Electrical Engg. NITTTR, Chandigarh
16. Dr. KC Lachhwani, Assistant Professor, Applied Science, NITTTR, Chandigarh
17. Mrs. Rama Chhabra, Associate Professor, CDC, NITTTR, Chandigarh
18. Dr. AB Gupta, HOD, CDC, NITTTR, Chandigarh
19. Sh. Roshan Lal, Sr. Lecturer, Kalpana Chawla Govt. Polytechnic for Women, Ambala City
20. Dr. P. Sudhakar Rao, Assistant Professor, Mechanical Engg. NITTTR, Chandigarh
21. Sh. Kamal Kumar, Lecturer, Computer, Government Girls Polytechnic, Lucknow
22. Sh. Pravesh Verma, Deputy Secretary, Board of Technical Education, Lucknow
23. Dr. Dinesh Yadav, Lecturer, Physics, Government Polytechnic, Bareilly
24. Dr. Yogendra Singh, Lecturer, Chemistry, Government Polytechnic, Ghaziabad
25. Professor Seema Kapoor, Dr. SSBUICET, Panjab University, Chandigarh
26. Sh. Navdeep Singh, Sr. Lecturer, Computer Sc. Engg. Government Polytechnic, KhuniMajra, Mohali
27. Sh. Gurmail Singh, Sr. Lecturer, ECE, Government Polytechnic, KhuniMajra, Mohali
28. Dr.Shimi S.L., Assistant Professor, Electrical Engg. NITTTR, Chandigarh

The following experts participated in the workshop for Developing the Curricula Structure and Contents of Diploma Programme in Electronics Engineering for UP State on 18-19 April, 2018 at NITTTR, Chandigarh:

1. Sh. Ram Partap Singh, Instructor, Drawings, Government Polytechnic, Kanpur
2. Sh. Narendra Kumar, Workshop Superintendent, Government Polytechnic, Kanpur
3. Sh. Rajeev Kumar, Workshop Superintendent, Government Polytechnic, Jaunpur

4.. Vikas Choudhary, Lecturer, Civil Engg. Government Polytechnic, Changipur, Noorpur Bijnor

5. Sh. Rahul Singh, Lecturer, Civil Engg. Government Polytechnic, Changipur, Noorpur Bijnor
6. Sh. Lal Ji Patel, Text Book Officer/CDC Officer, IRDT, Kanpur
7. Sh. Kamal Kumar, Lecturer, Computer, Government Girls Polytechnic, Lucknow
8. Sh. Sheetanshu Krishna, Government Polytechnic, Amethi
9. Sh. Amit Doegar, Assistant Professor, Computer Science and Engg. NITTTR, Chandigarh
10. Sh. Shirish Tripathi, Government Polytechnic, Unnao
11. Sh. Sanjay Kumar Singh, Government Polytechnic, Aurai, Bhadohi, UP
12. Dr. Kanika Sharma, Assistant Professor, ECE, NITTTR, Chandigarh
13. Mrs. Himmi Gupta, Assistant Professor, Civil Engg. NITTTR, Chandigarh
14. Ms. VarshreeGangwar, Lecturer, Chemical Engg. Government Polytechnic, Budaun
15. Dr. Poonam Syal, Associate Professor, Electrical Engg. NITTTR, Chandigarh
16. Dr. P. Sudhakar Rao, Assistant Professor, Mechanical Engg. NITTTR, Chandigarh
17. Sh. PK Singla, Associate Professor, CDC, NITTTR, Chandigarh
18. Mrs. Rama Chhabra, Associate Professor, CDC, NITTTR, Chandigarh
19. Mohd. Rizwanullah Siddiqui, HOD, Electrical Engg. Government Polytechnic, Lucknow
20. Sh. O.P. Choudhary, Lecturer, Electrical Engg. Government Polytechnic, Lucknow
21. Sh. Tushar Kiran, Lecturer, Mechanical Engg. Government Polytechnic, Lucknow
22. Sh. HeeraSiddiqui, Lecturer, Chemical Engg. Government Polytechnic, Lakhiurpur
23. Sh. R.P. Bhardwaj, Workshop Superintendent, Aryabhat Institute of Technology, Delhi-
24. Dr. AB Gupta, HOD, CDC, NITTTR, Chandigarh

The following experts participated in the workshop for Developing Curriculum Contents for 1st year of diploma programme in Electronics Engineering for UP State on 4th May, 2018 at State Board of Technical Education, Lucknow:

1. Sh. S.K. Govil, Ex Secretary, SIMT, JEEC
2. Dr. Amrita Mishra, Lecturer, Chemistry, Government Polytechnic, Lucknow
3. Sh. Ashok Kushwaha, Head, Computer, Government Polytechnic, Lucknow
4. Sh. Faizan Ahmad, Lecturer, Chemical Engg., Sanjay Gandhi Polytechnic, Jagdishpur, Amethi
5. Dr. Kalpana Singh, Lecturer, Physics, Government Polytechnic, Lucknow
6. Sh. Alok Srivastava, HOD, Civil Engg. Government Polytechnic, Shahjahanpur
7. Dr. Vinod Kashyap, Lecturer, English, Government Polytechnic, Lucknow
8. Sh. Rakesh Kumar, Lecturer, Electronics, Government Polytechnic, Barabanki
9. Sh. Subhash Chandra Misra, Retired Sr. DDG, BSNL, DOT, GOI

10. Sh. Brijesh Mishra, Softpro India
11. Sh. Ajay Choudhary, , Softpro India
12. Sh. FR Khan, JEEC, UP
13. Sh. K. Ram, Joint Director, (CZ)
14. Sh. Manish Kumar, Lecturer, Government Polytechnic, Unnao
15. Sh. Prabhakar Tiwari, HOD, Electrical Engg. Government Polytechnic, Premdharpatti, Pratapgarh
16. Sh. RK Singh, HOD, Electronics, Government Polytechnic, Pratapgarh
17. Ms. Rashmi Sonkar, HOD, IT, Government Girls Polytechnic, Faizabad
18. Sh. Ankit Gupta, Lecturer, Mechanical Engg. Government Polytechnic, Lucknow
19. Ms. Meenu Dwivedi, Lecturer, Mechanical Engg. Government Polytechnic, Lucknow
20. Sh. Sanjay Kumar Srivastava, Tata Motors Ltd., Lucknow
21. Sh. Kamal Kumar, Lecturer, Computer, Government Girls Polytechnic, Lucknow
22. Sh. Manoj Kumar, Director, IRDT, Technical Education, Kanpur
23. Sh. RC Rajput, Director, Technical Education, Kanpur
24. Sh. Sanjeeva Kumar Singh, Secretary, Board of Technical Education, Lucknow
25. Sh. Pravesh Verma, Electrical Engg. Board of Technical Education, Lucknow
26. Sh. Lal Ji Patel, Text Book Officer/CDC Officer, IRDT, Kanpur
27. Sh,. Ashrapal, Principal, Government Polytechnic, Tundla, Firozabad
28. Sh. Sandeep Kumar, Lecturer, Computer, Government Polytechnic, Allahabad
29. Sh. Umesh Chand Yadav, Government Polytechnic, Lucknow
30. Sh. OP Chaudhari, Lecturer, Government Polytechnic, Lucknow

The following experts participated in the workshop for Developing Curriculum Contents of 2nd year and 3rd year subjects of diploma course in Electronics Engineering for UP State on 30-31 October, 2018 at NITTTR, Chandigarh:

1. Sh. Devendra Kumar Verma, Lecturer, Electronics, Government Polytechnic, Talbehat, Lalitpur
2. Sh. Devendra Kumar, HOD, Electronics Engg. Government Polytechnic, Mainpuri
3. Sh. Rajan Srivastava, Lecturer, Electronics, Government Girls Polytechnic, Varanasi
4. Sh. Sanjay Kumar Singh, Lecturer, Electronics, Government Polytechnic, Aurai, Bhadhi
5. Sh. Ashok Kushwaha, Head, Computer, Government Polytechnic, Lucknow
6. Sh. Neeraj Kumar, Assistant Director, Technical Education, UP
7. Sh. Rajiv Sapra, HOD, Electronics Communication Engg., Government Polytechnic, Ambala City
8. Dr. Rajesh Mehra, Head, ECE Department, NITTTR, Chandigarh
9. Dr.MunishVashishth , YMCA UST, Faridabad
10. Dr. AB Gupta, Professor & Head, CDC, NITTTR, Chandigarh

The following experts participated in the workshop for finalizing resource equipment of diploma course in Electronics Engineering for UP State on 10th December, 2018 at NITTTR, Chandigarh:

1. Sh. Navdeep Singh, Senior Lecturer, Government Polytechnic, Khunimajra, Mohali
2. Mrs. Garima Saini, Assistant Professor, ECE, NITTTR, Chandigarh.
3. Dr. AB Gupta, Professor & Head, CDC, NITTTR, Chandigarh

11. EVALUATION STRATEGY

11.1 INTRODUCTION

Evaluation plays an important role in the teaching-learning process. The major objective of any teaching-learning endeavor is to ensure the quality of the product which can be assessed through learner's evaluation.

The purpose of student evaluation is to determine the extent to which the general and the specific objectives of curriculum have been achieved. Student evaluation is also important from the point of view of ascertaining the quality of instructional processes and to get feedback for curriculum improvement. It helps the teachers in determining the level of appropriateness of teaching experiences provided to learners to meet their individual and professional needs. Evaluation also helps in diagnosing learning difficulties of the students. Evaluation is of two types: Formative and Summative (Internal and External Evaluation)

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summative evaluation with a view to bring validity and reliability in the end-term examination system for achieving objectivity and efficiency in evaluation.

11.2 STUDENTS' EVALUATION AREAS

The student evaluation is carried out for the following areas:

- Theory
- Practical Work (Laboratory, Workshop, Field Exercises)
- Project Work
- Professional Industrial Training

A. Theory

Evaluation in theory aims at assessing students' understanding of concepts, principles and procedures related to a course/subject, and their ability to apply learnt principles and solve problems. The formative evaluation for theory subjects may be caused through sessional /class-tests, home-assignments, tutorial-work, seminars, and group discussions etc. For end-term evaluation of theory, the question paper may comprise of three sections.

Section-I

It should contain objective type items e.g. multiple choice, matching and completion type. Total weightage to Section-1 should be of the order of 20 percent of the total marks and no choice should be given in this section. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

Section-II

It should contain short answer/completion items. The weightage to this section should be of the order of 40 percent of the total marks. Again, no choice should be given in section-II

Section-III

It may contain two to three essay type questions. Total weightage to this section should be of the order of 40 percent of the total marks. Some built-in, internal choice of about 50 percent of the questions set, can be given in this section

Table II : Suggested Weightage to be given to different ability levels

Abilities	Weightage to be assigned
Knowledge	10-30 percent
Comprehension	40-60 percent
Application	20-30 percent
Higher than application i.e. Analysis,	Upto 10 percent

Synthesis and Evaluation	

B. Practical Work

Evaluation of students performance in practical work (Laboratory experiments, Workshop practicals/field exercises) aims at assessing students ability to apply or practice learnt concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work related attitudes. Formative and summative evaluation may comprise of weightages to performance on task, quality of product, general behaviour and it should be followed by viva-voce.

C. Project Work

The purpose of evaluation of project work is to assess students ability to apply, in an integrated manner, learnt knowledge and skills in solving real life problems, manipulative skills, ability to observe, record, creativity and communication skills. The formative and summative evaluation may comprise of weightage to nature of project, quality of product, quality of report and quality of presentation followed by viva-voce.

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Evaluation of professional industrial training report and viva-voce/ presentation aims at assessing students' understanding of materials, industrial processes, practices in the industry/field and their ability to engage in activities related to problem-solving in industrial setting as well as understanding of application of learnt knowledge and skills in real life situation. The formative and summative evaluation may comprise of weightages to performance in testing, general behaviour, quality of report and presentation during viva-voce.

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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. class-room, laboratory, library and field and execute them in right perspective. It is emphasized that a proper mix of different teaching methods in all these places of instruction only can bring the changes in stipulated students behaviour as in the 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 teacher to read them carefully, comprehend and start using them.

(A) Broad Suggestions:

1. Curriculum implementation takes place at programme, course and class-room 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. An academic plan needs to be prepared and made 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.

3. HOD of every Programme Department along with HODs and incharges of other departments are required to prepare academic plan at department level referring to 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 class room level and their success in achieving course level objectives lies in 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 time. It is essential for them to use the given time judiciously 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 and courses to be taught.

2. Teachers are required to prepare lesson plan for every theory class. This plan may comprise of contents to be covered, learning material 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 planned subject content, check desired learning outcomes 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 guided library exercises by identification of course specific experience requirement, setting time, assessment, etc. The assignments and seminars can be thought of as terminal outcome of library experiences.

5. Concept and content based field visits may be planned and executed for such content of course which 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.

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8. The student centred activities may be used to develop generic skills like task management, problem solving, 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.

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11. Students be made aware about issues related to ecology and environment, safety, concern for wastage of energy and other resources etc.

12. Students may be given relevant and well thought out project assignments, which are purposeful and develop practical skills. This will help students in developing creativity and confidence for their gainful employment.

13. A Project bank may be developed by the concerned department of the polytechnics in consultation with related Industry, research institutes and other relevant field organizations in the state.

13. LIST OF PARTICIPANTS

The following experts participated in the workshop for Developing the Curricula Structure and Contents of Diploma Programme in Electronics Engineering for UP State on 5-6 April, 2018 at NITTTR, Chandigarh:

1. Sh. Pankaj Yadav, Assistant Director, Directorate of Technical Education, Kanpur
2. Sh. Lal Ji Patel, Text Book Officer/CDC Officer, IRDT, Kanpur
3. Mohd. Qamruzzaman, Lecturer English, Government Polytechnic, Kanpur
4. Sh. Anjani Kumar Sharma, HOD, Chemical Engg. Government Polytechnic, Chandari
5. Dr. Balram, Lecturer Maths, Government Polytechnic, Lucknow
6. Sh. Sanjay Kumar Singh, Lecturer, Electrnics, Government Polytechnic, Aurai, Bhadohi, UP.
7. Sh. Nirdosh Kumar, Lecturer, Electrical Engg. Government Polytechnic, Naraini, Banda
8. Sh. Vinod Sonthwal, Lecturer, Civil Engg. NITTTR, Chandigarh
9. Sh. Vikas Choudhary, Lecturer, Civil Engg. Government Polytechnic, Changipur, Bijnor
10. Sh. Ashish Kumar, Head, Mechanical Engg. Government Polytechnic, Narwana Khurd, Meerut
11. Sh. Gopal Chandra Nayak, Assistant Professor, Regional Institute of English, Sector 32-C, Chandigarh.
12. Sh. Amit Doegar, Assistant Professor, Computer Science and Engg. NITTTR, Chandigarh
13. Dr. Kanika Sharma, Assistant Professor, ECE, NITTTR, Chandigarh
14. Mrs. Shano Solanki, Assistant Professor, Computer Science and Engg. NITTTR, Chandigarh
15. Dr. Lini Mathew, Associate Professor, Electrical Engg. NITTTR, Chandigarh
16. Dr. KC Lachhwani, Assistant Professor, Applied Science, NITTTR, Chandigarh
17. Mrs. Rama Chhabra, Associate Professor, CDC, NITTTR, Chandigarh
18. Dr. AB Gupta, HOD, CDC, NITTTR, Chandigarh
19. Sh. Roshan Lal, Sr. Lecturer, Kalpana Chawla Govt. Polytechnic for Women, Ambala City
20. Dr. P. Sudhakar Rao, Assistant Professor, Mechanical Engg. NITTTR, Chandigarh
21. Sh. Kamal Kumar, Lecturer, Computer, Government Girls Polytechnic, Lucknow
22. Sh. Pravesh Verma, Deputy Secretary, Board of Technical Education, Lucknow
23. Dr. Dinesh Yadav, Lecturer, Physics, Government Polytechnic, Bareilly
24. Dr. Yogendra Singh, Lecturer, Chemistry, Government Polytechnic, Ghaziabad
25. Professor Seema Kapoor, Dr. SSBUICET, Panjab University, Chandigarh
26. Sh. Navdeep Singh, Sr. Lecturer, Computer Sc. Engg. Government Polytechnic, Khuni Majra, Mohali
27. Sh. Gurmail Singh, Sr. Lecturer, ECE, Government Polytechnic, Khuni Majra, Mohali
28. Dr. Shimi S.L., Assistant Professor, Electrical Engg. NITTTR, Chandigarh

The following experts participated in the workshop for Developing the Curricula Structure and Contents of Diploma Programme in Electronics Engineering for UP State on 18-19 April, 2018 at NITTTR, Chandigarh:

1. Sh. Ram Partap Singh, Instructor, Drawings, Government Polytechnic, Kanpur
2. Sh. Narendra Kumar, Workshop Superintendent, Government Polytechnic, Kanpur
3. Sh. Rajeev Kumar, Workshop Superintendent, Government Polytechnic, Jaunpur
4.. Vikas Choudhary, Lecturer, Civil Engg. Government Polytechnic, Changipur, Noorpur Bijnor
5. Sh. Rahul Singh, Lecturer, Civil Engg. Government Polytechnic, Changipur, Noorpur Bijnor
6. Sh. Lal Ji Patel, Text Book Officer/CDC Officer, IRDT, Kanpur
7. Sh. Kamal Kumar, Lecturer, Computer, Government Girls Polytechnic, Lucknow
8. Sh. Sheetanshu Krishna, Government Polytechnic, Amethi
9. Sh. Amit Doegar, Assistant Professor, Computer Science and Engg. NITTTR, Chandigarh
10. Sh. Shirish Tripathi, Government Polytechnic, Unnao
11. Sh. Sanjay Kumar Singh, Government Polytechnic, Aurai, Bhadohi, UP
12. Dr. Kanika Sharma, Assistant Professor, ECE, NITTTR, Chandigarh
13. Mrs. Himmi Gupta, Assistant Professor, Civil Engg. NITTTR, Chandigarh
14. Ms. Varshree Gangwar, Lecturer, Chemical Engg. Government Polytechnic, Budaun
15. Dr. Poonam Syal, Associate Professor, Electrical Engg. NITTTR, Chandigarh
16. Dr. P. Sudhakar Rao, Assistant Professor, Mechanical Engg. NITTTR, Chandigarh
17. Sh. PK Singla, Associate Professor, CDC, NITTTR, Chandigarh
18. Mrs. Rama Chhabra, Associate Professor, CDC, NITTTR, Chandigarh
19. Mohd. Rizwanullah Siddiqui, HOD, Electrical Engg. Government Polytechnic, Lucknow
20. Sh. O.P. Choudhary, Lecturer, Electrical Engg. Government Polytechnic, Lucknow
21. Sh. Tushar Kiran, Lecturer, Mechanical Engg. Government Polytechnic, Lucknow
22. Sh. Heera Siddiqui, Lecturer, Chemical Engg. Government Polytechnic, Lakhiurpur
23. Sh. R.P. Bhardwaj, Workshop Superintendent, Aryabhat Institute of Technology, Delhi-
24. Dr. AB Gupta, HOD, CDC, NITTTR, Chandigarh

The following experts participated in the workshop for Developing Curriculum Contents for 1st year of diploma programme in Electronics Engineering for UP State on 4th May, 2018 at State Board of Technical Education, Lucknow:

1. Sh. S.K. Govil, Ex Secretary, SIMT, JEEC
2. Dr. Amrita Mishra, Lecturer, Chemistry, Government Polytechnic, Lucknow
3. Sh. Ashok Kushwaha, Head, Computer, Government Polytechnic, Lucknow
4. Sh. Faizan Ahmad, Lecturer, Chemical Engg., Sanjay Gandhi Polytechnic, Jagdishpur, Amethi
5. Dr. Kalpana Singh, Lecturer, Physics, Government Polytechnic, Lucknow
6. Sh. Alok Srivastava, HOD, Civil Engg. Government Polytechnic, Shahjahanpur
7. Dr. Vinod Kashyap, Lecturer, English, Government Polytechnic, Lucknow
8. Sh. Rakesh Kumar, Lecturer, Electronics, Government Polytechnic, Barabanki
9. Sh. Subhash Chandra Misra, Retired Sr. DDG, BSNL, DOT, GOI
10. Sh. Brijesh Mishra, Softpro India
11. Sh. Ajay Choudhary, , Softpro India
12. Sh. FR Khan, JEEC, UP
13. Sh. K. Ram, Joint Director, (CZ)
14. Sh. Manish Kumar, Lecturer, Government Polytechnic, Unnao
15. Sh. Prabhakar Tiwari, HOD, Electrical Engg. Government Polytechnic, Premdharpatti, Pratapgarh
16. Sh. RK Singh, HOD, Electronics, Government Polytechnic, Pratapgarh
17. Ms. Rashmi Sonkar, HOD, IT, Government Girls Polytechnic, Faizabad
18. Sh. Ankit Gupta, Lecturer, Mechanical Engg. Government Polytechnic, Lucknow
19. Ms. Meenu Dwivedi, Lecturer, Mechanical Engg. Government Polytechnic, Lucknow
20. Sh. Sanjay Kumar Srivastava, Tata Motors Ltd., Lucknow
21. Sh. Kamal Kumar, Lecturer, Computer, Government Girls Polytechnic, Lucknow
22. Sh. Manoj Kumar, Director, IRDT, Technical Education, Kanpur
23. Sh. RC Rajput, Director, Technical Education, Kanpur
24. Sh. Sanjeeva Kumar Singh, Secretary, Board of Technical Education, Lucknow
25. Sh. Pravesh Verma, Electrical Engg. Board of Technical Education, Lucknow
26. Sh. Lal Ji Patel, Text Book Officer/CDC Officer, IRDT, Kanpur
27. Sh,. Ashrapal, Principal, Government Polytechnic, Tundla, Firozabad
28. Sh. Sandeep Kumar, Lecturer, Computer, Government Polytechnic, Allahabad
29. Sh. Umesh Chand Yadav, Government Polytechnic, Lucknow
30. Sh. OP Chaudhari, Lecturer, Government Polytechnic, Lucknow

The following experts participated in the workshop for Developing Curriculum Contents of 2nd year and 3rd year subjects of diploma course in Electronics Engineering for UP State on 30-31 October, 2018 at NITTTR, Chandigarh:

1. Sh. Devendra Kumar Verma, Lecturer, Electronics, Government Polytechnic, Talbehat, Lalitpur
2. Sh. Devendra Kumar, HOD, Electronics Engg. Government Polytechnic, Mainpuri
3. Sh. Rajan Srivastava, Lecturer, Electronics, Government Girls Polytechnic, Varanasi
4. Sh. Sanjay Kumar Singh, Lecturer, Electronics, Government Polytechnic, Aurai, Bhadhi
5. Sh. Ashok Kushwaha, Head, Computer, Government Polytechnic, Lucknow
6. Sh. Neeraj Kumar, Assistant Director, Technical Education, UP
7. Sh. Rajiv Sapra, HOD, Electronics Communication Engg., Government Polytechnic, Ambala City
8. Dr. Rajesh Mehra, Head, ECE Department, NITTTR, Chandigarh
9. Dr. Munish Vashishth , YMCA UST, Faridabad

10. Dr. AB Gupta, Professor & Head, CDC, NITTTR, Chandigarh

The following experts participated in the workshop for finalizing resource equipment of diploma course in Electronics Engineering for UP State on 10th December, 2018 at NITTTR, Chandigarh:

1. Sh. Navdeep Singh, Senior Lecturer, Government Polytechnic, Khunimajra, Mohali
2. Mrs. Garima Saini, Assistant Professor, ECE, NITTTR, Chandigarh.
3. Dr. AB Gupta, Professor & Head, CDC, NITTTR, Chandigarh