NSQF ALIGNED CURRICULUM

DIPLOMA IN COMPUTER SCIENCE AND ENGINEERING

PUNJAB STATE BOARD OF TECHNICAL EDUCATION
&
INDUSTRIAL TRAINING

Developed By

Curriculum Development Center

National Institute of Technical Teachers Training & Research

(Ministry of Education, Government of India)

Sector - 26, Chandigarh, UT, India.

(September, 2024)

CONTENTS

FIRST SEMESTER

SECOND SEMESTER

THIRD SEMESTER

FOURTH SEMESTER

FIFTH SEMESTER

SIXTH SEMESTER

FOREWORD

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 of standard of life 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 cultures and environments together and giving rise to the concept of world turning into a global village. In India, a shift has taken place from the license-based closed economy to knowledge and market based 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, Punjab to revise the existing curricula of diploma programmes as per the needs of the industry and making them National Skill Qualification Framework (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 effective implementation of its curricula. Howsoever best the curriculum document is designed, if it 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 that the polytechnics 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 get the faculty members regularly trained and upskilled. So that it can infuse the much needed dynamism in the system. They are welcome to reach NITTTR Chandigarh whenever they want to train the faculty members and get the curricula revised.

Director
National Institute of Technical Teachers
Training & Research, Chandigarh

ACKNOWLEDGEMENTS

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

i) Chairperson, Punjab State Board of Technical Education and Industrial Training, Chandigarh for entrusting this project of curriculum revision to NITTTR, Chandigarh.

ii) Secretary, Board of Technical Education, Punjab for initiating this project of review of curriculum.

iii) Director, Technical Education, Punjab for taking keen interest in the review of this curriculum.

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

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

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

Coordinator

1. SALIENT FEATURES OF DIPLOMA PROGRAMME IN COMPUTER SCIENCE AND ENGINEERING

1)	Name of the Programme	:	Diploma Programme in Computer Science 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, Punjab
4)	Intake	:	40/60 (or as prescribed by the Board)
5)	Pattern of the Programme	:	Semester Pattern
6)	NSQF Level	:	Level - 5
7)	Ratio between theory and Practice	:	38 : 62

8) Industrial Training:

Six weeks of industrial training is included after IV semester during summer vacation

9) Ecology and Environment :

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

10) Energy Conservation:

An Energy Conservation Awareness Camp has been included in the curriculum to sensitize the students about significance and various aspects of energy conservation. Concepts of Energy Conservation have also been included in the subject of Environmental Studies.

11) Entrepreneurship Development:

An Entrepreneurial Awareness Camp and a full subject on Generic Skills and Entrepreneurship Development have been incorporated in the curriculum.

12) Camps on “Traffic Awareness and Road Safety” have been added in semester I & II under Student Centered Activities.

13) “Drugs Use and Abuse Awareness Camp” have been added in IIIrd Semester under Student Centered Activities.

14) Personality Development

A camp focusing on personality development of students has been incorporated in the curriculum.

15) 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, games, hobby classes like photography, painting, singing etc. seminars, declamation contests, educational field visits, NCC, NSS and other cultural activities etc.

16) 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 FOR DIPLOMA HOLDERS IN COMPUTER SCIENCE AND ENGINEERING

Diploma holders in Computer Science & Engineering can find employment in following divisions:

(1) Service Division (IT enabled services, maintenance service and installation of computer services)
(2) Assembly and Quality Control Division
(3) Software Development and Testing Industries
(4) Web Development Industries
(5) Publishing Industry
(6) Animation Industry
(7) Data Processing Industry
(8) Marketing Division(Corporate Handling, SME, Institutional Segment, Government Tender Business)
(9) Telecommunication Sector
(10) Teaching Organizations (Polytechnics, Vocational Institutions etc)
(11) Networking(LAN, WAN etc)
(12) Defence Services/Police Services/Cyber Services/Forensic Services
(13) Call Centres, BPO etc.

Wage Employment

(1) Service engineer/customer support engineer/maintenance engineer in installation, maintenance and service of computer systems and networking

(2) Assembly supervisor in manufacturing and production activity

(3) Data entry operator, computer operator, DTP operator, technician
(4) Technical Assistant/junior engineer in quality control and testing activities of computer systems manufacturing

(5) Junior marketing executive/junior sales executive/sales engineer in marketing activities

(6) Junior/senior technical assistant in R&D laboratories and educational institutions to help in maintaining computers and networks

(7) Test engineers in process industry

Self Employment

(1) Small scale unit doing third party service and maintenance of computer systems and networks

(2) Small scale vendor of computer cards, computer peripherals and electronic components and devices

(3) Setting up of computer assembly unit (small scale)

(4) Setting up of training institute for computer assembly maintenance and networking

(5) Web Designing/Publishing/Software Development Entrepreneurship

After first year, the NSQF Level – 3 pass out students have avenues to work as semi skilled employee. Similarly, after second year, the NSQF Level – 4 pass out students have wide scope to work as skilled employee in Computer Science and Engineering related industries.

3. LEARNING OUTCOMES OF DIPLOMA PROGRAMME IN COMPUTER SCIENCE AND ENGINEERING

Sr.	Learning Outcome
After undergoing this programme, students will be able to:	
1.	Communicate effectively in English with others
2.	Apply basic principles of mathematics , Chemistry and physics to solve engineering problems
3.	Prepare and interpret drawings of engineering components
4.	Use cutting tools, equipment and tooling for fabrication of jobs by following safe practices at the workplace
5.	Work on different software for word processing, power point presentation, spreadsheets and communicate ideas electronically
6.	Use electronic instruments to measure various engineering parameters
7.	Assemble, troubleshoot and maintain a computer system and install various software
8.	Use appropriate procedures for energy conservation and preventing environmental pollution
9.	Handle various pre-press activities by designing page layouts for digital and electronic publications by combining different media elements
10.	Design and troubleshoot analog and digital electronic circuits
11.	Write, compile and debug programmes using different programming constructs in “C Programming”
12.	Identify the software process model for specific software application and interpret different phases of software development life cycle
13.	Use various functions and components of different operation systems Operate Linux Operation System
14.	Design multimedia graphics independently and create script of multimedia animations using authoring tools in a team
15.	Design and host static webpages/portals using internet technologies
16.	Plan and execute given task and project as a team member or a leader
17.	Analyse problems and write program solutions to problems by choosing appropriate data structures
18.	Solve common programming problems and write programs in JAVA using OOP concepts in a way understandable to other programmers

19.	Differentiate and contrast different architectures such as RISC/CISC by interpreting different hierarchies of memories, memory organization and component organization
20.	Create and manage database of its security
21.	Set-up, diagnose problems, troubleshoot computer networks and maintain security of the networks
22.	Manage resources effectively at the workplace & know about Cyber laws and Security
23.	Explore the role and scope of Industry 4.0 and 5G network for future applications
24.	Differentiate and troubleshoot various hardware components used for input-output, storage, power supplies and processing in the PC organization
25.	Design and develop dynamic web sites using PHP, MYSQL and AJAX
26.	Use various mobile technologies and their use in different application scenarios
27.	Analyze various protocols for IoT
28.	Use techniques and tools to analyze big data and create statistical models
29.	Create and Manage Blogs websites using Wordpress, Web Applications using Moodle
30.	Implement Various algorithms & comparing them with respect to efficiency and complexities
31.	Use and implement various services on cloud such as SAAS, PAAS, IAAS
32.	Develop Market strategies based on price, place and promotion objectives
33.	Install and use of various open source softwares
34.	Write and debug simple as well as complex programmes in Python
35.	Use interactive applications development with android
36.	Apply the acquired knowledge and skills in solving live problems in the Computer and I.T. industry
37.	Explore interest and passion in areas other than professional stream

4. DERIVING CURRICULUM AREAS FROM LEARNING OUTCOMES OF THE PROGRAMME

The following curriculum areas have been derived from learning outcomes:

Sr. No.	Learning Outcomes	Curriculum Areas/Subjects
1.	Communicate effectively in English with others	– English and Communication Skills
2.	Apply basic principles of mathematics , Chemistry and physics to solve engineering problems	– Applied Mathematics – Applied Physics – Applied Chemistry
3.	Prepare and interpret drawings of engineering components	– Engineering Drawing
4.	Use cutting tools, equipment and tooling for fabrication of jobs by following safe practices at the workplace	– General Workshop
5.	Work on different software for word processing, power point presentation, spreadsheets and communicate ideas electronically	– Computer Fundamentals and Information Technology
6.	Use electronic instruments to measure various engineering parameters	– Basics of Electrical and Electronics Engineering
7.	Assemble, troubleshoot and maintain a computer system and install various software	– Computer Workshop
8.	Use appropriate procedures for energy conservation and preventing environmental pollution	– Environmental Studies
9.	Handle various pre-press activities by designing page layouts for digital and electronic publications by combining different media elements	– Desk Top Publishing (DTP) Fundamentals
10.	Design and troubleshoot analog and digital electronic circuits	– Digital Electronics

11.	Write, compile and debug programmes using different programming constructs in "C Programming"	– Computer Programming Using C
12.	Identify the software process model for specific software application and interpret different phases of software development life cycle	– Database Management System
13.	Use various functions and components of different operation systems Operate Linux Operation System	– Operating Systems
14.	Design multimedia graphics independently and create script of multimedia animations using authoring tools in a team	– Internet and Web Technologies
15.	Design and host static webpages/portals using internet technologies	– Internet and Web Technologies
16.	Plan and execute given task and project as a team member or a leader	– Generic Skills and Entrepreneurship Development
17.	Analyse problems and write program solutions to problems by choosing appropriate data structures	– Data Structures
18.	Solve common programming problems and write programs in JAVA using OOP concepts in a way understandable to other programmers	– Object Oriented Programming Using Java
19.	Differentiate and contrast different architectures such as RISC/CISC by interpreting different hierarchies of memories, memory organization and component organization	– Computer Architecture
20.	Create and manage database of its security	– Database Management System
21.	Set-up, diagnose problems, troubleshoot computer networks and maintain security of the networks	– Computer Network and Security
22.	Manage resources effectively at the workplace & know about Cyber laws and Security	– Computer Network and Security
23.	Explore the role and scope of Industry 4.0 and 5 G network for future applications	– Industry 4.0
24.	Differentiate and troubleshoot various hardware components used for input-output, storage, power supplies and processing in the PC organization	– Computer Workshop

25.	Design and develop dynamic web sites using PHP, MYSQL and AJAX	– Web Development using PHP
26.	Use various mobile technologies and their use in different application scenarios	– Mobile Technologies
27.	Analyze various protocols for IoT	– IoT
28.	Use techniques and tools to analyze big data and create statistical models	– Big Data
29.	Create and Manage Blogs websites using Wordpress, Web Applications using Moodle	– Web Development using PHP
30.	Implement Various algorithms & comparing them with respect to efficiency and complexities	– Computer Programming Using C
31.	Use and implement various services on cloud such as SAAS, PAAS, IAAS	– Cloud Computing
32.	Develop Market strategies based on price, place and promotion objectives	– Basics of Management
33.	Install and use of various open source softwares	– Open Source Technologies
34.	Write and debug simple as well as complex programmes in Python	– Computer Programming Using Python
35.	Use interactive applications development with android	– Mobile Application Development
36.	Apply the acquired knowledge and skills in solving live problems in the Computer and I.T. industry	– Minor Project – Major Project
37.	Explore interest and passion in areas other than professional stream	– Open Elective

5. ABSTRACT OF THE CURRICULUM AREAS

a) Humanities and Social Science Courses

1. English and Communication Skills
2. Generic Skills and Entrepreneurship Development
3. Basics of Management
4. Environmental Studies

b) Basic/Applied Science Courses

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

c) Engineering Science Courses

8. Engineering Drawing
9. Basics of Electrical and Electronics Engineering
10. Basics of Information Technology
11. General Workshop

d) Core Courses in Engineering/Technology

12. Computer Fundamentals and Information Technology
13. Desk Top Publishing (DTP) Fundamentals
14. Computer Workshop
15. Digital Electronics
16. Computer Programming Using C
17. Database Management System
18. Operating Systems
19. Internet and Web Technologies
20. Data Structures
21. Object Oriented Programming Using Java
22. Computer Architecture
23. Computer Network and Security

24. Multimedia Applications
25. Web Development using PHP
26. Computer Programming Using Python
27. Cloud Computing
28. Industry 4.0
29. Open Source Technologies
30. Artificial Intelligence

e) Electives

31. Program Electives
32. Open Electives

f) Project Work, Seminar and Industrial Training

33. Minor Project
34. Major Project
35. Industrial Training

6. HORIZONTAL AND VERTICAL ORGANISATION OF THE SUBJECTS

Sr. No.	Subjects	Distribution in Hours per week in Various Semesters					
		I	II	III	IV	V	VI
1.	English and Communication Skills	5	5	-	-	-	-
2.	Applied Mathematics	4	3	-	-	-	-
3.	Applied Physics	5	4	-	-	-	-
4.	Environmental Studies	2	-	-	-	-	-
5.	Computer Fundamentals and Information Technology	4	-	-	-	-	-
6.	Engineering Drawing	6	-	-	-	-	-
7.	General Workshop	4	4	-	-	-	-
8.	Applied Chemistry	-	5	-	-	-	-
9.	Basics of Electrical and Electronics Engineering	-	5	-	-	-	-
10.	Desk Top Publishing (DTP) Fundamentals	-	4	-	-	-	-
11.	Computer Workshop	-	4	-	-	-	-
12.	Digital Electronics	-	-	5	-	-	-
13.	Computer Programming Using C	-	-	7	-	-	-
14.	Database Management System	-	-	7	-	-	-
15.	Operating Systems	-	-	5	-	-	-
16.	Internet and Web Technologies	-	-	6	-	-	-
17.	Open Elective (Offline/MOOCs)	-	-	2	-	-	-
18.	Generic Skills and Entrepreneurship Development	-	-	-	3	-	-
19.	Data Structures	-	-	-	7	-	-
20.	Object Oriented Programming Using Java	-	-	-	7	-	-
21.	Computer Architecture	-	-	-	3	-	-
22.	Computer Network and Security	-	-	-	5	-	-
23.	Minor Project	-	-	-	4	-	-
24.	Multimedia Applications	-	-	-	-	6	-
25.	Web Development using PHP	-	-	-	-	6	-
26.	Computer Programming Using Python	-	-	-	-	6	-
27.	Cloud Computing	-	-	-	-	7	-
28.	Industry 4.0	-	-	-	-	2	2
29.	Program Elective	-	-	-	-	3	3
30.	Open Source Technologies	-	-	-	-	-	6
31.	Artificial Intelligence	-	-	-	-	-	6
32.	Basics of Management	-	-	-	-	-	3
33.	Major Project	-	-	-	-	-	10
34.	Student Centred Activities	5	1	3	6	5	5
Total		**35**	**35**	**35**	**35**	**35**	**35**

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN COMPUTER SCIENCE AND ENGINEERING

FIRST SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Hrs/Week		Credit	MARKS IN EVALUATION SCHEME								Total Marks of **Int. & Ext.**
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L/T	**P**		**Th**	**Pr**	**Tot**	**Th**	**Hrs**	**Pr**	**Hrs**	**Tot**	
1.1	*English and Communication Skills – I	3	2	4	20	10	30	50	3	20	3	70	100
1.2	*Applied Mathematics - I	4	-	4	50	-	50	50	3	-	-	50	100
1.3	*Applied Physics – I	3	2	4	20	10	30	50	3	20	3	70	100
1.4	*Environmental Studies	2	-	2	50	-	50	50	3	-	-	50	100
1.5	**Computer Fundamentals and Information Technology	2	2	3	20	10	30	50	3	20	3	70	100
1.6	*Engineering Drawing – I	-	6	3	-	50	50	50	3	-	-	50	100
1.7	+General Workshop – I	-	4	2	-	50	50	-	-	50	3	50	100
#Student Centred Activities including Traffic Awareness and Road Safety Camp(I)		-	5	-	-	-	-	-	-	-	-	-	-
Total		14	21	22	160	130	290	300	-	110	-	410	700

* Common course with other diploma programmes
** Common course with diploma in Information Technology
\+ Common course with diploma programmes in Electronics and Communication Engineering and Information Technology
\# SCA 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 other activities to promote experiential learning.

SECOND SEMESTER (COMPUTER SCIENCE AND ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME Hrs/Week		Credit	MARKS IN EVALUATION SCHEME								Total Marks of **Int. & Ext.**
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L/T	**P**		**Th**	**Pr**	**Tot**	**Th**	**Hrs**	**Pr**	**Hrs**	**Tot**	
2.1	*English and Communication Skills - II	3	2	4	20	10	30	50	3	20	3	70	100
2.2	*Applied Mathematics – II	3	-	3	50	-	50	50	3	-	-	50	100
2.3	*Applied Physics -II	2	2	3	20	10	30	50	3	20	3	70	100
2.4	*Applied Chemistry	3	2	4	20	10	30	50	3	20	3	70	100
2.5	**Basics of Electrical and Electronics Engineering	3	2	4	20	10	30	50	3	20	3	70	100
2.6	**Desk Top Publishing (DTP) Fundamentals	-	4	2	-	50	50	-	-	50	3	50	100
2.7	**Computer Workshop	-	4	2	-	50	50	-	-	50	3	50	100
2.8	+General Workshop – II	-	4	2	-	50	50	-	-	50	3	50	100
#Student Centred Activities including Traffic Awareness and Road Safety Camp(II)		-	1	-	-	-	-	-	-	-	-	-	-
Total		14	21	24	130	190	320	250	-	230	-	480	800

* Common Course with other diploma programmes

** Common course with diploma in Information Technology

\+ Common course with diploma programmes in Electronics and Communication Engineering and Information Technology

\# SCA 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 other activities to promote experiential learning.

THIRD SEMESTER (COMPUTER SCIENCE AND ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME Hrs/Week		Credit	MARKS IN EVALUATION SCHEME								Total Marks of **Int. & Ext.**
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L/T	**P**		**Th**	**Pr**	**Tot**	**Th**	**Hrs**	**Pr**	**Hrs**	**Tot**	
3.1	+Digital Electronics	3	2	4	20	10	30	50	3	20	3	70	100
3.2	**Computer Programming Using C	3	4	5	20	10	30	50	3	20	3	70	100
3.3	**Database Management System	3	4	5	20	10	30	50	3	20	3	70	100
3.4	**Operating Systems	3	2	4	20	10	30	50	3	20	3	70	100
3.5	**Internet and Web Technologies	2	4	4	20	10	30	50	3	20	3	70	100
3.6	Open Elective (Offline/MOOCs)	2	-	2	50	-	50	50	3	-	-	50	100
#Student Centred Activities including Energy Conservation Awareness Camp; Drug Use and Abuse Awareness Camp		-	3	-	-	-	-	-	-	-	-	-	-
	Total	16	19	24	150	50	200	300	-	100	-	400	600

** Common course with diploma in Information Technology

\+ Common course with diploma programmes in Electronics and Communication Engineering and Information Technology

\# SCA 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 other activities to promote experiential learning.

FOURTH SEMESTER (COMPUTER SCIENCE AND ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME Hrs/Week		Credit	MARKS IN EVALUATION SCHEME								Total Marks of **Int. & Ext.**
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L/T	**P**		**Th**	**Pr**	**Tot**	**Th**	**Hrs**	**Pr**	**Hrs**	**Tot**	
4.1	*Generic Skills and Entrepreneurship Development	3	-	3	50	-	50	50	3	-	-	50	100
4.2	**Data Structures	3	4	5	20	10	30	50	3	20	3	70	100
4.3	**Object Oriented Programming Using Java	3	4	5	20	10	30	50	3	20	3	70	100
4.4	**Computer Architecture	3	-	3	50	-	50	50	3	-	-	50	100
4.5	**Computer Network and Security	3	2	4	20	10	30	50	3	20	3	70	100
4.6	Minor Project	-	4	2	-	50	50	-	-	50	3	50	100
#Student Centred Activities including Entrepreneurial Awareness Camp		-	6	-	-	-	-	-	-	-	-	-	-
	Total	15	20	22	160	80	240	250	-	110	-	360	600

* Common Course with other diploma programmes

** Common course with diploma in Information Technology

SCA 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 other activities to promote experiential learning.

Industrial Training - After examination of 4th Semester, the students will go for training in a relevant industry/field organisation for a minimum period of 6 weeks and shall prepare a diary. It shall be evaluated during 5th semester by his/her teacher for 50 marks. The students shall also prepare a report at the end of training and shall present it in a seminar, which will be evaluated for another 50 marks. This evaluation will be done by HOD and lecturer incharge – training in the presence of one representative from training organizations.

FIFTH SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Hrs/Week		Credit	MARKS IN EVALUATION SCHEME								Total Marks of **Int. & Ext.**
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L/T	**P**		**Th**	**Pr**	**Tot**	**Th**	**Hrs**	**Pr**	**Hrs**	**Tot**	
-	Industrial Training	-	-	2	-	50	50	-	-	50	3	50	100
5.1	**Multimedia Applications	2	4	4	20	10	30	50	3	20	3	70	100
5.2	**Web Development using PHP	2	4	4	20	10	30	50	3	20	3	70	100
5.3	**Computer Programming Using Python	2	4	4	20	10	30	50	3	20	3	70	100
5.4	Cloud Computing	3	4	5	20	10	30	50	3	20	3	70	100
5.5	Industry 4.0 (Part I)	2	-	2	50	-	50	50	3	-	-	50	100
5.6	Program Elective I	3	-	3	50	-	50	50	3	-	-	50	100
#Student Centred Activities		-	5	-	-	-	-	-	-	-	-	-	-
Total		14	21	24	180	90	270	300	-	130	-	430	700

** Common course with diploma in Information Technology

SCA 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 other activities to promote experiential learning.

Program Elective I - Any one of the following : 5.6.1 Mobile Technologies 5.6.2 Big Data 5.6.3 Internet of Thing (IoT)

SIXTH SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Hrs/Week		Credit	MARKS IN EVALUATION SCHEME								Total Marks of **Int. & Ext.**
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L/T	**P**		**Th**	**Pr**	**Tot**	**Th**	**Hrs**	**Pr**	**Hrs**	**Tot**	
6.1	**Open Source Technologies	2	4	4	20	10	30	50	3	20	3	70	100
6.2	**Artificial Intelligence	2	4	4	20	10	30	50	3	20	3	70	100
6.3	*Basics of Management	3	-	3	50	-	50	50	3	-	-	50	100
6.4	Industry 4.0 (Part II)	2	-	2	50	-	50	50	3	-	-	50	100
6.5	Program Elective II	3	-	3	50	-	50	50	3	-	-	50	100
6.6	Major Project	-	10	3	-	50	50	-	-	50	3	50	100
#Student Centred Activities		-	5	-	-	-	-	-	-	-	-	-	-
Total		12	23	19	190	70	260	250	-	90	-	340	600

* Common Course with other diploma programmes

** Common course with diploma in Information Technology

Program Elective II- Any one of the following: 6.5.1 Digital Marketing 6.5.2 Network Security
6.5.3 Mobile Application Development 6.5.4 Data Science

SCA 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 other activities to promote experiential learning.

1.1 ENGLISH AND COMMUNICATION SKILLS – I

L	P
3	2

RATIONALE

Communication skills play 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.

LEARNING OUTCOMES

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

- Pronounce properly.
- Overcome communication barriers.
- Write legibly and effectively.
- Listen in proper prospective.
- Read various genres adopting different reading techniques.
- Converse logically.

DETAILED CONTENTS

1. Basics of Communication (12 hrs)

    1.1 Definition and process of communication
    1.2 Introduction to types of communication - formal and informal, oral and written, verbal and non-verbal
    1.3 Objectives of communication
    1.4 Essentials of communication
    1.5 Introduction to channels of communication - formal (upward, downward, diagonal, horizontal), informal (grapevine, consensus)
    1.6 Barriers to communication

2. Functional Grammar and Vocabulary (12 hrs)

    2.1 Parts of speech
    2.2 Article
    2.3 Tenses
    2.4 Subject verb agreement sentences
    2.5 Active and passive voice
    2.6 Synonyms and antonyms
    2.7 Pair of words
    2.8 Correction of incorrect sentences

3. Listening (04 hrs)

3.1 Meaning of listening
3.2 Listening and hearing
3.3 Importance of listening
3.4 Active listening – Meaning and strategies
3.5 Methods to improve listening skills

4. Speaking (03 hrs)

4.1 Importance
4.2 Methods to improve speaking

5. Reading (12 hrs)

5.1 Meaning
5.2 Techniques of reading: skimming, scanning, intensive and extensive reading
5.3 Comprehension, vocabulary enrichment and grammar exercises based on following readings:

Section - I

- My Struggle for an Education – Booker T. Washington
- Abraham Lincoln's letter to his son's headmaster – Abraham Lincoln
- Gateman's Gift – R.K Narayan
- The Selfish Giant - Oscar Wilde

Section - II

- Say Not, the Struggle Nought Availeth – A H Clough
- Stopping by Woods on a Snowy Evening – Robert Frost
- Where the Mind is Without Fear – Rabindranath Tagore

6. Writing (02 hrs)

6.1 Significance and effectiveness of writing
6.2 Paragraph writing – Word choice, sentence formation and construction of paragraph.

LIST OF PRACTICALS

1. Self and peer introduction
2. Newspaper reading
3. Just a Minute session – extempore
4. Situational conversation and role play
5. Language learning using open source software.

6. Greetings for different occasions
7. Improving pronunciation through tongue twisters.

INSTRUCTIONAL STRATEGY

Open source software should be used to help the students in developing listening skills. Student centred activities such as group discussions, role play should be used to ensure active participation of students in the classroom.

RECOMMENDED BOOKS

1. Revathi, Srinivas, "Communicating Effectively in English, Book-I", Abhishek Publications, Chandigarh.
2. Mohan, Krishna & Meera Banerji, "Developing Communication Skills (2nd Edition)", Published by Macmillan Publishers India Ltd; New Delhi.
3. Eastwood, John, "Oxford Practice Grammar", Oxford University Press, London
4. Chadha, R. K., "Communication Techniques and Skills", Dhanpat Rai Publications, New Delhi.
5. Wren & Martin, "High School English Grammar and Composition", S. Chand & Company Ltd., Delhi.
6. Kumar, Sanjay & Pushp Lata, "Communication Skills", Oxford University Press, New Delhi

WEBSITES FOR REFERENCE

1. http://www.mindtools.com/ page 8.html
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	12	12
2	12	12
3	04	6
4	03	3
5	12	15
6	02	2
Total	**45**	**50**

1.2 APPLIED MATHEMATICS - I

L	P
4	-

RATIONALE

Contents of this course provide fundamental base for understanding engineering problems and their solution algorithms. Contents of this course will enable students to use basic tools like binomial theorem, partial fractions, etc. for solving complex engineering problems with exact solutions in a way which involve less computational task. The analytical capabilities will enable the students to solve problems in engineering field.

LEARNING OUTCOMES

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

- Apply Complex Number and its representation for two dimensional designing and related calculations.
- Apply the basic concepts of permutation and combination to find out various ways or arrangements possible for a particular problem.
- Apply binomial theorem to find approximate value of certain expressions and extracting roots of certain expressions.
- Apply basics concepts of partial fractions to simplify the concept of rational expression.
- Solve engineering problems that are in matrix format by applying the basic understanding of matrices and their properties,
- Solve problems related to height, distance, elevation by making use of trigonometry.
- Write the equation of straight line and circle by using coordinate geometry.
- Optimize the utilization of resources by applying concepts of linear programming.

DETAILED CONTENTS

1. Algebra (20 hrs)

1.1 Complex Numbers: Complex number, representation, modulus and amplitude.

1.2 Partial fractions (linear factors, repeated linear factors, non-reducible quadratic factors excluding repeated factors).

1.3 Meaning of ${}^{n}p_{r}$ & ${}^{n}c_{r}$ (mathematical expression). Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof), first and second binomial approximation with applications to engineering problems.

1.4 Introduction to Matrices and Determinants – Addition, subtraction and multiplication (upto 3 * 3 matrices), Determinants, simple properties, Crammer Rule.

2. Trigonometry (15 hrs)

2.1 Introduction to T ratios, T-Ratios of Allied angles (without proof), Sum, Difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T-Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2).

2.2 Applications of Trigonometric terms in engineering problems such as to find an angle of elevation, height, distance etc.

3. Co-ordinate Geometry (18 hrs)

3.1 Cartesian and Polar coordinates (two dimensional), conversion from Cartesian to Polar coordinates and vice-versa

3.2 Slope of a line, equation of straight line in various standards forms (without proof); (slope intercept form, intercept form, one-point form, two-point form, symmetric form, normal form, general form), inter section of two straight lines, concurrency of lines, angle between straight lines.

3.3 General equation of a circle and its characteristics. To find the equation of a circle, given:

* Centre and radius
* Three points lying on it
* Coordinates of end points of a diameter

4. Operations Research (7 hrs)

4.1 Linear Programming Problems formulations.

4.2 Graphical Method

INSTRUCTIONAL STATREGY

Basic of algebra, trigonometry, coordinate geometry, operations research can be taught in the light of their applications in the field of engineering and technology. By laying more emphasis on applied part, teacher can also help in providing a good continuing education base to the students.

RECOMMENDED BOOKS

1. Grewal, BS, "Elementary Engineering Mathematics", Khanna Publishers, New Delhi
2. Sabharwal, SS & Dr Sunita Jain, "Applied Mathematics, Vol. I & II", Eagle Parkashan, Jalandhar
3. Sastry, SS, "Engineering Mathematics, Vol I & II", Prentice Hall of India Pvt. Ltd.,
4. Pal, Srimanta and Subodh C. Bhunia, "Engineering Mathematics", Oxford University Press, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	**Time Allotted (Hrs)**	**Marks Allotted (Out of 50)**
1.	20	16
2.	15	12
3.	18	16
4	7	06
Total	**60**	**50**

1.3 APPLIED PHYSICS – I

L	P
3	2

RATIONALE

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

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

LEARNING OUTCOMES

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

- Select units of various physical quantities for use in engineering solutions.
- Represent physical quantities as scalar and vector.
- Use the concepts of force and motion to solve problems.
- Solve problems related to friction, work, power and energy,
- Comprehend properties of matter.
- Comprehend modes of heat transfer.
- Make measurements with accuracy.

DETAILED CONTENTS

1. Units and Dimensions (9 hrs)

   1.1 Physical quantities Units - fundamental and derived units, systems of units (FPS, CGS and SI units)
   1.2 Dimensions and dimensional formulae of physical quantities (area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, surface tension, stress, strain)
   1.3 Principle of homogeneity of dimensions
   1.4 Dimensional equations and their applications, conversion of units from one system to another for density, force, pressure, work, power, velocity and acceleration. Checking of dimensional equations
   1.5 Limitations of dimensional analysis

2. Force and Motion (10 hrs)

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
2.4 Force, Momentum, Statement of Conservation of linear momentum, its applications
2.5 Impulse and its Applications
2.6 Circular motion, definition of angular displacement, angular velocity, angular acceleration, frequency, time period.
2.7 Relation between linear and angular velocity, linear acceleration and angular acceleration (Only Formula), Angular momentum and torque (definition only)
2.8 Concept of centripetal and centrifugal forces and their applications with examples such as banking of roads

3. Work, Power and Energy (8 hrs)

3.1 Work: and its units, examples of zero work, positive work and negative work
3.2 Friction: concept, types, laws of limiting friction
3.3 Energy and its units: Kinetic energy and gravitational potential energy with examples and their derivation
3.4 Principle of conservation of mechanical energy for freely falling bodies, examples of transformation of energy.
3.5 Power and its units, calculation of power in numerical problems

4. Properties of Matter (9 hrs)

4.1 Elasticity: definition of stress and strain, Modulii of elasticity (Only definition, No derivation) , Hooke's law, significance of stress strain curve
4.2 Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure
4.3 Surface tension: concept, its units, angle of contact, applications of surface tension, effect of temperature on surface tension
4.4 Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law

5. Thermometry (9 hrs)

5.1 Difference between heat and temperature
5.2 Modes of transfer of heat (Conduction, convection and radiation with examples)
5.3 Different scales of temperature and their relationship
5.4 Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them
5.5 Concept of Co-efficient of thermal conductivity

LIST OF PRACTICALS (to perform minimum 8 experiments)

1. To find volume of solid sphere using a vernier caliper.
2. To find internal diameter and depth of a beaker using a vernier caliper and hence find its volume.
3. To find the diameter of wire using a screw gauge
4. To determine the thickness of glass strip using a spherometer
5. To verify parallelogram law of forces
6. To study conservation of energy of a ball or cylinder rolling down an inclined plane.
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 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 can make the subject interesting and develop scientific temper in the students.

RECOMMENDED BOOKS

1. "Text Book of Physics for Class XI (Part-I, Part-II)", N.C.E.R.T., Delhi
2. "Applied Physics, Vol. I and Vol. II", TTTI Publications, Tata McGraw Hill, Delhi
3. Verma, HC, "Concepts in Physics Vol. I & II", Bharti Bhawan Ltd. New Delhi
4. "Comprehensive Practical Physics, Vol, I & II", JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
5. Naik, PV, "Engineering Physics", Pearson Education Pvt. Ltd, New Delhi
6. Banwait, RA & R, Dogra, "Applied Physics I & II", Eagle Parkashan, Jalandhar
7. Bhhatacharya, DK & Poonam Tandan, "Engineering Physics", Oxford University Press, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1.	9	10
2.	10	12
3.	8	8
4.	9	10
5.	9	10
Total	**45**	**50**

1.4 ENVIRONMENTAL STUDIES

L	P
2	-

RATIONALE

Engineering activities require the use of natural resources which results in wide-ranging adverse effects on the environment. Natural replenishment of these recourses is practically impossible. This necessities that all technicians should know about the basics of ecology, environment and its functions, environmental pollution and management and environmental legislation which will enable them to accomplish their professional work with environmental compatibility. Hence this subject.

LEARNING OUTCOMES

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

- Comprehend the importance of ecosystem and environment.
- Demonstrate interdisciplinary nature of environmental issues.
- Identify different types of environmental pollution and control measures.
- Take corrective measures for the abetment of environmental pollutions.
- Compute the impact of human activities on the environment.
- Understand purpose of 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.

DETAILED CONTENTS

1. Introduction: (4 hrs)
   Basics of ecology, eco system and environment. Review of carbon, nitrogen, sulphur and water cycle)

2. Conservation of land reforms: (3 hrs)
   Desertification, Causes, effects and prevention. rain water harvesting, maintenance of ground water, deforestation – its effects and control measures

3. Environmental Pollution: (10 hrs)
   Sources of pollution - natural and man made, causes, effects and control measures of pollution (air, water, noise, soil and radioactive). Concept of BOD, COD and AQI, Prevention of Pollution- Introduction to Cleaner Production Technologies, Waste Minimization Techniques, Concept of Zero Discharge, Impact of Energy

Usage on Environment: Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain.

4. Solid Waste management (3 hrs)
Classification of refuse material, sources, effects and control measures. Introduction to E-waste Management

5. Environmental Legislation (4 hrs)
Introduction to Water (prevention and control of pollution) Act, Air (Prevention and Control of Pollution) Act and Environmental Protection Act, Role and Function of State Pollution Control Board, Introduction to Energy Conservation Act & its importance, Concept of Environmental Impact Assessment (EIA)

6. Energy Conservation and Sustainable Development (6 hrs)
Introduction to Energy Management, Energy Conservation, Energy efficiency and its need. Role of Non-conventional Energy Resources (Solar Energy, Wind Energy, Bio mass energy, hydro energy) in environmental protection. Sustainable development, Concept of Green building and eco friendly materials.

INSTRUCTIONAL STRATEGY

In addition to theoretical instructions, different activities pertaining to Environmental Studies like expert lectures, seminars, visits etc. may also be organized.

RECOMMENDED BOOKS

1. Sharma, BR, "Environmental and Pollution Awareness", Satya Prakashan, New Delhi.
2. Khitoliya, Dr. RK, "Environmental Pollution", S Chand Publishing, New Delhi.
3. Deswal and Deswal, "Environmental Science", Dhanpat Rai and Co. (P) Ltd. Delhi.
4. Bharucha, Erach, "Environmental Studies", University Press (India) Private Ltd., Hyderabad.
5. Dhamija, Suresh K, "Environmental Engineering and Management", SK Kataria and Sons, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	4	06
2	3	05
3	10	16
4	3	05
5	4	06
6	6	12
Total	**30**	**50**

1.5 COMPUTER FUNDAMENTALS AND INFORMATION TECHNOLOGY

L	P
2	2

RATIONALE

Information technology has great influence on all aspects of life. 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 office automation tools using MS Office/Open Office/Libre Office, Internet concepts. This exposure will enable the students to enter their professions with confidence.

LEARNING OUTCOMES

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

- Identify computer hardware components, network components and peripherals.
- Install application and utility software.
- Use word processing software to prepare document.
- Use spreadsheet software to create workbook and automate calculation.
- Use presentation software to create interactive presentation.
- Browse information on the Web.

DETAILED CONTENTS

1. Basic Concepts of IT and Its Application (2 hour)

   Information Technology concept and scope, applications of IT.

2. Computer Hardware: (6 hour)

   Block diagram of a computer, components of computer system, CPU, Memory, Input devices; keyboard, Scanner, mouse etc., Output devices; VDU, LCD, Printers etc. Primary and Secondary Memory: RAM, ROM, optical disk (CD , DVD & Blue Ray Disk.), USB/Flash Drive, HDD(tracks and sectors), SSD .Various Ports

3. Software Concepts: (2 hour)

   System software, Application software, Utility Software

4. MS-Word (6 hour)

Features, File Management, Page Setup, Editing a document, Formatting a document, Formatting paragraph, Using find, replace mail merge

5. MS-Excel (6 hour)

Features, Starting Excel, open worksheet, enter, edit, data formulae to calculate values, format data, create chart, printing chart, save worksheet

6. MS-PowerPoint (6 hour)

Features, Starting PowerPoint, Slide layout, templates etc. Opening a new/existing presentation, Different views for viewing slides, Adding text boxes, Adding/importing pictures, Adding movie and sound, Adding tables and chart etc.

7. Internet Concepts: (2 hour)

Introduction to LAN, WAN, PAN, MAN, Introduction of Internet, applications of internet like: e-mail and browsing, Various browsers.

LIST OF PRACTICAL EXERCISES

1. Given a PC, identify its basic hardware components, network components and peripherals. List their functions.

2. Installation of various application software and utility software.

3 Installation of I/O devices like scanner, printer and plotter.

4. Practice on various features/functions of Windows Operating System.

Word Processing (MS Word/Open Office Writer/Libre Office Writer)

5. Creating/opening, saving and printing a document
6. Editing and formatting a document
7. Setting paragraph and page margins.
8. Adding header, footer and page numbering
9. Creating, inserting and formatting a table.
10. Spell checker, inserting date, time, special symbols, importing graphic images, drawing tools.

Spread Sheet Processing (MS Excel/Open Office Calc/Libre Office Calc)

11 Creating/opening, saving and printing a worksheet.
12 Editing and formatting of worksheets including changing colour, size, font, alignment of text and cell formatting.
13 Using statistical functions like sum, avg, min, max, if, count and countif, lookup.
14 Creating and formatting a chart, Using charts to analyse data. Use of filters.

Presentation Software (MS Power Point/Open Office Impress/Libre Office Impress)

15. Creating, saving, opening and printing a presentation.
16. Different views of a slide.
17. Using slide layout and template.
18. Editing and formatting slides by adding titles, subtitles, text, background, watermark, table, charts, images and sound.
19. Viewing the slide show with slide transition, animation effect, timing and order.

Internet and its Applications

20. Creating an e mail account. Sending and receiving e-mail.
21. Browsing and down loading of information from internet.
22. Surfing different websites like institute website, State Board PSBTE website, DTE website, NITTTR, Chandigarh website, AICTE website, various search engines like google, bing etc.

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 in addition to working on internet. The student should be made capable of working on computers independently.

RECOMMENDED BOOKS

1. Computer Fundamentals and Information Technology by Vipan Arora, Eagle Parkashan, Jalandhar
2. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
3. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
4. MS Office for Everyone by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi

5. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	02	4
2	06	9
3	02	4
4	06	9
5	06	9
6	06	9
7	02	6
Total	**30**	**50**

1.6 ENGINEERING DRAWING - I

L	P
-	6

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 16 sheets to be prepared and at least 3 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
- 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-CUM- PRACTICAL EXERCISES

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 1st angle only

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

4.6 Identification of surfaces

5. Sections (02 sheets)

5.1 Importance and salient features

5.2 Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.

5.3 Convention sectional representation of various materials, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections

5.4 Orthographic sectional views of different objects.

6. Isometric Views (02 sheets)

6.1 Fundamentals of isometric projections and isometric scale.

6.2 Isometric views of combination of regular solids like cylinder, cone, cube and prism.

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

7.1 Civil Engineering sanitary fitting symbols

7.2 Electrical fitting symbols for domestic interior installations

*8. Introduction to Computer Aided Drafting (03 sheets)

Basic introduction and operational instructions of various commands in Computer Aided Drafting. At least three 2 D drawings using Computer Aided Drafting of cube, cuboid, cone, pyramid, truncated cone and pyramid, sphere and combination of above solids.

*** Computer aided 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.

RECOMMENDED BOOKS

1. Singh, Surjit, “A Text Book of Engineering Drawing”, Dhanpat Rai & Co., Delhi
2. Gill, PS, “Engineering Drawing”, SK Kataria & Sons, New Delhi
3. Bhatt, ND, “Elementary Engineering Drawing in First Angle Projection”, Charotar Publishing House Pvt. Ltd., Anand
4. Layall, JS, “Engineering Drawing I & II”, Eagle Parkashan, Jalandhar
5. Goel, DK, “Engineering Drawing I”, GBD Publication.

1.7 GENERAL WORKSHOP – I
(For Computer Science and Engineering, Information Technology, Electronics and Communication Engineering)

L	P
-	4

RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practical. General workshop practical included in the curriculum in order to provide hands-on practical knowledge of different tools and basic manufacturing processes. Basic knowledge of workshop technology and practical in various workshops develop the attitude of team working, safety awareness and development of right attitude. This subject provides miniature industrial environment in the educational institute.

LEARNING OUTCOMES

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

- Identify shop wise tools and equipment, their types, specifications and use with proficiency.
- Identify different types of materials, their uses and to maintain tools, equipment etc.
- Use and take measurements with the help of basic measuring tools/instrument.
- Select proper tools for a particular operation and use hand tools in different workshops with predefined outcome.
- Select materials, tools, and sequence of operations to make a job as per given specification/drawing.
- Prepare simple jobs independently and inspect the same according to drawing.
- Operate various tools and equipment in different workshops with predefined outcome, performance, standards.
- Follow the safety procedures and precautionary measures in different workshop with zero accidents.

DETAILED CONTENTS CUM PRACTICAL EXERCISES

Note: The students are supposed to come in proper workshop uniform 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 workshops will be explained for conduct of practical. The students should prepare sketches of various tools/jobs sequence of operations etc. in their practical notebook.

The following shops are included in the syllabus:

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

1. WELDING SHOP –I

1.1 Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction and importance of welding as compared to other material joining processes. Classification of welding processes. Specifications and type of welding machines, welding parameters, welding methods, welding joints and welding positions. Classification and coding of electrodes and functions of electrode coating ingredients.

1.2 Demonstration of hand tools, arc welding machines, equipment and materials to be welded.

1.3 Jobs to be prepared:

Job I Practice of striking arc (Minimum 4 beads on 100 mm long M.S. flat) and Practice of depositing beads at different current levels. (Minimum 4 beads on M.S. flat at four different setting of current level).

Job II Making a lap joint using arc welding (SMAW) on MS Flat.

2. FITTING SHOP –I

2.1 Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction, functions, classification, specification and use of various types of holding, cutting, marking and measuring tools used in fitting shop like-Bench vice, V block, C clamp, Ball peen hammer, scriber, punches, files, hacksaw, surface plate, try square, calipers, steel rule, Vernier calliper, Micrometre and Vernier height gauge etc. Identification of materials like-Iron, Copper, Stainless Steel, Aluminium etc.), Identification of various steel sections like-flat, angle, channel, bar etc.). Introduction to various fitting shop operations/processes (Hacksawing, Drilling, Chipping and Filing).

2.2 Demonstration of various types of holding, cutting, marking and measuring tools used in fitting shop.

2.3 Jobs to be prepared:

Job I To make a rectangular job by performing the operations: Sawing, Marking, filing on MS work piece (75 x 50 x 6 mm) by making sides at 90 degree and surface flatness at 180 degrees and to maintain dimensions within an accuracy of ± 0 .25 mm.

Job II To Make 'V' type cut-out profile from a square piece of MS flat using hand hacksaw, filing, marking and measuring operations.

3. SHEET METAL SHOP – I

3.1. Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction and functions of various types of tools used in sheet metal shop: - snips, hand shearing, measuring tools, marking tools, striking tools and bending tools including types of stakes. Introduction and importance to different types of joints and fasteners used in sheet metal work. Introduction and purpose of different metals used in sheet-metal work-black iron, galvanized iron, aluminium and stainless steel. Introduction of different types of Rivets, types of riveted joints, advantages, disadvantages and applications.

3.2 Demonstration of various types of holding, cutting, marking and bending tools used in fitting shop. demonstration of various raw materials used in sheet metal shop e.g. black-iron sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheet etc.

3.3 Jobs to be prepared:

Job I Shearing and bending practice on a sheet using hand shears/snips and stakes.

Job II To fabricate different types of sheet metal joint such as lap joint-single seam/double seam.

4. ELECTRIC SHOP - I

4.1 Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction, functions and specifications of different types of tools, wires, cables, switches, fuses, cleats, clamps, allied items, and accessories used in Electric shop. Introduction to battery charger and its functioning. Introduction to common electrical appliances such as auto electric iron, electric kettle, ceiling/table fan, desert cooler etc. Introduction to lead acid battery and nickel cadmium battery.

4.2 Demonstration and identification of common electrical materials with standard ratings and specifications such as wires, cables, switches, fuses, cleats, clamps and allied items, tools and accessories. Demonstration of common electrical appliances such as auto electric iron, electric kettle, ceiling/table fan, desert cooler etc. Demonstration of lead acid battery and nickel cadmium battery.

4.3 Job Practice:

Job I Identification of phase, neutral, earth wires for connection to domestic electrical appliances and their connections to three pin plugs.

Job II Practice in making series and parallel circuit. Make one lamp control by one switch circuit.

Job III Installation of battery and connecting two or three batteries in series and parallel.

5. CARPENTRY SHOP – I

5.1 Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction to wood, timber their properties, uses & defects and their joints. Seasoning of wood and its advantages. Introduction, specifications and function of various types of tools used in carpentry (such as different types of Saws, C-Clamp, Chisels, Carpenter's vice, Mallets, Marking gauges, Scriber, Try-square, Steel tape, Wooden plane, Metallic Jack plane, Rulers) by segregating as cutting tools, supporting tools, holding tools, measuring tools etc. Types of wooden joints. Techniques/method of sharpening of jack plane cutter/blade.

5.2 Demonstration of wood/timber, seasoning, various types of tools used in carpentry shop. Types of wooden joints.

5.3 Jobs to be Prepared:

Job 1 To make a rectangular wooden piece involving operations like-plaining, marking, sawing and measuring.

Job II Iron jack plane blade/cutter sharpening and Chisel sharpening practice.

Job III To make a Half Lap Joint (cross, L or T shape – any one)

6. ELECTRONIC SHOP – I

6.1 Safety precautions of concerned shop and use of personal protective equipment (PPE), Difference between electrical and electronic devices, Tools used in electronics workshop - Tweezers, Screw drivers (different sizes), Insulated Pliers, Cutter, Snipper, Crimping tool, different types of Screw Drivers, L-Keys, Soldering Iron, Files, multimeter (analog and digital)

6.2 Demonstrate the jointing methods. mounting and dismantling as well as uses of the items mentioned below:

Various tools used in electronics shop. Various types of single, multi-cored insulated screened power, audio video, co-axial, general purpose wires/cables. Various types of fuses (slow acting, fast acting, thermal fuse and glass fuse). Various switches

6.3 Job Practice

Job I To make perfect solder joints and exposure to modern soldering and re soldering process.

Job II To make soldering on PCBs and to remove components/wires by de-soldering.

Job III Cut, strip, connect/solder/crimp different kinds of wires/cables (including coaxial and shielded cable) to different types of power/general purpose/ audio video/ telephone plugs, sockets jacks, terminal, binding, posts, terminal strips, connectors.

Note:

1. Workshop instructors will guide and help the students throughout the practical class in order to explain and complete the job according to syllabus and for providing necessary facilities to the students during performance of practical by observing the safety precautions

2. The Workshop Superintendent or Foreman Instructor or Instructor will demonstrate and deliver the theoretical instructions with regard to introduction, functions, classification and specification of tools, instruments, equipment, apparatus etc. of all the topics covered in the syllabus of workshops.

3. The Workshop Superintendent or Foreman Instructor will also conduct the mid-term test and final practical exam of this subject.

RECOMMENDED BOOKS

1. Workshop Practice By Swaran Singh, S.K. Kataria & Sons Publisher of Engineering Books New Delhi.
2. Workshop Practice by HS Bawa; Tata McGraw Hill Publishers, New Delhi.
3. Workshop Technology I, II, III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publish ers Pvt. Ltd. Mumbai
4. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar
5. Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Co., New Delhi

TRAFFIC AWARENESS & ROAD SAFETY CAMP (I)

A diploma holder must have knowledge of various types of traffic rules and regulations. Road safety education is vital for people of all ages. As a responsible citizen, you should be aware of each and every road safety rules. Observation is the key skill you need in ensuring road safety By obeying safety rules and regulations, you can save yourself and others on the road. This camp covers the basic concepts of traffic rules and safety. Lectures will be delivered on following broad topics with the coordination of Distt. Traffic police. There will be no exam for this camp.

1. Road safety Scenario

2. School bus and traffic management

3. Awareness of Traffic Signs

4. Speeding Limit

5. Always Wear your Shields

6. Overtaking

7. Awareness through Hoardings

8. Walking & Safe cycling

2.1 ENGLISH AND COMMUNICATION SKILLS - II

L	P
3	2

RATIONALE

Communication skills play 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.

LEARNING OUTCOMES

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

- Make proper oral presentations.
- Speak confidently.
- Debate properly.
- Write accurate official/business letters.
- Respond to telephone calls effectively.
- Overcome communication barriers.

DETAILED CONTENTS

1. Functional Grammar and Vocabulary (12 hrs)

   Theory and Practical exercises on following:
   1.1 One word substitution
   1.2 Functional Grammar and Vocabulary
   1.3 Prefixes and Suffixes
   1.4 Punctuation
   1.5 Narration
   1.6 Idioms and Phrases

2. Reading (9 hrs)
   Comprehension, Vocabulary enrichment and grammar exercises based on the following readings:

   Section-I

   - The Last Leaf - O' Henry
   - Sparrows - K A Abbas
   - The Postmaster - Rabindra Nath Tagore

Section-II

- Night of the Scorpion - Nissim Ezekiel
- All the World is a Stage - William Shakespeare
- Success – Emily Dickenson
- Daffodils – William Wordsworth

3. Writing (24 hrs)

3.1 Writing Resume and Cover letter
3.2 Correspondence: Business and Official
3.3 Report Writing – Introduction and features of good report.
3.4 Press Release
3.5 Memos and Circulars
3.6 Notices (lost, found, and auction)
3.7 Agenda and Minutes of Meetings
3.8 Filling-up different forms such as bank form and on-line form for placement etc.
3.9 Precis Writing
3.10 E mail writing

LIST OF PRACTICALS

1. Group discussion on some current topic of interest.
2. Small speech using voice modulation.
3. Debate
4. Manners and Etiquette
5. Power point presentation
6. Telephonic conversation: General etiquette for making and receiving calls.
7. Mock interviews

INSTRUCTIONAL STRATEGY

Open source software should be used to help the students in developing listening skills. Student centred activities such as group discussions, role play should be used to ensure active participation of students in the classroom.

RECOMMENDED BOOKS

1. Revathi, Srinivas, "Communicating Effectively in English, Book-I", Abhishek Publications, Chandigarh.
2. Mohan, Krishna & Meera Banerji, "Developing Communication Skills (2nd Edition)", Published by Macmillan Publishers India Ltd; New Delhi.
3. Eastwood, John, "Oxford Practice Grammar", Oxford University Press, London

4. Chadha, R. K., “Communication Techniques and Skills”, Dhanpat Rai Publications, New Delhi.
5. Wren & Martin, “High School English Grammar and Composition”, S. Chand & Company Ltd., Delhi.
6. Kumar, Sanjay & Pushp Lata, “Communication Skills”, Oxford University Press, New Delhi

WEBSITES FOR REFERENCE

1. http://www.mindtools.com/ page 8.html
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	12	12
2	9	12
3	24	26
Total	**45**	**50**

2.2 APPLIED MATHEMATICS – II

L	P
3	-

RATIONALE

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

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Apply differential calculus to solve max/min and related rate measure problems.
- Apply concepts of definite integrals to calculate the area of a curve bounded by axes.
- Evaluate complex integrals in a simpler way by applying definite integral.
- Solve engineering problems by making use of ordinary differential equations.

DETAILED CONTENTS

1. Differential Calculus (18 hrs)

1.1 Definition of function; Introduction to limit and continuity (definition only).

1.2 Standard differentiation of algebraic, trigonometric, inverse trigonometric functions, logarithmic function and exponential function.

1.3 Differentiation of sum, product and quotient of functions, Differentiation of function of a function, differentiation of implicit functions and parametric functions.

1.4 Logarithmic differentiation and successive differentiation (excluding nth order).

1.5 Application of differential calculus in:

(a) Rate Measures

(b) Maxima and minima (single variable functions) using second order derivative only

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

2. Integral Calculus (22 hrs)

2.1 Indefinite integrals, Integration as inverse operation of differentiation with simple examples.

2.2 Standard integrals and related simple problems

2.3 Simple integration by substitution, by parts and by partial fractions (for linear factors only)

2.4 Evaluation of definite integrals (simple problems)

Evaluation of $\int_0^{\pi/2} \text{Sin}^n x.\, dx$, $\int_0^{\pi/2} \text{Cos}^n x\, dx$, $\int_0^{\pi/2} \text{Sin}^m x\ \text{Cos}^n x\, dx$

using formulae without proof (m and n being positive integers only).

2.5 Applications of integration for evaluation of area bounded by a curve and axes (Simple problems).

3. Differential Equations (5 hrs)

3.1 Definition, order, degree of ordinary differential equations.

3.2 Formation of differential equation (up to 2^{nd} order). Solution of Differential equations with Variable separation and Linear Differential equations.

INSTRUCTIONAL STATREGY

Basic elements of Differential Calculus, Integral Calculus, and Differential Equations can be taught in the light of their applications in the field of engineering and technology. By laying more stress on applied part, teachers can also help in providing continuing education base to the students.

RECOMMENDED BOOKS

1. Grewal, BS, "Elementary Engineering Mathematics", Khanna Publishers, New Delhi

2. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar

3. Sabharwal, SS & Dr Sunita Jain, "Applied Mathematics, Vol. I & II", Eagle Parkashan, Jalandhar

4. Engineering Mathematics, Vol I, II & III by V Sundaram et al, Vikas Publishing House (P) Ltd., New Delhi

5. Sastry, SS, "Engineering Mathematics, Vol I & II", Prentice Hall of India Pvt. Ltd.,

6. Pal, Srimanta and Subodh C. Bhunia, "Engineering Mathematics", Oxford University Press, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	**Time Allotted (Hrs)**	**Marks Allotted (Out of 50)**
1	18	20
2	22	25
3	5	05
Total	**45**	**50**

2.3 APPLIED PHYSICS – II

L	P
2	2

RATIONALE

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

LEARNING OUTCOMES

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

- Apply the concept of wave motion
- Illustrate laws of reflection and refraction of light.
- Comprehend the phenomenon related to electrostatics
- Comprehend the terms and laws related to electricity and magnetism.
- Make use of laser for engineering applications.

DETAILED CONTENTS

1. Wave motion and its Applications (6 hrs)

   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 Free, forced and resonant vibrations with examples
   1.3 Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications
   1.4 Ultrasonics – Introduction and applications.

2. Optics (6 hrs)

   2.1 Laws of reflection and refraction, refractive index, lens formula for thin lenses, power of lens, magnification
   2.2 Total internal reflection and its applications, Critical angle and conditions for total internal reflection
   2.3 Simple and compound microscope, astronomical telescope in normal adjustment, magnifying power (Only formula).

3. Electrostatics (6 hrs)

3.1 Coulombs law, unit of charge,
3.2 Electric field, Electric lines of force and their properties, Electric flux, Electric potential and potential difference
3.3 Capacitor and its working principle, Capacitance and its units. Capacitance of parallel plate capacitor (No derivation), Series and parallel combination of capacitors (numericals)
3.4 Dielectric and its effect on capacitance, dielectric break down

4. Electricity and Magnetism (9 hrs)

4.1 Electric Current and its Unit, Direct and alternating current,
4.2 Resistance and its Units, Specific Resistance, Conductance, Specific Conductance, Series and Parallel combination of Resistances. Factors affecting Resistance, Superconductivity (concept only)
4.3 Ohm's law and its verification
4.4 Kirchhoff's laws, Wheatstone bridge principle
4.5 Heating effect of current, Electric power, Electric energy and its units (related numerical problems)
4.6 Introduction to magnetism, Types of magnetic materials. Dia, para and ferromagnetic materials with their properties,
4.7 Magnetic field and its units, magnetic lines of force, magnetic flux and their units
4.8 Concept of electromagnetic induction, Faraday's Laws and Lenz's law, Galvanometer and its use.

5. Modern Physics (3 hrs)

5.1 Lasers: its characteristics, spontaneous and stimulated emission, population inversion; Principle, construction and working of Ruby laser, engineering applications of lasers.

LIST OF PRACTICALS (To perform minimum 8 experiments)

1. To find the time period of a simple pendulum
2. To determine and verify the time period of cantilever
3. To verify laws of reflection from a plane mirror.
4. To find the focal length of convex lens by parallax method.
5. To determine the magnifying power of an astronomical telescope
6. To verify ohm's laws by drawing a graph between voltage and current.
7. To verify laws of resistances in series and parallel combination.
8. To find resistance of galvanometer by half deflection method
9. To measure very low resistance and very high resistances using Slide Wire bridge
10. Use of CRO in plotting AC and DC waveforms.
11. To find wave length of the laser beam.

INSTRUCTIONAL STATREGY

Teacher may use various instructional media like models, charts and graphs while imparting instructions. The field application should be made clear before teaching the basics to develop proper understanding of the physical phenomenon**.** Use of demonstration can make the subject interesting and develop scientific temper in the students.

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. Practical Physics by C. L. Arora, S Chand Publications
4. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (hrs)	Marks Allotted (Out of 50)
1	06	10
2	06	10
3	06	10
4	09	15
5	03	05
Total	**30**	**50**

2.4 APPLIED CHEMISTRY

L	P
3	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 diploma holders to develop scientific temper and appreciate importance of chemistry. Hence the subject of Applied Chemistry.

LEARNING OUTCOMES

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

- Interpret both qualitative and quantitative aspects of simple chemical substances.
- Substantiate the laws and principles on which structure of atom is established.
- Understand types of bonds in chemical substance and their influence on the properties of chemical substances.
- Prepare solution of required concentrations.
- Understand qualitatively and quantitatively pH and buffer solutions.
- Significance of pH and buffer solutions and their industrial applications (in the process such as electrolysis, electrochemical machining of materials etc).
- Explain cause and factors adversely affecting natural water quality and remedial measures available for water purification to achieve water quality standards required for domestic, agricultural and industrial applications.
- Appreciate and practice the water conservation techniques.
- Identify and classify the substance based on the electric behavior.
- Realize the laws/principles efficiently used in development of electrochemical cells towards the greener energy.
- Identify most efficient fuel for the engine and engineering applications.
- Understand the elementary idea of polymers and plastics
- Distinguish different type of plastics and their applications.

DETAILED CONTENTS

1. Basic Concept of Chemistry (2 hrs)
   - 1.1 Symbols of elements and valency, writing of chemical formulae of simple compounds.
   - 1.2 Calculation of molecular masses of $CaCO_3$, NaCl, $CuSO_4$, NaOH, $Ca(OH)_2$, H_2SO_4, $C_2H_2O_4$. (Atomic mass of elements should be provided)

2. Atomic Structure and Chemical Bonding (8 hrs)
   - 2.1 Bohr's model of atom (qualitative treatment only).
   - 2.2 Atomic number, atomic mass number isotopes and isobars.
   - 2.3 Definition of orbit and orbitals, shapes of s and p orbitals only, quantum numbers and their significance,
   - 2.4 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).
   - 2.5 Chemical bonding and cause of bonding and types of chemical bonding; Ionic bond (example NaCl) and Covalent bond (sigma (σ) and pi (π) bonds) with examples of H_2, O_2, N_2 and CH_4 Metallic bonding.

3. Solutions (05 hrs)
   - 3.1 Definition of solution, solute and solvent with examples
   - 3.2 Methods to express the concentration of solution- molarity (*M*) and molality (m), mass percentage, volume percentage and mole fraction and related simple numericals.
   - 3.3 Arrhenius concept of acids and bases. pH of solution, simple numericals on pH and industrial applications of pH.
   - 3.4 Definition of buffer solution and types of buffer solutions with examples and industrial applications of buffers solutions.

4. Water (10 hrs)
   - 4.1 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 numericals.
   - 4.2 Disadvantages caused by the use of hard water in domestic industry and boiler feed water.
   - 4.3 Removal of hardness -Permutit process and Ion-exchange process.
   - 4.4 Drinking water and characteristics of drinking water.
   - 4.5 Natural water sterilization by chlorine and UV radiation and reverse osmosis (elementary idea).

5. Electro Chemistry (6 hrs)
   - 5.1 Electronic concept of oxidation, reduction and redox reactions
   - 5.2 Definition of terms: electrolytes, non-electrolytes with suitable examples
   - 5.3 Faradays laws of electrolysis and simple numerical problems.
   - 5.4 Industrial Application of Electrolysis – Electroplating.
   - 5.5 Application of redox reactions in electrochemical cells (qualitative idea only excluding reactions) - commercial dry cell (Primary) and elementary idea of secondary cell (Only lead storage battery)

6. Chemistry of Fuels and Lubricants (12 hrs)
   - 6.1. Definition of fuel, classification of fuels (primary and secondary), characteristics of good fuel.

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

6.3 Coal - proximate analysis of coal

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

6.5 Gaseous fuels – chemical composition, calorific value and applications of natural gas (CNG), LPG, producer gas, water gas and biogas. (preparation/manufacture excluded)

6.6 Definition of Lubricant and characteristics of good lubricant

6.7 Classification of lubricants –liquid lubricants, solid lubricants, semi-solid lubricants with examples

6.8 Properties of lubricant: Physical properties –viscosity and viscosity index, cloud point and pour point, flash point and fire point, oiliness. Chemical properties- Total Acid Value or Number (TAV or TAN), carbon residue, saponification value.

7. Polymers and Plastics (02 hrs)

7.1 Definition of polymer, monomer and degree of polymerization

7.2 Brief introduction of plastics - thermo plastics and thermo setting plastics with suitable examples (PVC, PS, PTFE, Nylon 6, Nylon 66, bakelite) distinction between thermo and thermo setting plastics

7.3 Applications of polymers in industry and daily life

7.4 Introduction to nano materials and nano technology

LIST OF PRACTICALS

1. Preparation of standard solution of oxalic acid.
2. To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.
3. To determine TDS in given sample of water.
4. To prepare Mohr's salt from ferrous sulfate and ammonium sulfate.
5. Determination of pH of given solution using pH meter.
6. Estimation of total alkalinity of given water sample by titrating it against standard sulfuric acid solution.
7. Gravimetric estimation of moisture in the given coal sample (proximate analysis).
8. Gravimetric estimation of ash content in the given coal sample (proximate analysis).
9. Determination of viscosity of given liquid using Redwood viscometers
10. To construct simple Daniel cell and measure its e.m.f. using voltmeter.
11. To estimate hardness of water using EDTA method.

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.

RECOMMENDED BOOKS

1. Kuricose, J.C. and J. Rajaram, "Chemistry in Engineering", Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Jain, P.C. & Monika Jain, "Engineering Chemistry", Dhanapat Rai Publishing Company, New Delhi.
3. Ahuja, S. C. and G. H. Hugar, "Eagle's Applied Chemistry (I and II)", Eagle Prakashan, Jalandhar.
4. Rao, C N R, "Understanding Chemistry", Universities Press (India) Pvt Ltd., 2011
5. Chopra, H. K. & A. Parmar, "Engineering Chemistry – A Text Book", Narosa Publishing House, New Delhi.
6. Pandey, Dr. Himanshu, "Engineering Chemistry", Goel Publishing House, Meerut, India.

SUGGESTED DISTRIBUTION OF MARKS

Topics	Time Allotted (hrs)	Marks Allotted (Out of 50)
1.	02	03
2.	08	08
3.	05	06
4.	10	12
5.	06	06
6.	12	12
7.	02	03
Total	**45**	**50**

2.5 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

L	P
3	2

RATIONALE

This subject gives the knowledge of fundamental concepts and principles of basic electrical and electronics engineering and aims at providing the students to understand the basic concepts and principles of DC and AC Circuits, electromagnetic induction and with basic understanding of various types of materials such as conductors, semiconductors and insulators, p-n junction, need of rectifiers, concept of transistor, working of transistors in various configurations and their applications. The teacher should give emphasis on understanding of concepts by explaining the various terms used in the subject. Practical exercises have been included in order to reinforce various concepts. Industrial/field exposure must be given by organizing industrial visit.

LEARNING OUTCOMES

After going through the subject, the students will be able to:

- Explain the concept of DC circuits and various laws such as Ohm's Law, Kirchhoff's Laws.
- Demonstrate the concept of electro-magnetic induction, self-inductance, mutual inductance and terminologies related to EMI.
- Demonstrate the types of cell and batteries, its construction, applications and steps to maintain the battery.
- Describe the concept of AC quantity and AC circuits containing resistance, inductance and capacitor.
- Plot the VI characteristics of PN junction diode and Zener diode.
- Explain the concept of Half wave, Full wave and Bridge rectifier and observe waveforms of each.
- Plot input and output characteristics of transistor in CB and CE mode.
- Explain the concept of FET and MOSFET and plot the input, output characteristics

DETAILED CONTENTS

1. **DC Circuits** (05 hrs)

1.1 Definition of voltage, current, power and energy with their units, Ohm's Law, Difference between ac and dc. Simple problems on series and parallel combination of resistors with their wattage consideration.

1.2 Application of Kirchhoff's current law and Kirchhoff's voltage law to simple circuits. Star – Delta connections and their conversion. Concept of Voltage source and current source.

1.3 Concept of nodal analysis, Mesh and loop analysis,

1.4 Theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power transfer theorem.

2. **Electro Magnetic Induction** (05 hrs)

2.1 Concept of electro-magnetic field produced by flow of electric current, magnetic circuit, concept of magneto-motive force (MMF), flux, reluctance, permeability, analogy between electric and magnetic circuit.

2.2 Faraday's laws of electro-magnetic induction, principles of self and mutual induction, self and mutually induced e.m.f.

3. **Batteries** (06 hrs)

3.1 Basic idea of primary and secondary cells

3.2 Construction, working principle and applications of Lead-Acid, Lithium-ion, Nickel-Cadmium batteries, Charging methods used for lead-acid battery, Care and maintenance of lead-acid battery, Series and parallel connections of batteries

3.3 General idea of solar cells, solar panels and their applications

4. **AC Fundamentals** (06 hrs)

4.1 Concept of alternating quantities, Concepts of: cycle, frequency, time period, amplitude, instantaneous value, average value, r.m.s. value, maximum value, form factor and peak factor, Representation of sinusoidal quantities by phasor diagrams.

4.2 Equation of sinusoidal wave form for an alternating quantity and its derivation

4.3 Effect of alternating voltage applied to a pure resistance, pure inductance and pure capacitance.

5. **Semiconductor Physics** (06 hrs)

5.1 Basic atomic structure, Concept of insulators, conductors and semiconductors, atomic structure of Germanium (Ge) and Silicon (Si).

5.2 Concept of intrinsic and extrinsic semiconductor and types, process of doping.

5.3 Energy level diagram of conductors, insulators and semiconductors; minority and majority charge carriers.

5.4 Formation of P and N type semiconductors and their conductivity, effect of temperature on conductivity of intrinsic semiconductors.

6. **Semiconductor Diode:** (06 hrs)

6.1 PN junction diode, forward and reverse biased PN junction, potential barrier, drift and diffusion currents, depletion layer, V-I characteristics,

6.2 Zener diode and their applications.

6.3 Application of diode as half-wave, full wave and bridge rectifiers.(without derivation).

6.4 Voltage regulators and their types.
6.5 Clipper & clampers

7. **Bipolar-Transistors** (06 hrs)

7.1 Concept of a bipolar transistor, its structure, PNP and NPN transistors, their symbols and mechanism of current flow; Current relations in a transistor; concept of leakage current;

7.2 CB, CE, CC configurations of a transistor and their comparison .

8. **Field Effect Transistors** (05 hrs)

8.1 Construction, operation and characteristics of FETs and their applications.

8.2 Construction, operation and characteristics of a MOSFET in depletion and enhancement modes and its applications.

8.3 CMOS - advantages and applications

LIST OF PRACTICALS

1. Operation and use of the following instruments: voltmeter, ammeter ,Wattmeter, Multi-meter, CRO, Signal generator, LCR meter, Regulated Power Supply by way of taking readings of relevant quantities with their help.

2. To verify following network theorems applicable to D.C. circuit. i) Superposition Theorem, ii) Thevenin's Theorem

3. Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions.

4. Verification of Kirchhoff's Current and Voltage Laws in a dc circuit

5. Observation of change in resistance of a bulb in hot and cold conditions, using voltmeter and ammeter.

6. To find the ratio of inductance of a coil having air-core and iron-core respectively and to observe the effect of introduction of a magnetic core on coil inductance

7. Identification and connection of batteries in an electronic circuit.

8. Plotting of V-I characteristics of a PN junction diode

9. Plotting of V-I characteristics of a Zener diode.

10. To observe and plot the output wave shape of :

a. Half-wave rectifier circuit using one diode

b. Full-wave rectifier circuit using two diodes

c. Bridge-rectifier circuit using four diodes

11. Plotting of input and output characteristics of transistors in CE & CB configuration.

RECOMMENDED BOOKS

1. Basics of Electrical Engineering by G.L. Marwaha, Eagle Parkashan, Jalandhar.
2. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and Co, New Delhi.
3. A Textbook of Basic Electrical and Electronics Engineering by J.B Gupta , S.K. Kataria & Sons, New Delhi
4. Basic Electronics by Harish C. Saini , Eagle Parkashan, Jalandhar
5. Basic Electronics and Linear Circuit by NN Bhargava, Kulshreshta and SC Gupta, Tata McGraw Hill Education Pvt Ltd., New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	05	06
2	05	06
3	06	06
4	06	07
5	06	07
6	06	07
7	06	06
8	05	05
Total	**45**	**50**

2.6 DESKTOP PUBLISHING (DTP) FUNDAMENTALS

L	P
-	4

RATIONALE

This course will enable the students to familiarize with the features and use of application packages such as Adobe Photoshop, Corel Draw or any other equivalent latest package(s). They will develop skills in handling the software. Adobe Photoshop will help the students in understanding technical aspects of multimedia content creation, the processes and tools used for designing multimedia systems. This will make the students proficient in designing and developing a multimedia application.

Note: Since this is a practical oriented subject, there will be no theory paper. It is suggested that the teacher should explain the following topics during the practical classes itself.

LEARNING OUTCOMES

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

- Operate and design in graphics.
- Use photo-shop software for drawing and editing photos.
- Identify the tools to create animations
- Reduce the size of various file formats i.e. audio, video and text.
- Demonstrate the concepts related to desktop publishing software.
- Design visiting cards and advertisement pamphlets.
- Design wedding cards, flex and printed designer boxes.
- Design multi-page document and drawing pictures for the books.
- Add special effects in drawing.
- Generate special effects to various types of text in various documents.
- Add various symbols to a design and creating different patterns.

TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION

1. Introduction

   Overview of Desktop Publishing (DTP)

2. Photoshop and Animation Technology

   Photo-shop workshop, image editing tools, specifying and adjusting colours, using gradient tools, selection and move tools, transforming path drawing and editing tools, using channels, layers, filters and actions

Animation Technology

Definition, History of Animation, Types of animation- 2D and 3D, Basic principles of animation, Various Terms-Animation Drawings/Cels, Rough Drawings, Clean ups, Colour reference drawings, Layout, Model Sheet, Key Drawings and in Between, Master Background, Concept Piece, Character drawing, Story Board.

3. Corel Draw/Inkscape

3.1 Introduction, exploring Corel Draw screen, using dialog boxes, using roll ups, create/open file, save file, import/export files, print file

- Use of ribbon bar, use of tool box, select object, shaping objects using zoom tool, filling objects, outline objects, use of line tool
- Setting up new drawing, setting multi-page document, undo/redo mistakes, repeat, cut, copy, paste, delete, duplicate, clone
- Insert object, paste special, copy attributes from select all, drawing objects, selecting objects
- Page setup, insert/delete page, use of layers, roll up, grid and scale set up, guideline set up

3.2 Formatting objects

- Arranging objects: align, order, group, ungroup
- Arranging objects: combine, break apart, weld, intersection, trim, separate
- Mode edit: to line, to curve, stretch, rotate, align, convert to curves
- Creating special effects: Transform roll up, clear transformation, add perspective, envelope roll up
- Creating special effects: blend roll-up, extrude roll up, counter roll up, power line, power-clip clear effects
- Working with text: Character, paragraph text, frame, setting of tabs, indents, bullets, spacing in paragraph text

LIST OF PRACTICALS

1. Using various features of Photo-shop/GIMP
2. Making multimedia presentations combining, Flash, Photo-shop, such as department profile, lesson presentation, games and project presentation
3. Flip Books: Capture a series of images using your camera's continuous mode. Design your Flipbook, Printing the flipbook, Layout the Flipbook pages, Arrange the pictures, Holding the end of the stack.
4. Stop Motion Animation: using characters in stop motion animation.

5. Inserting objects in the drawing, aligning, ordering, grouping and ungrouping of those objects
6. Use of combine, break apart, weld, intersection, trim and separate tools in a given drawing
7. Use of mode edit tools i.e. to line, to curve, to stretch, and rotate
8. Creating special effects i.e. transform roll-up, envelop roll up, add perspective, extrude roll up, contour roll up, power line, power clip, clear effects.
9. To insert character and paragraph text in a drawing and frame, setting of tabs, indents, bullets and spacing in paragraph text.
10. Filling of text to a given path, aligning it to base line, straighten text and edit text
11. Using tools such as spell checker, and thesaurus.
12. Using find and replace text utility and type assist.
13. Adding various symbols to a drawing and creating different patterns.
14. To draw various logos with the help of tracing methods.

INSTRUCTIONAL STRATEGY

This subject is completely practical oriented. Stress is to be given to impart hands on experience to the students. With this subject, the students will be able to create, edit, format and print a document with the help of corel-draw, Adobe Photoshop etc.

RECOMMENDED BOOKS

1. Learning Desktop Publishing by Ramesh Bangia; Khanna Book Publishing Co. Pvt. Ltd., New Delhi
2. Desktop Publishing from A to Z by Bill Grout and Osborne; McGraw Hill
3. DTP (Desktop Publishing) for PC user by Houghton; Galgotia Publishing House Pvt. Ltd., Daryaganj, New Delhi.

2.7 COMPUTER WORKSHOP

L	P
-	4

RATIONALE

The course aims at making the students familiar with various parts of computers and how to assemble them, and different types of peripherals desired. In addition, the course will provide the students with necessary knowledge and skills in computer software installation and maintenance to make him diagnose software faults.

LEARNING OUTCOMES

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

- Identify various computer components.
- Write the specifications of a computer.
- Describe and differentiate various types of Motherboard, Processors, RAM, Secondary storage devices.
- Install various components of computer.
- Assemble and de-assemble computer system.
- Install operating system i.e. MS-Window and Linux.
- Diagnose the various faults in computer system i.e. SMPS, HDD, RAM.
- Identify various cables used for connection.
- Outline the dimensions (space requirements) for setting a computer centre.
- Install and configure various application software.
- Identify various types of virus and clean the system using various antivirus software.

DETAILED CONTENTS

Part-A (Hardware)

1.1 Familiarization and specifications with various components and parts of personal computer: Mother board details, hard disk drive, floppy disk drive. CD ROM drive, DVD, Blu-ray keyboard, display devices, various chips (memory chips and CPU); serial and parallel ports, inkjet, USB Ports, SATA Fire wire, Bluetooth, Dot matrix and Laser printers.

1.2 Introduction and working principle of UPS

1.3 Assembling and disassembling of PCs, power supply, linear power supply and switch mode power supply, trouble shooting of SMPS.

1.4 Setting up of basic infrastructure for computers (including power layout, air conditioning, earthing etc.

1.5 Demonstrate various types of cables like twisted pair cable, co axial cable, fiber optics cable, general purpose cables

1.6 Introduction to various networking devices like network interface card, hubs, router, switch, connectors, and modem.

1.7 Introduction to single phase and three phase supply and wiring system. Importance of three phase supply and wiring system.

1.8 Use of multimeter to test components and measurement of circuit voltage, resistance.

Part-B (Software)

1.9 Introduction to FOSS, installation of various operating systems, LINUX/MS windows latest versions. Setting up multiboot system/dual boot system. Familiarization of their features with practical demonstrations. Create window system image. Installation and configuration of device drivers. Disk management

1.10 Installation of latest version of application software proprietary/free software like MS-Office/open office, Adobe Photoshop, Corel Draw, Macromedia Flash etc.

1.11 Installation and configuration of latest version of database software like Oracle/ MySQL/ SQL Server etc.

1.12 Introduction to Virus/Spyware/Worm/Trojan Horse, their detection, prevention and cure.

1.13 Installation, uninstallation and use of Antivirus software.

INSTRUCTIONAL STRATEGY

As the subject is practice oriented, sufficient exercises on assembling and dissembling of computer system should be given.. Field visits to the places where assembly of computers is taking place will be helpful to the students. Visits to the manufacturing units of CVT or UPS will also be helpful to the students.

RECOMMENDED BOOKS

1) PC Upgrade and Maintenance Guide by Mark Minasi, BPB Publication
2) Hardware Bible by Winn Rosch, Techmedia Publications
3) IBM PC and Clones by B Govinda Rajalu. Tata McGraw Hill Education Pvt Ltd , New Delhi

4) Common Computer Circuits and Faults Vol. 1 by M. Lotia, BPB Publications, New Delhi
5) Monitor and Fault Diagnosis Vol. 1 and II. M. Lotia, BPB Publications, New Delhi
6) Complete Guide to Window and Workstation by Peter Norton. Tech Media Publications, New Delhi

2.8 GENERAL WORKSHOP - II
(For Computer Science and Engineering, Information Technology, Electronics and Communication Engineering)

L	P
-	4

RATIONALE

Psychomotor skills are mastered through practice, an opportunity therefore, has been extended to students through this course to refine their skills in different trades. The basic skills developed during first semester will be refined during this course by doing higher order skills jobs including machining. In addition to developing general manual and machining skills in the students, the objective of development of sense of dignity of labour, precision, safety at work places, team working and right attitude among the students will also be met.

LEARNING OUTCOMES

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

- Select materials, sequence of operations, select tools to make a given job based on interpretation of drawing as per given specification with close tolerances using at least the resources of three shops.
- Prepare a job as per given specifications for a given shop.
- Specify and read/understand specifications of different types of tools, equipment and machines used in various shops.
- Inspect visually to identify various types of defects in different type of materials.
- Analyze a given job and identify various operations required to make it.
- Follow safety procedures and measures.
- Maintain good housekeeping practices.

DETAILED CONTENTS (PRACTICAL)

Note: The students are supposed to come in proper workshop uniform 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 workshops will be explained for conduct of practical. The students should prepare sketches of various tools/jobs sequence of operations etc. in their practical notebook.

The following shops are included in the syllabus.

1 Welding Shop –II
2 Fitting Shop – II
3 Sheet Metal Shop –II
4 Electric Shop -II
5 Carpentry Shop –II
6 Electronic Shop –II

1. WELDING SHOP –II

1.1 Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction to gas welding (Oxy-acetylene welding, Air acetylene welding, Oxy-hydrogen welding). Introduction to gas welding equipment: - Gas welding torch, cylinders, Blow pipe and Pressure regulators etc. Types of gas welding flames. Functions of filler materials and fluxes. Introduction to soldering and brazing. Difference between welding, soldering and brazing. Introduction to resistance welding.

1.2 Demonstration of Gas welding equipment, TIG, MIG and Spot welding machines. Demonstration of brazing and soldering

1.3 Jobs to be prepared:

Job I Making a lap joint on 75 mm × 35 mm × 3mm M.S. plate using gas welding (Oxy-acetylene).

Job II Making a simple job on spot welding machine.

2. FITTING SHOP - II

2.1 Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction, function and specification of different types of cutting tools (chisels and scrapers etc.), tightening tools (pliers, screw driver, wrenches etc.) types of drill and drilling machines used in fitting shop. Classification of files: according to cut, grade, and shape. Measuring devices (Fillet/radius gauge, screw pitch gauge, wire gauge, telescopic gauge), Vernier height gauge. Surface gauge and universal surface gauge. Description of drill, reamer, tap and die set. Selection of dies for threading, selection of drill size for taping.

2.2 Demonstration on use of various measuring tools (Vernier caliper, Vernier height gauge and outside and inside micrometers etc.), finding least count and checking of zero error. Demonstration of various types of drills, taps and dies.

2.3 Jobs to be prepared:

Job I To make a job by drilling and tapping (manually) process on soft metals- Aluminum or Copper or Bronze.

Job II To Make ‘U’ type cut-out profile from a square piece of MS flat using hand hacksaw, filing, marking, drilling and measuring operations up to an accuracy of $\pm$ 0.1 mm.

3. SHEET METAL SHOP - II

3.1 Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction and functions of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine, Wood Turning Machine, Wiring Machine, Setting Down Machine, Forming Machine, Fly press etc. Introduction to various metal forming processes e.g. Spinning, Punching, Blanking, cup drawing, Introduction to metal spinning process. Introduction of various types of nuts, bolts, screws etc.

3.2 Demonstration of various machines and types of nuts, bolts, screws etc.

3.3 Jobs to be prepared:

Job I To prepare a job involving soldering or brazing process.

Job II To fabricate a funnel/conduit pipe from GI sheet.

4. ELECTRIC SHOP - II

4.1 Safety precautions of concerned shop and use of Personal Protective Equipment (PPE), Introduction and use of single phase and three phase supply, its wiring system and importance. Introduction and function of an electric motor for any three-phase electric machine. Estimating and costing of power consumption. Identification and familiarization with the following tools: Tweezers, Screw Drivers (Different sizes), Insulated pliers, Cutters, Sniper, Philips Screw driver (star screw driver), L-Keys.

4.2 Demonstration of dismantling, servicing and reassembling of table/ceiling fan, air-cooler, auto electric iron, heater etc. Testing and reversing direction of rotation of single phase and three phase motors and their wiring methods.

4.3 Job Practice:

Job I Connection of single-phase energy meter with supply and load including reading and working out power consumption and cost of energy.

Job II Finding faults in electric circuits, machines, with series testing lamp and multimeter.

Job III Connection and wiring practice for reversing direction of rotation of single phase and three phase motors

.

5. CARPENTRY SHOP – II

5.1 Safety precautions of concerned shop and use of Personal Protective Equipment (PPE). Introduction, parts and functions of Jig saw and radial saw wood working machine, Band saw, Circular saw and Electric Planer. Introduction and basic functions of Wood working lathe and its tools. Saw re-sharpening machine, wood working lathe, Saw Brazing unit.

5.2 Demonstration of Rip Saw, dovetail saw and Tenon saw. Method of sharpening various saws. Demonstration on Band Saw and Circular Saw, Chain and Chisel, Universal wood working machine, Saw re-sharpening machine, Saw Brazing unit.

5.3 Jobs to be prepared:
Job I Preparation of mitre joint.
Job II Preparation of a lengthening joint

6. ELECTRONIC SHOP – II

6.1 Identification and familiarization with tools used in laying of networking, monitoring systems.

6.2 Identification and familiarization with different types of Routers, Modems, Switches, Smart hubs etc.

6.3 Job Practice

Job I Creation of LAN. connecting at least 4 systems.

Job II Use of various types of switches and protective devices in electronic circuits

Job III To make regulated power supply on general purpose PCB.

Note:-

1. Workshop instructors will guide and help the students throughout the practical class in order to explain and complete the job according to syllabus and for providing necessary facilities to the students during performance of practical by observing the safety precautions
2. The Workshop Superintendent or Foreman Instructor or Instructor will demonstrate and deliver the theoretical instructions with regard to introduction, functions, classification and specification of tools, instruments, equipment, apparatus etc. of all the topics covered in the syllabus of workshops.
3. The Workshop Superintendent or Foreman Instructor will also conduct the mid-term test and final practical exam of this subject.

RECOMMENDED BOOKS

1. Workshop Practice By Swaran Singh, S.K. Kataria & Sons Publisher of Engineering Books New Delhi.
2. Workshop Practice by HS Bawa; Tata McGraw Hill Publishers, New Delhi.
3. Workshop Technology I, II, III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publish ers Pvt. Ltd. Mumbai
4. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar
5. Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Co., New Delhi

TRAFFIC AWARENESS & ROAD SAFETY CAMP (II)

A diploma holder must have knowledge of various types of traffic rules and regulations. Road safety education is vital for people of all ages. As a responsible citizen, you should be aware of each and every road safety rules. Observation is the key skill you need in ensuring road safety By obeying safety rules and regulations, you can save yourself and others on the road. This camp covers the basic concepts of traffic rules and safety. Lectures will be delivered on following broad topics with the coordination of Distt. Traffic police. There will be no exam for this camp.

1. Time management
2. Traffic light signals
3. Speed limits of vehicles
4. Schedule of offences
5. Dividing lines
6. Proper road Maintenance and Warnings
7. Test yourself

3.1 DIGITAL ELECTRONICS

L	P
3	2

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.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Verify and interpret truth tables for all logic gates.
- Realize all logic functions with AND, OR, NOT, NAND and NOR gates
- Design half adder and full adder circuit
- Demonstrate and design 4-bit adder, 2's complement subtractor
- Verify and interpret truth tables for all flip flops.
- Verify and interpret truth tables of multiplexer, de-multiplexer, encoder and decoder ICs
- Design a four bit ring counter and verify its operation
- Design 4-bit SISO, PISO, SIPO, PIPO shift registers

DETAILED CONTENTS

1. Introduction (02 hrs)

   a) Distinction between analog and digital signal.
   b) Applications and advantages of digital signals.

2. Number System (04 hrs)

   a) Binary, octal and hexadecimal number system: conversion from decimal and hexadecimal to binary and vice-versa.
   b) Binary addition, subtraction, multiplication and division including binary points. Sign magnitude method of representation, 1’s and 2’s complement method of addition/subtraction, floating point representation

3. Codes and Parity (04 hrs)

   a) Concept of code, weighted and non-weighted codes, examples of BCD, excess-3 and Gray code.

   b) Concept of parity, single and double parity and error detection and correction (Hamming code)
   c) Alpha numeric codes: ASCII, EBCDIC and Unicode.

4. Logic Gates (06 hrs)

a) Concept of negative and positive logic
b) Definition, symbols and truth tables of gates. Construction of NOT, AND and OR gates from NAND and NOR gates (universal gates).

5. Logic Simplification (05 hrs)

a) Postulates of Boolean algebra, De Morgan's Theorems. Various identities. Formulation of truth table and Boolean equation for simple problem. Implementation of Boolean (logic) equation with gates

b) Karnaugh map (upto 4 variables) and simple application in developing combinational logic circuits

6. Arithmetic circuits (05 hrs)

a) Half adder and Full adder circuit, design and implementation.
b) Half and Full subtractor circuit, design and implementation.
c) 4 bit adder/subtractor.
d) Adder and subtractor IC (7484)
e) 2-bit comparator

7. Decoders, Multiplexers and De-Multiplexers (06 hrs)

a) Basic functions and block diagram of Encoders and decoders.
b) Basic functions and block diagram of Multiplexers and De-Multiplexers. Different types and ICs.
c) Four bit decoder circuits for 7 segment display and decoder/driver ICs.

8. Latches and flip flops (04 hrs)

a) Concept and types of latch with their working and applications
b) Operation using waveforms and truth tables of RS, T, D, JK and Master/Slave JK flip flops.
c) Difference between a latch and a flip flop
d) Flip flop ICs

9. Shift Register (06 hrs)

Introduction and basic concepts including shift left and shift right.

a) Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out.
b) Universal shift register

c) Buffer register, Tristate Buffer register
d) IC 7495

10. Counters (03 hrs)

a) Introduction to Asynchronous and Synchronous counters
b) Binary up/down counters (upto MOD-8)
c) Decade counter.
d) Pre settable and programmable counters
e) Ring counter with timing diagram
f) Counter ICs

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
   - Design of a NOR gate latch and verification of its operation

3. - To design 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. To design 4 bit adder, 2's complement subtractor circuit using an 4 bit adder IC and an XOR IC and verify the operation of the circuit.

5. To design a NOR Gate Latch and verification of its operation

6 Verification of truth table for positive edge triggered, negative edge triggered, level triggered IC flip-flops (At least one IC each of D latch , D flip-flop, JK flip-flops).

7. Verification of truth table for encoder and decoder ICs, Mux and DeMux

8. To design a 4 bit SISO, SIPO, PISO, PIPO shift registers using JK/D flip flops and verification of their operation.

9. To design a 4 bit ring counter and verify its operation.

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.

RECOMMENDED BOOKS

1. Malvino Leach,"Digital Electronics and Applications", Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Morris Mano,"Digital Logic Designs", Prentice Hall of India, New Delhi
3. Floyd and Jains, "Digital Fundamentals", Pearson Education
4. KS Jamwal,"Digital Electronics", Dhanpat Rai and Co., New Delhi
5. RJ Tocci,"Digital Systems: Principles and Applications", Prentice Hall of India, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allocation (Out of 50)
1.	2	2
2.	4	5
3.	4	5
4.	6	8
5.	5	5
6.	5	5
7.	6	6
8.	4	4
9	6	6
10.	3	4
Total	**45**	**50**

3.2 COMPUTER PROGRAMMING USING C

L	P
3	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:

- Identify the 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.
- Use structures and union for handling data.
- Explain the concepts of C programming language
- Explain and implement the language constructs concepts
- Install C software on the system and debug the programme
- Explain and execute member functions of C in the programme
- Describe and implement array concept in C programme
- Describe and execute pointers
- Handle file with C

DETAILED CONTENTS

1. Algorithm and Programming Development (02 hrs)

    1.1 Overview of computer language and Operating systems – Machine level language, assembly level language, high level language, assembler, compiler and interpreter
    1.2 Steps in development of a program
    1.3 Flow charts, Algorithm development
    1.4 Programme Debugging

2. Program Structure (08 hrs)

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

3. Control Structures (08 hrs)

- 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. Functions (08 hrs)

- 4.1 Introduction to functions
- 4.2 Global and Local Variables
- 4.3 Function Declaration
- 4.4 Standard functions
- 4.5 Parameters and Parameter Passing
- 4.6 Call - by value/reference

5. Arrays (06 hrs)

- 5.1 Introduction to Arrays
- 5.2 Array Declaration, Length of array
- 5.3 Single and Multidimensional Array.
- 5.4 Arrays of characters
- 5.5 Passing an array to function

6. Pointers, Structures and Unions (07 hrs)

- 6.1 Introduction to Pointers
- 6.2 Declaration of structures
- 6.3 Accessing structure members
- 6.4 Structure Initialization
- 6.5 Unions

7. File Handling with C (06 hrs)

- 7.1 Introduction to Files (streams in C)
- 7.2 File : File Declaring, File Opening, File Closing
- 7.3 Operations on File : Reading on File, Writing on File, Appending on file
- 7.4 Random Access of a file
- 7.5 Command line argument.

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.
17. Write a program to apply open, close and save operations on a file to be performed on C file.
18. Program to perform write and read operations in file.

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).

RECOMMENDED BOOKS

1. Kanetkar, Yashwant, “Let us C”. BPB Publication, New Delhi
2. Balaguruswami, E, “Programming in ANSI C”, Tata McGraw Hill Education Pvt. Ltd. New Delhi.
3. Salaria, RS, “Problem Solving and Programming in C”, Khanna Book Publishing Co (P) Ltd. New Delhi.
4. Gottfried, “Programming in C”, Schaum Series, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
5. Subburaj, R, “Programming in C”, Vikas Publishing House Pvt. Ltd., Jangpura, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	02	02
2	08	09
3	08	09
4	08	09
5	06	06
6	07	09
7	06	06
Total	**45**	**50**

3.3 DATABASE MANAGEMENT SYSTEM

L	P
3	4

RATIONALE

Database and database systems have become an essential component of everyday life in modern society. This course will acquaint the students with the knowledge of fundamental concepts of DBMS and its application in different areas, storage, manipulation and retrieval of data using query languages. Oracle/My SQL/SQL Server can be use as package to explain concepts.

LEARNING OUTCOMES

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

- Define and describe the database
- Contrast and compile the design of database architecture
- Convert and compare the designs and differentiate between the keys
- Convert database in the form of tables
- Normalize the data
- Provide the security to the database
- Respond various queries in the SQL

DETAILED CONTENTS

1. Introduction (04 hrs)

   Database Systems; Database and its purpose, Characteristics of the database approach, Advantages and disadvantages of database systems. Classification of DBMS Users; Actors on the scene, Database Administrators, Database Designers, End Users, System Analysts and Application Programmers, Workers behind the scene (DBMS system designers and implementers, tool developers, operator and maintenance personnel)

2. Database System Concepts and Architecture (05 hrs)

   Data models, schemas, instances, data base state. DBMS Architecture; The External level, The conceptual level, The internal level, Mappings. Data Independence; Logical data Independence, Physical data Independence. Database Languages and Interfaces; DBMS Language, DBMS Interfaces. Classification of Database Management Systems

3. Data Modeling using E.R. Model (Entity Relationship Model) (06 hrs)

   Data Models Classification; File based or primitive models, traditional data models, semantic data models. Entities and Attributes, Entity types and Entity sets, Relationship among entities

4. Relational Model: (05 hrs)

   Relational Model Concepts: Domain, Attributes, Tuples and Relations. Relational constraints and relational database schemes; Domain constraints, Key constraints and constraints on Null. Relational databases and relational database schemes, Entity integrity, referential integrity and foreign key

5. Normalization (05 hrs)

   Non-loss decomposition and functional dependencies, First, Second and Third normal forms, Boyce/Codd normal form, denormalization

6. Database Access and Security (06 hrs)

   Database security, process controls, database protection, grant and revoke

7. MYSQL/SQL (Structured Query Language) (14 hrs)

   SQL* DDL (Data Definition Languages): Creating Tables, Creating a table with data from another table, Inserting values into a table, updating columns of a Table, Deleting Rows, Dropping a Table. DML (Data Manipulation Language): Database Security and Privileges, Grant and Revoke Command, Maintaining Database Objects, Commit and Rollback, various types of select commands, various types of joins, sub query, aggregate functions.

LIST OF PRACTICALS

1. Exercises on creation and modification of structure of tables.
2. Exercises on inserting and deleting values from tables.
3. Exercises on querying the table (using select command).
4. Exercises on using various types of joins.
5. Exercises on using functions provided by database package.
6. Exercises on commands like Grant, Revoke, Commit and Rollback etc.
7. Design of database for any application.

INSTRUCTIONAL STRATEGY

Explanation of concepts using real time examples, diagrams etc. For practical sessions books along with CDs or learning materials with specified activities are required. Various exercises and small applications should be given along with theoretical explanation of concepts.

RECOMMENDED BOOKS

1) Vig, Dr. Renu, and Ekta Walia, "Fundamentals of Database Management Systems", an ISTE, Publication, New Delhi.
2) ISRD Group, "Introduction to DBMS", Tata McGraw Hill Education Pvt Ltd, New Delhi.
3) Wesley, Date C.J. Adison, "An Introduction to Database Systems".
4) Elmasri, Navathe, Adison Wesley, "Fundamentals of Database Systems".
5) Desai, Bipin C., "An Introduction to Database Systems", Galgotia Publications Pvt. Ltd., Daryaganj, New Delhi 110002.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	04	4
2	05	6
3	06	8
4	05	5
5	05	5
6	06	6
7	14	16
Total	**45**	**50**

3.4 OPERATING SYSTEMS

L	P
3	2

RATIONALE

The course provides the students with an understanding of human computer interface existing in computer system and the basic concepts of operating system and its working. The students will also get hands-on experience and good working knowledge to work in windows and Linux environments. The aim is to gain proficiency in using various operating systems after undergoing this course. While imparting instructions, the teachers are expected to lay more emphasis on concepts and principles of operating systems, its features and practical utility.

LEARNING OUTCOMES

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

- Identify memory management technique.
- Differentiate scheduler algorithm.
- Setup of Linux labs.
- Use Linux for running various programming languages
- Set up open source labs.
- Describe and identify various file system.
- Assist in handling other open sources

DETAILED CONTENTS

1. Overview of Operating Systems (03 hrs)

   Definition of Operating Systems, Types of Operating Systems – Distributed OS and Network OS, Importance of Operating Systems, Functions of Operating Systems

2. Process Management (04 hrs)

   Process Concepts, Process Control block, Process State Diagram, Operations on Processes, Inter Process Communication, Process synchronization and semaphores

3. CPU Scheduling (04 hrs)
   Basic Concepts, Scheduling Queues, Schedulers, Scheduling Criteria, Scheduling Algorithms and their evaluation

4. Deadlock (05 hrs)
   Deadlock model, Characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection and recovery

5. Memory Management (05 hrs)

   Basic Concepts, Logical vs Physical address space, Swapping, Paging and segmentation, Virtual Memory and demand paging

6. Input Output Management (04 hrs)

   Dedicated and shared devices, Input output devices and storage devices,

7. File System Management (04 hrs)
   File Concepts, Access methods, File Structure, Allocation methods and free space management

8. Linux Operating System (16 hrs)

   Introduction, history of Linux, Linux Overview, Structure of Linux, Linux releases, open linux, system requirements, file structures, Linux Commands and Filters: Shell: concepts of command options, input, output redirecting and network file, process and communication commands like: mkdir, cd, ls, who, whoami, cat, more, tail, head, mv, chmod, grep, wc, sort, kill, write, wall, mail, news

LIST OF PRACTICALS

1. Directory commands
2. File commands
3. Process management
4. Using file permission commands
5. Mail commands
6. Establishment of LAN network for homogeneous and heterogeneous systems through DHCP.

INSTRUCTIONAL STRATEGY

This subject is both theory and practical oriental. Therefore, stress must be given on particulars along with theory. Laboratory must have windows as well as Linux operating system. Concepts of O.S. must be taught practically.

RECOMMENDED BOOKS

1. Operating Systems by Achyut S Godbole and Atul Kahate: Tata McGraw Hill Education Pvt Ltd , New Delhi
2. Linux – The Complete Reference by Ruichard Peterson, Tata McGraw Hill, New Delhi
3. Operating Systems by Stallings Tata McGraw Hill.
4. Operating Systems- A Concept Based Approach by Dham Dhare, Tata McGraw Hill Education Pvt Ltd , New Delhi
5. Operating System Concepts by Ekta Walia, Khanna Publishers, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted (Hrs)**	**Marks Allotted (Out of 50)**
1.	03	03
2.	04	04
3.	04	05
4	05	06
5	05	06
6	04	05
7	04	05
8	16	16
Total	**45**	**50**

3.5 INTERNET AND WEB TECHNOLOGIES

L	P
2	4

RATIONALE

This course will enable the students to understand the basics of internet and various application of internet like e-mail, FTP, Telnet, Newsgroups and video conferencing In addition, this course develops competency amongst the students to design professional web sites and interactive web pages. They will have overview of different technologies like of HTML, CSS, JavaScript.

LEARNING OUTCOMES

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

- Define internet and its operation.
- Outline application of internet.
- Use application of video conferencing
- Use application of E-communication
- Describe the application of E-communication and benefit to society.
- Define and differentiate between various web browsers.
- Develop static webpage/web portal.
- Validate input data.

DETAILED CONTENTS

1. Internet Basics (06 hrs)

   Concept of Internet, its applications, specification and technical details for establishing Internet. Types and functions of modems, Internet service providers, Intranets, E-mail, Telnet, FTP, IRC, NNTP, Video conferencing, e-commerce

2. Internet Connectivity (04hrs)

   Wired and wireless connectivity like optical fibre, cable media, mobile internet, leased line, ISDN, VSAT, RF link, Wi-Fi

3. World Wide Web (WWW): (06 hrs)

   World Wide Web and its evolution, web page, web server, HTTP/HTTPS protocol. Examples of web servers. Navigation Tools: Mozilla Firefox, Google Chrome, Internet Explorer, Uniform Resource Locator (URL). Hypertext, hyperlinks and hypermedia, URL, its registration, browsers, search engines, proxy servers

4. Developing Web Portals Using HTML (4 hrs)

- Basic structure of HTML
- Introduction to HTML 5
- Formatting text, title, headings, Horizontal rules and comments
- Inserting links and images,
- Creating tables
- Creating forms using HTML 5
- Using div and span tag

5 Cascading Style Sheets (CSS) (4 hrs)

- Introduction to syntax of CSS,
- Different methods of including CSS,
- CSS attributes,
- CSS box model
- Various CSS properties like margin, padding, border
- Font related CSS properties like Text, fonts, color
- CSS background related properties
- Class and Id in CSS

6 JavaScript (06 hrs)

- Basic introduction to JavaScript
- Methods of including JavaScript
- Variable declaration
- Operators in JavaScript
- Control Statements and looping Statements
- Document Object Model (DOM)
- Validating Forms using JavaScript

LIST OF PRACTICALS

1. Configuring computer system to access internet
2. Managing social networking profile and e-mail account
3. To demonstrate the use of TELNET, FTP, IRC
4. Demonstration of audio-video conferencing
5. Demonstration of e-commerce transaction
6. Creating Web pages using HTML and CSS
7. Creating the email validation using JAVA script
8. Creating of mobile validation, regex checking and empty text box.

INSTRUCTIONAL STRATEGY

Students should be exposed to Internet as the subject is practice oriented, theoretical Instruction may be given during practical session also.

RECOMMENDED BOOKS

1. Rajkamal, "Internet and Web Technologies", Tata McGraw Hill Education Pvt. Ltd., New Delhi.
2. Alam, Tanweer, "Web Technology", Khanna Book Publishing Co. (P) Ltd., New Delhi.
3. Stephanie, Cottrell, Bryant, "Teach Yourself HTML 4.0 with XML, DHTML and Java Script", IDG Books India Pvt. Ltd., New Delhi.
4. Dynamic Web Publishing – Unleashed Tech Media

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted (Hrs)**	**Marks Allotted (Out of 50)**
1	06	10
2	04	06
3	06	10
4	04	06
5	04	06
6	06	12
Total	**30**	**50**

3.6 OPEN ELECTIVE

L	P
2	-

RATIONALE

Open Elective refers to a course that students can opt for in addition to their primary area of study. The open electives is from an unrelated discipline with the intention to provide exposure in that discipline. It provides the students the opportunity to select and learn a subject related to his/her interest, thus allowing them to explore their passion..

LIST OF SUGGESTED OPEN ELECTIVES

The student can opt one course out of the following :

1 Foreign Language
2 National Cadet Corps (NCC)
3 Yoga
4 First Aid
5 Creative Writing
6 Sketching, Drawing and Colour Studies
7 Gardening
8 Photography
9 Legal Studies
10 Event Management
11 Diet and Nutrition

Open elective can be offered online or offline.

3.6.1 FOREIGN LANGUAGE
(French, Japanese, German, Spanish)

L	P
2	-

RATIONALE

This course is an introduction to the specific language. Learning to understand and articulate oneself in day to day real life situations, and to begin to make sense of the language as a cultural space are the overall objectives of the course. The student should be able to grasp the basic sentence structure and build a good foundational vocabulary through this course.

LEARNING OUTCOMES

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

- Enhance the level of vocabulary in specific language.
- Manage situational communication in specific language.

DETAILED CONTENTS

1. Introduction (06 hrs)

   Self introduction, Numbers, Days, Months, Date, Time, and Counting

2. Vocabulary (06 hrs)

   My home, My family, My friend, Daily routine, Hobbies, Food, Greeting and Thanking

3. Grammar (12 hrs)

   Verb and Verb forms, Articles, Possessive pronouns, Auxiliary verbs, Questions, Present and Past tense

4. Theme (06 hrs)

   Means of transport, Basic directions, Food, Drink, Family, Groceries and Meals

RECOMMENDED BOOKS

1. Annie Berthet, Hugot et al, "Alter Ego - Méthode de Français", Hachette.
2. 3 A Corporation, "Minna no Nihongo", Goyal Publishers, New Delhi.
3. Stefanie Dengler, "NETZWERK Deutsch als Fremdsprache A1", Goyal Publishers, New Delhi.
4. Jaime Corpas et.al, "Aula International 1", Difusión, Madrid.

INSTRUCTIONAL STRATEGY

Teachers are expected to develop necessary knowledge in the students for comprehending basic concepts and principles of the subject so that they may pursue their passion. As far as possible, the teaching of subject shall be supplemented by demonstration and practices to enhance the relevant skills.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	06	10
2	06	10
3	12	20
4	06	10
Total	**30**	**50**

3.6.2 NATIONAL CADET CORPS (NCC)

L	P
2	-

RATIONALE

This course is structured to instil in the students qualities like nationalism, patriotism, discipline, team spirit, esprit-de-corps, leadership, self-confidence, national integration and improve their personality. The objective of the course is to expose the students to a regimental way of life, which is essential to inculcate in them the values of discipline, duty, punctuality, orderliness, smartness, and respect for authority, correct work ethos and self-confidence. In addition, it will inculcate defence services work ethos, which is characterized by hard work, sincerity of purpose, honesty, ideals of selfless service, dignity of labour, secular outlook, comradeship, spirit of adventure and sportsmanship.

LEARNING OUTCOMES

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

- Explain aims and objectives of NCC.
- Understand the importance of national integration.
- Assist Civil Administration in performance of selective duties during disasters.
- Perform drill without arms.
- Contribute towards nation building.
- Provide voluntary social service.

DETAILED CONTENTS

1. Introduction (08 hrs)

Aims and objectives of NCC, Organisation structure and training, NCC Song, National Integration and awareness, Religions, Culture, Traditions and Customs of India, National Integration: Importance and Necessity. Freedom Struggle and Nationalist Movement in India, Problems/ Challenges of national integration, Unity in diversity, Famous leaders of India, Images/ Slogans for national integration, Contribution of youth to nation building

2. Civil Affairs (04 hrs)

Civil Defence Organization and its duties/ NDMA, Types of emergencies/ Natural Hazards, Role of NCC during Natural Hazards/ Calamities

3. Drill Without Arms (08 hrs)

General and Words of Command, Attention, Stand at Ease and Stand Easy, turning and inclining at the halt, Sizing, forming up in three ranks and numbering, open and close order march and Dressing, Saluting at the halt, Getting on parade, dismissing and falling out, Marching, length of pace and time of marching in quick time and halt, slow march and halt, Turning on the march and wheeling, Saluting on the March Individual word of command

4. Personality Development and Leadership (04 hrs)

Personality development, self-awareness, Leadership, life/soft skills, time management and character building.

5. Social Service (06 hrs)

Basics of Social service, and its needs, Social/ Rural Development Projects: MNREGA, SGSY, NSAP; Literacy enhancement and poverty alleviation, Social evils, Contribution of youth towards social welfare.

RECOMMENDED BOOKS

1 "Cadet Hand Book (Common Subjects)", published by DG, NCC.
2 "Grooming Tomorrow's Leaders", published by DG, NCC.
3 "Youth in Action", published by DG, NCC.

INSTRUCTIONAL STRATEGY

Teachers are expected to develop necessary knowledge in the students for comprehending basic concepts and principles of the subject so that they may pursue their passion. As far as possible, the teaching of subject shall be supplemented by demonstration and practices to enhance the relevant skills.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	08	14
2	04	06
3	08	14
4	04	06
5	06	10
Total	**30**	**50**

3.6.3 YOGA

L	P
2	-

RATIONALE

Yoga is a practice that connects the body, breath, and mind. It uses physical postures, breathing exercises, and meditation to improve overall health. It not only improves physical health but also mental and spiritual well -being, which are the foundations of life. The course is aimed at developing skills in yoga for strength, flexibility and relaxation.

LEARNING OUTCOMES

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

- Explain the importance of yoga and its effect on health
- Perform yoga in various forms and combinations
- Understand the philosophy of heartfulness meditation.
- Promote positive health and holistic wellness through yoga and meditation.

DETAILED CONTENTS

1. Yoga (4 hrs)

   Concept, need and importance, Yogic principles, Rules and precautions to be followed by yoga practitioners, Introduction to Ashtanga yoga and Yoga sutra

2. Asanas and Mudras (14 hrs)

   Basic asanas, Asanas in different postures - Sukshma Vayayam, Pawan Muktasan, Surya Namaskar, Hasta Utthanasana, Padahastasana, Tadasana, Vrikshasana,Tirayak Tadasana, Natarajasana, Vajrasana, Padmasana, Bhujangasana.
   Mudras - Concept, Important mudras - Prana Mudra, Varuna Mudra, Prithvi Mudra, Aakash Mudra, Gyana Mudra.

3. Pranayama (6 hrs)

Kapalbhati Pranayama, Nadi Shodhan Pranayama (Anulom Vilom), Bhastrika Pranayama, Ujjayi Pranayama.

4. Meditation (3 hrs)

Heartfulness meditation, Practice on meditation

5. Health Benefits of Yoga and Meditation (3 hrs)

Benefits and effect of Asanas, Mudras and Pranayama on various systems and organs of human body. Relaxation and wellness through meditation

RECOMMENDED BOOKS

1. Saraswati, Swami Satyananda, "Asana, Pranayama, Mudra and Bandha", Yoga Publication Trust, Bihar.
2. BKS Iyengar, "Light on Yoga", George Allen and Unwin.
3. Mudras by Heartfulness; Heartfulness Education Trust.
4. Kamlesh D Patel, "The Way of the Heart", Spiritual Hierarchy Publication Trust
5. Goel, Aruna, "Yoga Education: Philosophy and Practice", Deep & Deep Publications, New Delhi.
6. Nagendra, H R, and R Nagarathna, "Yoga for Promotion of Positive Health". Swami Vivekananda Yoga Prakashan.

INSTRUCTIONAL STRATEGY

Teachers are expected to develop necessary knowledge in the students for comprehending basic concepts and principles of the subject so that they may pursue their passion. As far as possible, the teaching of subject shall be supplemented by demonstration and practices to enhance the relevant skills.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	04	06
2	14	24
3	06	10
4	03	05
5	03	05
Total	**30**	**50**

3.6.4 FIRST AID

L	P
2	-

RATIONALE

First aid is a valuable and life-saving course. The objective of this course is to impart knowledge and skills to the students necessary in an emergency to help sustain life, reduce pain, and minimize the consequences of injury or sudden illness until professional medical help
arrives.

LEARNING OUTCOMES

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

- Administer basic life support skills including cardiopulmonary resuscitation
- Provide first aid of simple and multiple system trauma.

DETAILED CONTENTS

1. Basics of First Aid (4 hrs)

   First aid, importance of first aid, first aider, laws of first aid, contents of an ideal first aid kit, dealing with an emergency.

2. Emergency Response (10 hrs)

   CPR, steps for performing CPR,CPR for newborns and infants, recovery position, first aid in drowning, fractures of bones, causes and types of fractures, dislocation.

3. First Aid in Burns (4 hrs)

   Types of burns, danger of burns, first aid in dry burns and scalds, electrical burns, chemical burns, sunburn, heatstroke.

4. First Aid in Wounds and Injuries (6 hrs)

Types of wounds- small cuts and abrasions, Head injury- nose bleed, bleeding gums, bleeding from varicose veins, Shocks- causes of shock and its first aid.

5. First Aid in Poisoning (3 hrs)

Poisoning by swallowing, gases, injections, skin absorption, Animal bites, snake bites and insect stings.

6. First Aid in Foreign Objects Entering the Sense Organs: (3 hrs)

Foreign body in the eye, ear, nose, skin, swallowing of foreign objects.

Note : Persons from Civil Defence/ National Disaster Response Force (NDRF) etc. can be invited for conduct of first aid classes and demonstration of first aid practices.

RECOMMENDED BOOKS

1. Gauri Goyal, Dr. Kumkum Rajput, Dr. Manjul Mungali,, "First Aid and Health", SBPD Publishing House
2. Williamson, Swapna Naskar and Goswami Mala, "First Aid and Emergency Care", Kumar Publishing House, New Delhi.
3. Mahopatra, R., "First Aid for You and Me", Academic Publishers, New Delhi.

INSTRUCTIONAL STRATEGY

Teachers are expected to develop necessary knowledge in the students for comprehending basic concepts and principles of the subject so that they may pursue their passion. As far as possible, the teaching of subject shall be supplemented by demonstration and practices to enhance the relevant skills.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	04	06
2	10	18
3	04	06
4	06	10
5	03	05
6	03	05
Total	**30**	**50**

3.6.5 CREATIVE WRITING

L	P
2	-

RATIONALE

Creative writing is a written art form that uses the imagination to tell stories and compose essays, poetry, screenplays, novels, lyrics, and more. The objective of this course is to acquaint the students with ideas related to creative writing including art, craft and basic skills required for a creative writer.

LEARNING OUTCOMES

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

- Distinguish between literary genres.
- Practice various forms of creative writing.
- Write for various media.

DETAILED CONTENTS

1. Fundamentals of Creative Writing (06 hrs)

   Meaning and significance of creative writing, Genres of creative writing: poetry, fiction, Non-fiction, Drama and other forms, Research for creative writing

2. Elements of Creative Writing (10 hrs)

   Plot, Setting, Character, Dialogue, Point of view, Literary devices and figurative language, Elements of style, Grammar and the structure of language, Proof reading and editing

3. Traditional Forms of Creative Writing (10 hrs)

   Fiction: short story, novella and novel, Poetry, Drama, Essay, Fable, Biography, Memoire and autobiography, Travelogues, Diaries, Self-narrative writing

4. Writing for Media (04 hrs)

Print media, Broadcast media, Internet - Web content writing and blog writing, Advertising

RECOMMENDED BOOKS

1. Anjana Neira Dev. Anuradha Marwah, Swati Pal, "Creative Writing: A Beginner's Manual", Pearson Longman, Delhi
2. Robert Scholes, Nancy R. Comley, Carl H. Klaus, Michael Silverman, "Elements of Literature: Essay, Fiction, Poetry, Drama, Film", Delhi
3. Bell, Julia and Magrs, Paul, "The Creative Writing Course-Book", Macmillan, London
4. Gardner, John, "The Art of Fiction", Vintage, New York

INSTRUCTIONAL STRATEGY

Teachers are expected to develop necessary knowledge in the students for comprehending basic concepts and principles of the subject so that they may pursue their passion. As far as possible, the teaching of subject shall be supplemented by demonstration and practices to enhance the relevant skills.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted (Hrs)**	**Marks Allotted (Out of 50)**
1	6	10
2	10	16
3	10	16
4	4	08
Total	**30**	**50**

3.6.6 SKETCHING, DRAWING AND COLOUR STUDIES

L	P
2	-

RATIONALE

This course is aimed to develop aesthetic sense of students. It also encompasses training in sketching, drawing and colouring to develop their mental faculties of observation, imagination and creation.

LEARNING OUTCOMES

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

- Sketch common objects and various geometrical and non-geometrical forms found in life and nature.
- Use different medium and materials.
- Use colour judiciously in creation of visual work.
- Prepare collage using various paper and materials.

DETAILED CONTENTS

1. Sketching of Objects and Nature (8 hrs)

   Sketching of objects at home like cup, plate, glass, book, pencil box etc.
   Sketching of tree, mountain, hills, vegetables flower etc. for Nature study using Pencil, colour Pencil

2. Drawing of Human and Animal Figures (10 hrs)

   Drawing of Human and animal form with the help of Basic Geometrical shapes

3. Collage Making (4 hrs)

   Creating Collage with the help of coloured cut out papers, picture from a magazine or any easily available materials

4. Colours (8 hrs)

Water colour, Poster colour, Colour theory – Colour system, Colour wheel, Colour dimensions, Drawing with oil pastel colour and dry pastel.

RECOMMENDED BOOKS

1. Betty Edwards, "Color: A Course in Mastering the Art of Mixing Colors", Penguin Group Inc., New York
2. Feisner, E., "Colour Studies", Fairchild Publications, USA

INSTRUCTIONAL STRATEGY

Teachers are expected to develop necessary knowledge in the students for comprehending basic concepts and principles of the subject so that they may pursue their passion. As far as possible, the teaching of subject shall be supplemented by demonstration and practices to enhance the relevant skills.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted (Hrs)**	**Marks Allotted (Out of 50)**
1	08	14
2	10	16
3	04	06
4	08	14
Total	**30**	**50**

3.6.7 GARDENING

L	P
2	-

RATIONALE

Gardening activities are fantastic for helping students engage in a way that is more difficult in the classroom. Watching plants grow is a fun and educational experience for them. Their enormous curiosity and excitement over anything new makes them natural for gardening. Growing plant seeds teaches them how nature works and adds to their interest in environmental sustainability.

LEARNING OUTCOMES

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

- Explain various techniques of gardening, cultivation, multiplication, raising of seedlings of garden
- Discuss new and modern techniques of plant propagation.
- Develop interest in nature and plant life.

DETAILED CONTENTS

1. Gardening (6 hrs)

   Definition, objectives and scope. Different types of gardening - landscape and home/ terrace gardening, parks and its components. Plant materials and design.

2. Gardening Operations (14 hrs)

   Soil laying, manuring, watering, management of pests and diseases and harvesting.

3. Sowing/Raising of Seeds and Seedlings (10 hrs)

Structure and types - Seed dormancy; causes and methods of breaking dormancy. Seed storage: Seed banks, factors affecting seed viability, genetic erosion Seed production technology. Seed testing and certification. Transplanting of seedlings.

RECOMMENDED BOOKS

1. Bose T.K., Mukherjee, D., "Gardening in India", Oxford & IBH Publishing Co. New Delhi.
2. Kumar, N., "Introduction to Horticulture", Rajalakshmi Publications. Nagercoil, Tamil Nadu.
3. Sandhu, M.K., "Plant Propagation", New Age International Publishers.

INSTRUCTIONAL STRATEGY

Teachers are expected to develop necessary knowledge in the students for comprehending basic concepts and principles of the subject so that they may pursue their passion. As far as possible, the teaching of subject shall be supplemented by demonstration and practices to enhance the relevant skills.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	06	10
2	14	24
3	10	16
Total	**30**	**50**

3.6.8 PHOTOGRAPHY

L	P
2	-

RATIONALE

Photography is a unique and creative medium of self-expression that requires aesthetic sense as well as technical expertise. Students who are highly passionate about learning the workings of cameras and different technologies based on them can pursue this course. The objective of this course is to enable the candidates to understand the utility of different camera parts and the art of taking candid shots.

LEARNING OUTCOMES

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

- Explain the principles of photography.
- Handle various cameras for taking photographs.
- Apply aesthetics of photography.

DETAILED CONTENTS

1. Basic Photography (04 hrs)

   Meaning and definition of photography, Basic principle in the film and digital photography, History of photography.

2. Camera Function and Accessories (04 hrs)

   Basic camera, Different parts of camera and their basic functions, Camera Accessories

3. Main Controls of Camera (10 hrs)

   Parts of Camera, Types of lenses, Shutter, Diaphragm, Exposure, Film and digital image sensor, Depth of field, Lighting, Photography with flash, Filters in photography.

4. Digital Camera (05 hrs)

Process of digital imaging, Types of digital cameras, Menu operationsof digital cameras, Introduction to colors.

5. Aesthetics of Photography (07 hrs)

Definition of lighting, Principles of lighting, Reflection, Light characteristics, Color, Direct light and indirect light, Light and subject, Light as subject, Shadow as subject, Light sources, Natural light and artificial light, Principles of visualization, Composition guidelines

RECOMMENDED BOOKS

1. Dilwali, Ashok, "All about Photography", National Book Trust, New Delhi.
2. Sharma, O.P., "Practical Photography", Hind Pocket Books.
3. Freeman, "The Photographer's Guide to Light", John Collins & Brown

INSTRUCTIONAL STRATEGY

Teachers are expected to develop necessary knowledge in the students for comprehending basic concepts and principles of the subject so that they may pursue their passion. As far as possible, the teaching of subject shall be supplemented by demonstration and practices to enhance the relevant skills.

.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	04	06
2	04	08
3	10	16
4	05	08
5	07	12
Total	**30**	**50**

3.6.9 LEGAL STUDIES

L	P
2	-

RATIONALE

The course introduces the students to Indian legal system, contracts management, and legal documentation. Further, the course familiarizes students with basic knowledge of labour laws that would be useful.

LEARNING OUTCOMES

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

- Understand the Indian Legal System.
- Discuss Indian Contract Act.
- Explore labour laws and laws related to women.

DETAIL CONTENTS

1. Introduction to Indian Legal System (4 hrs)

   Constitution of India, Sources of Law and Judicial system.

2. The Indian Contract Act (6 hrs)

   Contract – meaning and kinds. Essentials of a valid contract, Discharge of a contract, Contract of Agency

3. Legal Documentation (10 hrs)

   Drafting of legal documents including Non-Disclosure Agreements (NDA), Request for Proposal (RFP), collaboration agreements, joint venture agreements, tendering and subcontracting

4. Labour Laws (6 hrs)

Provident Fund, ESIC, Gratuity and Bonus

5. Legislation Related to Women (4 hrs)

Sexual harassment at Work place (Prevention, Prohibition and Redressal), Protection of Women from Domestic Violence Act, Criminal Law (Amendment) Act, The Indecent Representation of Women (Prohibition) Act.

RECOMMENDED BOOKS

1. Joseph Minattur, "Indian Legal System", Indian Law Institute, New Delhi.
2. Srivastava, S.C., "Industrial Relations and Labour Laws", Vikas Publishing House Pvt. Ltd.
3. Aggarwal, S K, "Business Law", Galgotia Publishers, Delhi.

INSTRUCTIONAL STRATEGY

Teachers are expected to develop necessary knowledge in the students for comprehending basic concepts and principles of the subject so that they may pursue their passion. As far as possible, the teaching of subject shall be supplemented by demonstration and practices to enhance the relevant skills.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted (Hrs)**	**Marks Allotted (Out of 50)**
1	04	07
2	06	10
3	10	16
4	06	10
5	04	07
Total	**30**	**50**

3.6.10 EVENT MANAGEMENT

L	P
2	-

RATIONALE

Event Management is a course which deals with the planning, coordinating, and organising of events for people and communities. It is a part of the mass communication course which is offered by many prestigious colleges in India. Event management course aims to imbibe knowledge on analysing, marketing, planning and strategies in business administration to its students.

LEARNING OUTCOMES

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

- Explain the purpose of special events in an organization.
- Use techniques and strategies required to plan successful special events.
- Promote and conduct special events.
- Assess the quality and success of special events.

DETAILED CONTENTS

1. Principles of Event Management (04 hrs)

   Introduction to event management, size & type of event, event team, code of ethics, principles of event management, role of event manager – planning, organising, leading and controlling an event

2. Event Planning (08 hrs)

   Objective of event, use of planning tools, protocols, dress codes, staging, staffing.

3. Event Marketing (04 hrs)

   Advertising, publicity, event marketing process, even hospitality

4. Event Leadership (06 hrs)

Teambuilding & work distribution, managing team, managing meetings, written & verbal communication.

5. Event Safety and Security (04 hrs)

Role of Security, Safety, Crowd management, Risk management.

6. Event Accounting (04 hrs)

Budget, Cash flow analysis, Profit & loss statement, Balance sheet.

RECOMMENDED BOOKS

1. Singla, Sita Ram, "Event Management", ATH Publishers, New Delhi.
2. Sharma, Divakar, "Event Planning and Management", Deep & Deep Publication.

INSTRUCTIONAL STRATEGY

Teachers are expected to develop necessary knowledge in the students for comprehending basic concepts and principles of the subject so that they may pursue their passion. As far as possible, the teaching of subject shall be supplemented by demonstration and practices to enhance the relevant skills.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted (Hrs)**	**Marks Allotted (Out of 50)**
1	4	06
2	8	12
3	4	08
4	6	10
5	4	08
6	4	06
Total	**30**	**50**

3.6.11 DIET AND NUTRITION

L	P
2	-

RATIONALE

The objective of this course is to help the students to understand the concept of diet and nutrients and provide knowledge about causes and symptoms of Nutrition-related disorders.

LEARNING OUTCOMES

On completion of this course, the students will be able to:

- Comprehend the nutritional value of different food items.
- Explain the need of nutrition during the normal stages of life.
- Calculate normal dietary requirements and balanced diet.

DETAILED CONTENTS

1. Introduction (04 hrs)

   Basic concepts of health, Nutrition, Nutrients, Nutrition requirement, Balanced diet. Relationship between health & nutrition, Assessment of nutritional status.

2. Nutrients (16 hrs)

   Nutrients & their classification. Macro Nutrients –Sources, Functions and Effects on the Body; Micro nutrients - sources, Functions and effects on the Body; Fat soluble nutrients - sources, Functions and effects on the body, Water soluble nutrients - Sources, Functions and effects on the body, Digestion, Absorption of carbohydrates, Lipids, Proteins and energy.

3. Energy and Nutrition-related Disorders (06 hrs)

Basic concepts, Definition and components of energy requirement, Protein malnutrition, Iodine deficiency disorders, Disease and disorder caused by imbalance of nutrients, Food allergies.

4. Nutritional Needs (04 hrs)

Nutritional need during normal stages of life - Infancy, Childhood, Adolescence, Pregnancy, Lactation and Old age, Disease management with diet.

RECOMMENDED BOOKS

1. Antia, F.P., "Clinical Dietetics and Nutrition", Oxford University Press.
2. Swaminathan, "Essentials of Food and Nutrition", Ganesh and Co., Madras.
3. Subhangini Joshi, "Nutrition and Dietetics", McGraw Hill Publishers.
4. B.S. Narsinga Rao et al, "Nutritive Value of Indian Foods", National Institute of Nutrition, Hyderabad.

INSTRUCTIONAL STRATEGY

Teachers are expected to develop necessary knowledge in the students for comprehending basic concepts and principles of the subject so that they may pursue their passion. As far as possible, the teaching of subject shall be supplemented by demonstration and practices to enhance the relevant skills.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	04	06
2	16	28
3	06	10
4	04	06
Total	**30**	**50**

ENERGY CONSERVATION AWARENESS CAMP

A diploma holder must have knowledge of various tips of energy conservation. Energy conservation has attained priority as it is regarded as additional energy resource. Energy saved is energy produced. This camp covers the basic concepts of energy management and its conservation. It gives the insight to energy conservation opportunities in household appliances and star rating. Lectures will be delivered on following broad topics. There will be no exam for this camp.

1. Classification of energy- primary and secondary energy, commercial and non-commercial energy, non-renewable and renewable energy with special reference to solar energy

2. Introduction to energy management, energy conservation, energy efficiency and its need

3. Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance

4. Standards and Labeling

- Concept of star rating and its importance
- Types of product available for star rating

5. Salient Features of Punjab Energy Conservation Building Code (ECBC)

6. General Energy Saving Tips in:

    - Lighting System
    - Room Air Conditioners
    - Refrigerators
    - Water Heater
    - Computers
    - Fans, Heaters, Blowers and Washing Machines
    - Colour Television
    - Water Pumps
    - Kitchens
    - Transport

DRUGS USE AND ABUSE AWARENESS CAMP

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

1. Drugs Use and Abuse in Society
   b. Concept and overview
   c. Extent of the problem
   d. Drug use as a social problem
   e. Causes of Drug Use: Biological, Socio-cultural, psychological

2. Types of Dugs and identification of Abuse
   a. Familiar drugs: Tabacco, Caffeine, over the counter drugs
   b. Restricted Drugs: Opiates, Hallucinogens, Marijuana
   c. Reformance enhancing drugs
   d. Uppers and Downers: Stimulants and Depressants

3. Impact of Drug Abuse
   a. Individual level biological and psychological
   b. Family social, National

4. Management and Prevention of Drug Abuse
   a. Medical and psychological
   b. Role of family School , Media and Legislation

4.1 GENERIC SKILLS AND ENTREPRENEURSHIP DEVELOPMENT

L	P
3	-

RATIONALE

Generic Skills and Entrepreneurship Development is one of the courses from "Human Science" subject area. Generic skills have emerged as an important component of employability skills, which enable an individual to become and remain employable over lifetime and to lead happy and prosperous life. Entrepreneurship development aims at developing conceptual understanding for setting-up one's own business venture/enterprise. This aspect of Human Resource Development has become equally important in the era, when wage employment prospects have become meager. Both the subject areas are supplementary to each other and soft skills are required to be developed in diploma pass-outs for enhancing their employability and self confidence.

LEARNING OUTCOMES

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

- Explain the importance of generic skills
- Manage himself/herself physically, intellectually and psychologically
- Work effectively as a team member
- Manage tasks effectively
- Develop an entrepreneurial mindset.
- Identify entrepreneurial support system for new ventures and small businesses.
- Recognize a business opportunity.
- Conduct market survey and prepare project report.

DETAILED CONTENTS

1. Introduction to Generic Skills (04 hrs)

   1.1 Importance of Generic Skill Development
   1.2 Life Long Learning and associated importance of Generic Skill Development

2. Managing Self (07 hrs)

   2.1 Knowing Self for Self Development
   - Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc.

   2.2 Managing Self - Physical
   Personal grooming, Health, Hygiene, Time Management
   2.3 Managing Self – Intellectual development

- Information Search: Sources of information
- Communication: Official & business correspondence, Job application covering letter and resume

2.4 Managing Self – Psychological

- Stress, Emotions, Anxiety-concepts and significance
- Techniques to manage stress

3. Managing in Team (06 hrs)

3.1 Team - definition, team dynamics
3.2 Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background

4 Task Management (03 hrs)

4.1 Task Initiation, planning, execution, close out
4.2 Exercises/case studies on task planning towards development of skills for task management

5. Problem Solving (05 hrs)

5.1 Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving
5.2 Different approaches for problem solving.
5.3 Steps followed in problem solving.
5.4 Exercises/case studies on problem solving.

6. Entrepreneurship (20 hrs)

6.1 Introduction

- Concept/Meaning and its need
- Qualities of an entrepreneur
- Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level.

6.2 Obtaining financial assistance through various government schemes like Prime Minister Employment Generation Program (PMEGP) Pradhan Mantri Mudra Yojana (PMMY) , Make in India, Start up India, Stand up India , National Urban Livelihood Mission (NULM); Technology Business Incubator (TBI) and Science and Technology Entrepreneur Parks (STEP).

6.3 Market Survey and Opportunity Identification (Business Planning)

- How to start a small scale unit/ industry
- Procedures for registration of small-scale unit /industry

- Assessment of demand and supply in potential areas of growth.
- Understanding business opportunity
- Considerations in product selection

6.4 Project Report Preparation

- Preliminary Project Report
- Techno-Economic Feasibility Report
- Exercises on preparation of Detailed Project Report

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

1. Balasubramanian, S., "Soft Skills for Interpersonal Communication", Orient Black Swan, New Delhi**.**

2. **"**Lifelong learning", Policy Brief (www.oecd.orf).
3. Rathore, BS, and Dr JS Saini, "A Handbook of Entrepreneurship", Aapga Publications, Panchkula (Haryana).
4. Gupta, CB, and P Srinivasan, "Entrepreneurship Development", Sultan Chand and Sons, New Delhi.
5. "Entrepreneurship Development", Tata McGraw Hill Publishing Company Ltd., New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1.	04	06
2.	07	08
3.	06	06
4.	03	04
5.	05	06
6.	20	20
Total	**45**	**50**

4.2 DATA STRUCTURES

L	P
3	4

RATIONALE

Data structures are the techniques of designing the basic algorithms for real-life projects. Understanding of data structures is essential and this facilitates the understanding of the language. The practice and assimilation of data structure techniques is essential for programming. The knowledge of 'C' language and data structures will be reinforced by practical exercises during the course of study. The course will help students to develop the capability of selecting a particular data structure.

LEARNING OUTCOMES

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

- Identify the problem and formulate an algorithm for it.
- Identify the various designing techniques
- Store data, process data in linked list.
- Sort the data in ascending or descending order.
- Apply various data structure techniques in an array.
- Implement trees and various traversing techniques.
- Implement various sorting algorithms and to compare them for checking efficiency.
- Identify proper data handling technique for handling data.

DETAILED CONTENTS

1. Fundamental Notations (6 hrs)

   1.1 Problem solving concept top down and bottom up design, structured programming
   1.2 Concept of data types, variables and constants
   1.3 Concept of pointer variables and constants

2. Arrays (6 hrs)

   2.1 Concept of Arrays, Single and multi dimensional arrays,
   2.2 Representation of arrays - Row major order and column major order
   2.3 Finding location of an element in single and multi dimensional arrays
   2.4 Operations on arrays with Algorithms (searching, traversing, inserting, deleting)

3. Stacks, Queues and Recursion (8 hrs)

- 3.1 Introduction to stacks
- 3.2 Representation of stacks
- 3.3 Implementation of stacks
- 3.4 Applications of stacks
- 3.5 Introduction to queues
- 3.6 Implementation of queues
- 3.7 Circular Queues
- 3.8 De-queues
- 3.9 Recursion

4. Linked Lists (9 hrs)

- a. Introduction to linked list
- b. Representation of linked lists in Memory
- c. Operations on linked list
- d. Application of linked lists
- e. Doubly linked lists
- f. Operations on doubly linked lists

5. Trees (8 hrs)

- 5.1 Concept of Trees
- 5.2 Representation of Binary tree in memory
- 5.3 Traversing Binary Trees (Pre order, Post order and In order)
- 5.4 Searching, inserting and deleting binary search trees

6. Sorting and Searching (8 hrs)

- 6.1 Introduction to sorting and searching
- 6.2 Search algorithm (Linear and Binary)
- 6.3 Sorting algorithms (Bubble Sort, Insertion Sort, Quick Sort, Selection Sort, Merge Sort.

LIST OF PRACTICALS

Write programmes in C to implement

1. Sorting an array
2. The addition of two matrices using functions
3. The multiplication of two matrices
4. Push and pop operation in stack
5. Inserting and deleting elements in queue
6. Inserting and deleting elements in circular queue
7. Insertion and deletion of elements in linked list
8. Insertion and deletion of elements in doubly linked list
9. The Factorial of a given number using with recursion and without recursion
10. Fibonacci series with recursion and without recursion
11. Program for binary search tree operation

12. The selection sort techniques
13. The bubble sort technique
14. The quick sort technique
15. The merge sort technique
16. The binary search procedures to search an element in a given list
17. The linear search procedures to search an element in a given list

INSTRUCTIONAL STRATEGY

This subject clears all fundamentals of programming techniques. Teachers should stress on explaining all the techniques and algorithm in detail in theory sessions. The students should be asked to convert their ideas about a problem into and algorithms in theory class and them write programs for the algorithms. Finally all the programmes should be run on computers. This will help the students to have clear concepts of programming.

RECOMMENDED BOOKS

1. Lipschutz, "Data structures – Schaum's Outline Series", McGraw Hill Education Pvt Ltd , New Delhi.
2. ISRD Group, "Data Structure using C", Tata McGraw Hills Education Pvt Ltd., New Delhi.
3. Sofat, Sanjiv, "Data Structures", Khanna Publishers, New Delhi.
4. Patel, R.B., "Expert Data Structures with C", Khanna Publishers, New Delhi.
5. Salaria, RS, "Data Structures and Algorithm Using C", Khanna Book Publishing Co. (P) Ltd. New Delhi.
6. Kanetkar, Yashwant, "Data Structure through C", BPB Publications.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	6	6
2	6	6
3	9	10
4	8	10
5	8	10
6	8	8
Total	**45**	**50**

4.3 OBJECT ORIENTED PROGRAMMING USING JAVA

L	P
3	4

RATIONALE

Object oriented programming is a new approach to understand the complexities of the real world. In contrast to the earlier approaches like procedural etc, object orientation helps to formulate the problems in a better way giving high reliability, adaptability and extensibility to the applications. The students are already familiar with this concept of programming in C which is the basic for JAVA. This course offers the modern programming language JAVA that shall help the students to implement the various concept of object orientation practically. The students will be able to programme in the object oriented technology with the usage of JAVA.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Explain the concepts of OOPS
- Explain and execute the language construct concepts.
- Debug and compile the program written in Java.
- Explain and implement class program.
- Explain and execute member functions.
- Describe and implement inheritance concepts.
- Explain and implement Polymorphism using Java program.
- Install Java IDE, Compiler, Java virtual machines
- Explain and implement the packages, abstract class and interface.
- Implement the exception handling in live projects

DETAILED CONTENTS

1. Overview of Java (06 hrs)

   History and evolution, Features of Java, OOPs using Java, Anatomy of Java Programmee, Java Bytecode, Difference between JDK, JRE and JVM, Installing JDK, Compiling Java Program, Applications of Java

2. Language Constructs (12 hrs)

   Data types and type declarations, Literals, variables, type conversion, and casting, operators, control statements, looping and jump statements, input using scanner class, arrays and functions.

3. Classes and Objects (08 hrs)

Creating classes and declaring objects, Object & Object Reference defining methods, Defining access specifiers, accessing class members, Constructors, using this keyword, garbage collection

4. Inheritance (05 hrs)

Definition of inheritance, constructor chaining, order of invocation, types of inheritance, single inheritance, multilevel inheritance, hierarchical inheritance, hybrid inheritance, Using final keyword

5. Polymorphism (04 hrs)

Method & constructor overloading, method overriding, up-casting and down-casting.

6. Packages, Abstract class & Interface (06 hrs)

Defining packages, Access protection, Importing packages, Key points of Abstract class & interface, difference between an abstract class & interface, implementation of multiple inheritance through interface.

7. Exception Handling (04 hrs)

Definition of exception handling, implementation of keywords like try, catch, finally, throw & throws. importance of exception handling in practical implementation of live projects.

LIST OF PRACTICALS

1. Installation of JDK and compiling a simple Java program
2. Programming exercise on control flow statement, operators and looping statements in Java.
3. Program to scan the input using input scanner class
4. Programming exercise on arrays and functions in Java
5. Program to demonstrate the concept of classes and objects using access specifiers
6. Program to demonstrate the use of constructors
7. Programming exercise on different type of inheritance in Java
8. Program to demonstrate the concept of overloading and overriding
9. Program to demonstrate the concept of packages, abstract classes and interfaces
10. Programming exercise on exception handling

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 algorithm and run on computer. It is required that students should maintain records (files with printouts).

RECOMMENDED BOOKS

1. Herbert, Schildt,"The Complete Reference Java", McGraw Hill Publishers
2. Bhutani, Sunil, & Amrendra Shara, "Object Oriented Programming using JAVA", Eagle Publishing House, Jalandhar.
3. Malhotra, Sachin, "Java Programming", Oxford University Press, New Delhi.
4. "Head First Java", O-REILLY, Kathy Sierra & Bert Bates.
5. Wu, C.Thomas, "Object-Oriented programming With Java".

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (Out of 50)
1.	06	02
2.	12	12
3.	08	09
4.	05	12
5.	04	05
6.	06	05
7.	04	05
Total	45	50

4.4 COMPUTER ARCHITECTURE

L	P
3	-

RATIONALE

This subject provides the students with the knowledge of detailed organization of currently available personal computers in order to understand their functioning and maintenance. The students will also get familiar with different types of mother boards, architecture and bus standards.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Illustrate the use of number system and coding system.
- Compare and contrast different RISC and CISC architectures.
- Understand the use of registers in computer organization.
- Apply various arithmetic operations.
- Identify different I/O interfaces.
- Distinguish different types of interrupts and DMA.
- Understand the purpose of memory hierarchy.
- Compare and contrast the use of different memory organizations.

DETAILED CONTENTS

1. Data Representation (6 hrs)

   Data Types-Number System, 1's Complement, 2's Complement, BCD Code, Gray Code

2. Central Processing Unit (7 hrs)

   Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Introduction to RISC, CISC architecture, Pipeline processing, Parallel processing

3. Arithmetic Operations (8 hrs)

   Introduction, Addition, Subtraction, Multiplication and Division algorithm

4. Input-Output Organisation (12 hrs)

   Input-output interface, I/O bus and interface for module, I/ O vs memory bus. Isolated vs memory mapped, IP modes of data transfer, first in first out buffer, priority interrupt, daisy chaining priority, parallel priority interrupt priority encoder, interrupt cycle, direct memory access DMA controller, DMA transfer

5. Memory Organisation (12 hrs)

Memory hierarchy; main memory, memory address, map, RAM and ROM chips, memory connection to CPU, auxiliary memory, associative memory, read and write operation, cache memory, associative mapping, virtual memory, memory management hardware, memory segmentation.

INSTRUCTIONAL STRATEGY

As this paper is fully theoretical so it should be taught in a way to make it interesting by showing charts to the students to enable them to understand the subject theoretically. Block diagram of computer, algorithms to various arithmetic operations, CDs for demonstration should be used to make the students understand the subject. After completing the subject, students must know how the computer works, about various types of controllers and memory organization.

RECOMMENDED BOOKS

1. Rafiquzzaman, "Computer Architecture", M; Prentice Hall of India, New Delhi.
2. Bose, SK, "Hardware and Software of Personal Computers", Willey Eastern Ltd., New Delhi.
3. Tanenbaum, Andrew S, "Structured Computer Organisation", Prentice Hall of India, New Delhi.
4. Mano, Morris, "Computer system Architecture", Pearson Education India

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	6	06
2	7	08
3	8	08
4	12	14
5	12	14
Total	**45**	**50**

4.5 COMPUTER NETWORK AND SECURITY

L	P
3	2

RATIONALE

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

LEARNING OUTCOMES

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

- Setup Networking Labs
- Setup Basic Wireless Labs
- Diagnose & Solve Network Problems
- Diagnose & Solve Network Problems remotely
- Provide security to networks
- Manage & handle WAN
- Prevent external Network Attacks

DETAILED CONTENTS

1. Networks Basics (05 hrs)

    - Concept of network
    - Types of network - LAN, MAN and WAN
    - Network Services
    - Topologies
    - Switching Techniques

2. Networking Models (10 hrs)

    - Introduction to IEEE Standards
    - OSI Reference Model
    - TCP/IP Model

3. IP Addressing (08 hrs)

- Concept of physical and logical addressing
- Different classes of IP addressing, special IP address
- Sub netting and super netting
- Loop back concept
- IPV4 and IPV6 packet Format
- Configuring IPV4 and IPV6

4. Network Connectivity (05 hrs)

- Network connectivity Devices
- NICs
- Hubs, Switches, Routers
- Configuration of Routers & Switches

5 Network Administration (08 hrs)

- Network Security Principles, Cryptography, using secure protocols
- DHCP Server
- Workgroup/Domain Networking

6 Network Security (07 hrs)

- Using ssh, sftp & https
- Virus, Worms and Trojans Definitions, preventive measures , deploying virus protection.
- Computer Network Attacks: Active Attacks, Passive Attacks, Stealing Passwords, Social Engineering, Bugs and Backdoors, Denial-of-Service Attacks, Botnets, Phishing Attacks
- Firewalls Definition and types of firewalls, Configuring & deployment of Firewall
- Spoofing vs Hijacking , Remote password guessing, eavesdropping, methods of password cracking,

7 Wireless Networks (02 hrs)

- Wireless Basics
- Wireless Security

LIST OF PRACTICALS

1. Recognize the physical topology and cabling (coaxial, OFC, UTP, STP) of a network.
2. Recognition and use of various types of connectors RJ-45, RJ-11,BNC and SCST
3. Making of cross cable and straight cable
4. Install and configure a network interface card in a workstation.
5. Identify the IP address of a workstation and the class of the address and configure the IP Address on a workstation
6. Study and Demonstration of sub netting of IP address
7. Use of Netstat and its options.
8. Connectivity troubleshooting using PING, IPCONFIG, IFCONFIG
9. Installation of Network Operating System(NOS)
10. Simulating a network set up.

INSTRUCTIONAL STRATEGY

Since the facilities are not available in the polytechnic, students need exposure to various security systems and software available in some organisations, universities and engineering colleges. For this, visits may be organized for students. The teachers should also be exposed in this area. Some practicals can be conducted in the laboratory.

RECOMMENDED BOOKS

1. Tanenbaum, “Computer Networks”, Prentice Hall of India, New Delhi.
2. Forouzan, “Data Communications and Networking”, Edition 2nd and 4th, Tata McGraw Hill Education Pvt Ltd., New Delhi.
3. Stallings, William, “Data and Computer Communication”, Pearson Education, New Delhi.
4. Jain, V.K., and Narija Bajaj, “Computer Network and Communications”, Cyber Tech Publications, New Delhi.
5. Katre, J.S., “Computer Network”, Tech-Max Publication, Pune.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (Out of 50)
1.	05	05
2.	10	10
3.	08	09
4.	05	06
5.	08	10
6.	07	08
7.	02	02
Total	**45**	**50**

4.6 MINOR PROJECT

L	P
-	4

Minor project work aims at exposing the students to the various industries dealing with computers. It is expected from them to get acquainted with computer environment possess desired attitudes. 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 be stored 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

The teachers may guide /help students to identify their minor project work and chalk 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.

Evaluation of Students for Minor Project :

The criteria for evaluation of minor project work is as follows :

Criteria	Weightage
Punctuality and Regularity	10 %
Planning and Execution	30%
Initiative in learning new things	10%
Report Writing	20%
Presentation and Viva	30%

Note :
A viva voce examination will be conducted at the end of minor project for assessing the work of student. The examination Committee for this purpose will consist of a professional and the teacher who has guided the project.

ENTREPRENEURIAL AWARENESS CAMP

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

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

INDUSTRIAL TRAINING OF STUDENTS

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

This document includes guided and supervised industrial training of a minimum of 6 weeks duration to be organised during the semester break starting after second year i.e. after 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. A minimum of one visit per week by the teacher is recommended. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An internal assessment of 50 and external assessment of 50 marks have been provided in the study and evaluation scheme of 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) Relationship with workers 15%
d) Industrial training report 55%

5.1 MULTIMEDIA APPLICATIONS

L	P
2	4

RATIONALE

This subject aims to develop a clear understanding of multimedia and its usage for enhancing teaching instruction methodologies, business and personal communications. It will help the students in understanding technical aspects of multimedia content creation, the processes and tools used for designing multimedia systems, the image processing tools. This will make the students understand the designing and developing aspects of a multimedia application comprising various essential elements of multimedia.

LEARNING OUTCOMES

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

- Describe multimedia, characteristics, challenges and applications of multimedia system.
- Identify hardware and software system and various stages in Multimedia Project Creation.
- Analyze various compression standards.
- Design and edit raster graphics through Adobe Photoshop.
- Understand the basic animation principles.
- Determine the various trends in Multimedia based projects.

DETAILED CONTENTS

1. Introduction to Multimedia System (03 hrs)

   Definition of Multimedia, Characteristics of a Multimedia System, Components of Multimedia System, Different Multimedia Capturing Devices, Applications of multimedia System, Challenges of a Multimedia System

2. Text and Images (03 hrs)

   Text: Fonts and Faces, Using Text in Multimedia, Hypermedia and Hypertext

   Image: Defining Pixel, Resolution, Vector vs Bitmap Graphics, Overview of Graphic Image File Formats like GIF, JPG, PNG, BMP, SVG, EPS, and Basic Introduction to different Raster and Vector Image Editing Software.

3. Using Adobe Photoshop (8 hrs)

Introduction, Features of Adobe Photoshop, Various File Formats, Basic operations in Photoshop, Tools and Panels in Photoshop, Introduction to Various Color Models and Color Modes

Making Color Adjustments in Photoshop, Using Layers and Masks, Various Blending Modes and Filters

4. Audio and Video (3 hrs)

Audio: Introduction to Digital Audio, MIDI vs Digital Audio, Overview of Different Audio File Formats like WAV, AIFF, AU, M4A, FLAC, MP3, AAC and Basic Introduction to different Audio Editing Software

Video: Defining Video, Analog vs. Digital Video, Various Display Devices, Overview of different Video File Formats like MP4, MOV, MKV, AVI, FLV, WMV, WEBM, MPEG-4 Part 10, Basic Introduction to different Video Editing Software

5. Data Compression (3 hrs)

Introduction to Data Compression, Need of Data Compression, Different types- Lossy and Lossless Compression, An Overview of Various Image, Audio and Video Compression Standards- JPEG, AAC, MPEG-1 Audio Layer 3, FLAC, MPEG-1, MPEG-2, MPEG-4, H.264

6. Animation (3 hrs)

Defining Animation, Principles of Animation, Different Animation Techniques- Cel Animation, Computer Animation (2D and 3D Animation)

7. Making Multimedia Project (3 hrs)

Stages of Multimedia Project Creation: Planning and Costing, Designing, Producing, Testing and Delivering,

Authoring Tools: Introduction to Multimedia Authoring Tools, Types of Authoring Tools, Selection of an Authoring Tool, Benefits of using Authoring Tool

8. Trends in Multimedia Based Systems (4 hrs)

Introduction to Interactive Video and its types, Applications of Interactive Video, Introduction to VR and its types, Applications of VR, Introduction to Metaverse-Future of VR.

LIST OF PRACTICALS

1. Installing and using various Multimedia Capturing and Display Devices
2. Compressing the image, audio and video files in different formats and comparing their sizes
3. Installing and exploring the basic features of Adobe Photoshop
4. Using the selection tool in Adobe Photoshop
5. Exploring the various color models and color modes in Adobe Photoshop
6. Perform Color Adjustments using Color Balance, Hue/ Saturation Dialog, Levels and Curves in Adobe Photoshop
7. Using Mask to perform selection and to refine the mask in Adobe Photoshop
8. Create different layers and manage them using layer effects and styles in Adobe Photoshop
9. Apply different blending modes and filters in Adobe Photoshop
10. Install and design basic animation using tools like Synfig

INSTRUCTIONAL STRATEGY

As the subject is practice oriented, more stress should be given to students to do the work practically. The features of Multimedia System, Data compression, Elements of Multimedia and software packages like Photoshop, Synfig are to be demonstrated in class using LCD projector.

RECOMMENDED BOOKS

1. Multimedia in Practice Technology and Applications by Judith Jeffcoate, Pearson Education
2. Multimedia Making it work by Tay Vaughan, McGraw Hill,

3. Multimedia: Computing Communications & Applications by Steinmetz, Pearson Education
4. Adobe Photoshop CS5 Classroom in a Book by Adobe Systems
5. Multimedia Systems – Algorithms, Standards, and Industry Practices by Parag Havaldar and Gerard Medioni, Course Technology

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	03	05
2	03	06
3	08	12
4	03	05
5	03	06
6	03	05
7	03	05
8	04	06
Total	**30**	**50**

5.2 WEB DEVELOPMENT USING PHP

L	P
2	4

RATIONALE

This course will enable the students to understand the basics of HTML, CSS based framework and design the basic web templates using these frameworks. Students will also be able to setup the development environment for running PHP Scripts. Students will be able to understand the basics of PHP and MySQL and implement the same to develop dynamic web pages. Students will also be able to make use of Advanced PHP concept to refine the development process.

LEARNING OUTCOMES

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

- Use Bootstrap to design web pages.
- Setup the development environment.
- Implement the basic concepts of PHP.
- Apply CRUD operations using MySQL and PHP.
- Develop Dynamic Web applications.

DETAILED CONTENTS

1. HTML and CSS Based Framework (04 hrs)

   Introduction to Bootstrap, Using Bootstrap in Web Projects, Understanding Grid Layout and Breakpoints, using fonts and icons through Google fonts, fontawesome libraries, Overview of Bootstrap Components

2. Setting up Development Environment (02 hrs)

   Introduction to WAMP Server, Installing Development Server on Windows, Installing IDEs like Visual Studio Code/ Atom/ Sublime

3. Introduction to PHP (05 hrs)

Static vs Dynamic Web Content, PHP as Server-Side Scripting Language, Features of PHP, Applications of PHP, Basic Structure of PHP Program and Executing through WAMP Server, Using Comments, Literals, Variables: Rules for PHP Variables, Data types in PHP, Implicit and Explicit Casting, Variable Scope, echo and print statements,

4. Expressions, Control Flow and PHP Functions (05 hrs)

Introduction to Expressions, Operators and its types: Arithmetic, Logical, Relational, Conditional, Assignment, Increment/ Decrement, Operator Precedence and Associativity, Conditional Statements: if, if-else, if-elseif-else, switch, Looping Statements: for, while, do while, Jumping Statements: break, continue and goto, Basic Syntax of Functions in PHP, User Defined vs Default Functions, User Defined Function: Defining Function, Returning Values from Function

5. PHP Strings and Arrays (05 hrs)

Strings: Introduction, Using Single and Double quote strings in PHP, PHP String functions: strlen(), str_word_count(), strrev(), strpos(), str_replace(), trim(), md5(), strtolower(), strtoupper()

Arrays: Introduction, Numerically Indexed and Associative Arrays, Assignment Using array keyword, foreach loop for iteration, Multidimensional Array, Using Array Functions: is_array(), count(), sort(), shuffle(), explode(), compact()

6. Form Handling and Accessing MySQL using PHP (05 hrs)

GET vs POST method for accepting data, Retrieving Submitted Form Data, Sanitizing Inputs, Connecting MySQL through PHP using MySQLi, Performing CRUD (Create, Retrieve, Update and Delete) operations using PHP and MySQLi

7. Cookies, Sessions and Authentication (04 hrs)

Using Cookies in PHP: Setting, Accessing and Destroying a Cookie

Sessions in PHP: Introduction, starting a Session, setting session variable, Timeout in Sessions, Destroying Session, Creating Login Authentication Module

LIST OF PRACTICALS

1. Design a HTML, CSS based Web Portfolio using Bootstrap.
2. Installing and setting up Development Server.
3. Create Basic PHP Script to implement various data types.
4. Create PHP Script to use various operators and conditional statements.
5. Create PHP Script to use different looping statements and compare the output.
6. Use various array and string-based functions.
7. Create an HTML form and retrieving the data on server side.
8. Perform CRUD operations and make Web Portfolio Dynamic using PHP and MySQLi.
9. Create and Use Cookies in Web Portfolio.
10. Apply Session based authentication to Web Portfolio.

INSTRUCTIONAL STRATEGY

Teachers should lay emphasis on developing practical skills among the students. Experts may be invited from industries to discuss actual projects and experiences.

RECOMMENDED BOOKS

1. Introduction Bootstrap 4 by Jorg Krause; Apress eBook, New York
2. Learning PHP, MySQL & JavaScript by Robin Nixon, O'Reilly
3. Web Enabled Development Application by Ivan Bayross : Commercial; TMH
4. HTML, CSS, JavaScript,Perl, Python and PHP by Schafer Textbooks; Wiley India
5. Head First PHP & MySQL by Lynn Beighley & Michael Morrison; O'Reilly

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1.	04	06
2.	02	03
3.	05	09
4.	05	09
5	05	09
6	05	08
7	04	06
Total	**30**	**50**

5.3 COMPUTER PROGRAMMING USING PYTHON

L	P
2	4

RATIONALE

The objective of this course is to impart the knowledge of python programming methodologies and their significance. Upon completion of this subject, the student will be able to write non trivial Python programs dealing with a wide variety of subject matter domains.

LEARNING OUTCOMES

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

- Execute Python code in a variety of environments.
- Use correct Python syntax and control flow construct.
- Use various standard Python modules such as os, sys, math, and time
- Trap various errors via the Python Exception Handling model
- Use the IO model in Python to read and write disk files
- Create their own classes and use existing Python classes.
- Use the Python Regular Expression capabilities for data verification

DETAILED CONTENTS

1. Introduction (03 hrs)

    - History of Python
    - Python Versions
    - Installing Python
    - Environment Variables
    - Executing Python from the Command Line
    - Integrated Development and Learning Environment (IDLE)
    - Editing Python Files
    - Python Documentation
    - Dynamic Types
    - Python Reserved Words
    - Naming Conventions

2. Basic Python Syntax (02 hrs)

    - Basic Syntax
    - Comments
    - String Values
    - String Methods

- Python variables
- Python operators
- Understanding python blocks

3. Python program flow control (04 hrs)

- Conditional blocks using if, else and elseif
- Simple for loop in python
- Use of while loop
- Loop manipulation using Pass, Continue and Break

4. Collections (03 hrs)

- Introduction
- Lists
- Tuples
- Sets
- Dictionaries
- Sorting Dictionaries
- Copying Collections
- Implementing loop using range, string, list and dictionaries

5. Functions (03 hrs)

- Introduction
- Defining Your Own Functions, Parameters
- Function Documentation
- Keyword and Optional Parameters
- Passing Collections to a Function
- Variable Number of Arguments
- Functions - "First Class Citizens"
- Passing Functions to a Function
- map
- filter
- Mapping Functions in a Dictionary
- Lambda
- Inner Functions
- Closures

6. Modules (02 hrs)

- Modules
- Standard Modules – sys, math, time
- The dir Function

7. Exceptions in Python (02 hrs)

- Errors
- Runtime Errors
- The Exception Model
- Exception Hierarchy
- Handling Multiple Exceptions
- Raise and assert

8. Data Streams in Python (04 hrs)

- Introduction to Data Streams
- Creating Your Own Data Streams
- Access Modes
- Read and write operations in a File
- Additional File Methods
- Using Pipes as Data Streams
- Handling IO Exceptions

9. Classes in Python (04 hrs)

- Introduction
- Principles of Object Oriented Programming
- Creating Classes
- Instance Methods
- Special Methods
- Class Variables
- Inheritance
- Polymorphism

10. Regular Expressions (03 hrs)

- Introduction
- Simple Character Matches
- Special Characters
- Character Classes
- Quantifiers
- The Dot Character
- Greedy Matches
- Grouping
- Matching at Beginning or End
- Match Objects
- Substituting

- Splitting a String
- Compiling Regular Expressions
- Flags

LIST OF PRACTICALS

1. Getting started with Python and IDLE in interactive and batch modes

2. Use of the string methods: - lower, count and replace

3. Write instructions to perform each of the steps below
   (a) Create a string containing at least five words and store it in a variable.
   (b) Print out the string.
   (c) Convert the string to a list of words using the string split method.
   (d) Sort the list into reverse alphabetical order using some of the list methods (you might need to use dir(list) or help(list) to find appropriate methods).
   (e) Print out the sorted, reversed list of words.

4. Write a program that determines whether the number is prime or not.

5. Find all numbers which are multiple of any number a, but not the multiple of number b, between any given range.

6. Swap two integer numbers using a temporary variable. Repeat the exercise using the code format: a, b = b, a. Verify your results in both the cases.

7. Find the largest of n numbers, using a user defined function largest().

8. Write a function myReverse() which receives a string as an input and returns the reverse of the string.

9. Check if a given string is palindrome or not.

INSTRUCTIONAL STRATEGY

Teachers should lay emphasis on practicals and experts from industries may be invited to deliver lectures and share experiences with the students.

RECOMMENDED BOOKS

1. Learning Python by Mark Lutz; Pratham Books, Bangalore
2. Foundations of Python Network Programming by John Goerzen and Brandeu Rhodes; Apress-eBook distributed by Springer Science and Business Media, New York
3. Dive Into Python by Mark Pilgrim; Pratham Books, Bangalore
4. Think Python by Allen B. Downey; O'Reily Media
5. Python Programming For Beginners: A Must Read Introduction to Python Programming by Robert Richards; Pratham Books, Bangalore

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1.	03	05
2.	02	03
3.	04	07
4.	03	06
5.	03	06
6.	02	03
7.	02	03
8.	04	06
9.	04	06
10.	03	05
Total	**30**	**50**

5.4 CLOUD COMPUTING

L	P
3	4

RATIONALE

This course offers a good understanding of cloud computing concepts and challenges faced in implementation of cloud computing.

LEARNING OUTCOMES

After undergoing the subject, a student would be able to:

- Understand the core concepts of cloud computing paradigm.
- Understand various Service Models and Deployment Models.
- Apply the concept of virtualization.
- Describe the scheduling of tasks in cloud.
- Illustrate the fundamental concepts of cloud storage.
- Describe various security issues in the cloud.
- Use cloud computing

DETAILED CONTENTS

1. Introduction (06 hrs)

   - Evolution of Cloud Computing
   - Defining Cloud Computing
   - Characteristics
   - Benefits
   - Challenges
   - Applications of cloud computing

2. Cloud Computing Models (08 hrs)

   - Cloud Computing Service Models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS);

   - Cloud Computing Deployment Models: Private Cloud; Public Cloud, Community Cloud, Hybrid Cloud, Major Cloud Service providers.

3. Service Level Agreement (SLA) Management (06 hrs)

   - Overview of SLA
   - Types of SLA
   - SLA Life Cycle
   - SLA Management Process.

4. Virtualization (06 hrs)

- Overview of Virtualization
- Types of Virtualizations
- Benefits of Virtualization
- Hypervisors

5. Cloud Security (06 hrs)

- Importance of cloud security
- Infrastructure Security
- Data Security & Privacy Issues
- Legal Issues in Cloud Computing

6. Cloud Storage (07 hrs)

- Definition
- Storage as a Service
- Benefits and Challenges
- Storage Area Networks (SANs)

7. Scheduling in Cloud (06 hrs)

- Overview of Scheduling problem
- Different types of scheduling
- Scheduling for independent and dependent tasks
- Static vs. Dynamic scheduling.

LIST OF PRACTICALS

1. Using Google drive to make spreadsheets and notes.
2. Working with different Cloud vendors: Amazon, Microsoft Azure, IBM
3. Installation and configuration of JustCloud /OwnCloud
4. Working in Cloud9 to demonstrate different languages
5. Implementing virtualization using VMware Hypervisor
6. Simulating cloud using CloudSim

RECOMMENDED BOOKS

1. Rajkumar Buyya, James Broberg, Andrzej Goscinski (Editors): Cloud Computing: Principles and Paradigms, Wiley, 2011

2. Kumar Saurabh, Cloud Computing, Wiley, 2012.

3. Barrie Sosinsky: Cloud Computing Bible, Wiley, 2011.

4. Judith Hurwitz, Robin Bloor, Marcia Kaufman, Fern Halper: Cloud Computing for Dummies, Wiley, 2010.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted (hrs)**	**Marks Allotted (Out of 50)**
1.	6	7
2.	8	9
3.	6	7
4.	6	7
5.	6	6
6.	7	8
7.	6	6
Total	**45**	**50**

5.5 INDUSTRY 4.0 (PART I)

L	P
2	-

RATIONALE

This subject will play an important role in understanding the basic concepts related to industry 4.0. It will help the students to acquire elementary knowledge about various fields of Industry 4.0 like Internet of Things, Artificial Intelligence, Big Data Analytics, Cyber Physical System, Block Chain, Augmented and Virtual Reality. It will further give exposure to the students about introduction of 5G Communication.

LEARNING OUTCOMES

At the end of the course, the student will be able to :

- Explain the elements of Industry 4.0
- Describe the benefits of adopting Industry 4.0
- Understand the components of 5 G network.
- Apply the concept of 5 G networks to industry.

Detailed Contents

1. Introduction, History, Evolution of Industry 4.0 (2 hrs)
2. Technologies in Next Generation Industry 4.0 Environment (4 hrs)
3. Elements of Industry 4.0 (9 hrs)
   Internet of Things (IoT) : Introduction and concept
   Artificial Intelligence (AI) : Introduction and Branches of AI
   Big data analytics : Introduction to data science and big data
   Cyber-Physical systems (CPS) : CPS in real world
   Augmented and Virtual Reality : Concept, difference between AR and VR
   Blockchain : Concept
4. Benefits of adopting Industry 4.0 (3 hrs)
   Interoperability, Transparency and consistency, Programmability, Decentralization, Token omics
5. 5G in Industry 4.0 (6 hrs)
   5G Industry Progress,

5G Network Challenges: Frequency Bands and spectrum, Huge Data Volume, Complexity of MIMO, Beamforming, Ultra Low Latency Service, Ultra Reliability, Security, Upgradation of user end devices, 5G network deployment, 5G Network Transformation:-Higher speed and greater bandwidth, Scalable and Agile network elements, Flexible networks

6. 5G Industry Applications (6 hrs)

5G Service Transformation: Introduction and uses of Enhanced Mobile Broadband, Fixed Wireless Access, Massive Internet of Things (IoT), Broadband Internet of Things (IoT), Critical Internet of Things (IoT),

Industry Application- Live broadcast, Smart Power Grid, Smart City,

Security:-Introduction, DoS (Denial os Service) and DDoS (Distributed Denial of Service), Security Recommendations by ITU-T, Security Threats and Recommendations by NGMN

Business : Remote expertise, Automation with robots and cobots, Defect monitoring with machine vision, Predictive maintenance, Automated guided vehicles (AGVs) and automated mobile robots (AMRs) for manufacturing.

INSTRUCTIONAL STRATEGY

The teacher should lay emphasis on conceptual understanding of elements of Industry 4.0 and 5 G network. Experts may by invited to deliver lectures and share experiences.

REFERENCE BOOKS

1. R. Vannithamby and S. Talwar, “Towards 5G: Applications, Requirements and Candidate Technologies”, John Willey & Sons, West Sussex.
2. Manish, M., Devendra, G., Pattanayak, P., “5G and Beyond Wireless Systems : PHY Layer Perspective”, Springer Series in Wireless Technology
3. Kuno Pfister,”Getting Started with IoT”, O Reilly Media.
4. Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, Pearson Education.
5. Ethem Appaydin,”Introduction to Machine Learning”, PHI Learning.
6. F. Provost and T. Fawcett, “Data Science for Business”, O'Reilly Media.
7. Kumar Sourav and Ashutosh Saxena, “Block Chain Technology”, Wiley Publishers.

8. Schmalstieg and Hollerer, “Augmented Reality: Principles & Practice”, Pearson Education India, ISBN-10: 9332578494
9. Steven M. LaValle, “Virtual Reality”, Cambridge University Press.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	2	04
2	4	06
3	9	15
4	3	05
5	6	10
6	6	10
Total	**30**	**50**

PROGRAM ELECTIVE-I
5.6.1 MOBILE TECHNOLOGIES

L	P
3	-

RATIONALE

Mobile Technologies includes basic introduction of various wireless, cellular or mobile communication technologies. Different concepts related to communication of mobile devices and their hardware and software configuration will be explained.

Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

LEARNING OUTCOMES

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

- Understand core concepts and various issues of mobile communication technologies.
- Compare and contrast the different features of GSM and 3G, 4G, 5G technologies.
- Analyse and use of Transport layer in Mobile IP technology.
- Classify various wireless technologies.
- Describe the use of various Mobile OS and their features.

DETAILED CONTENTS

1. Mobility: (06 hrs)

   Introduction of mobile/cellular communication technology, Issues, challenges, and benefits of mobile communication, Various Components of mobile communication, Distributed/network operating systems

2. Global System for Mobile Communication (GSM) System Overview: (08 hrs)

   GSM Architecture, Mobility Management, Network Signaling, GPRS, CDMA, EDGE, Introduction to 3G, 4G, 5G Technologies

3. Mobile IP Networks (12 hrs)

   Physical mobility, challenges, limits and connectivity, mobile IP or cellular IP in mobile computing, Mobile TCP

4. Wireless Technologies: (09 hrs)

   Wifi standards, Bluetooth technologies and standards, Near Field Communication, Wi Max Standards, Mobile AdHoc Networks, Vehicular Area Networks.

5. Mobile OS: (06 hrs)

   Introduction to various mobile operating systems (Android, Windows 10, iOS)

6. Application Development: (04 hrs)

   WWW programming model, Development Environment for Mobile Devices

INSTRUCTIONAL STATREGY

Teacher may use various teaching aids like slides, animations, flow charts, block diagrams etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics of different communication technologies to develop proper understanding latest development in this area.

RECOMMENDED BOOKS

1. Mobile Communication by Jochen Schiller; Pearson Education.
2. Principles of Mobile Computing by U. Hansman and L. Merck; Springer.
3. Computer Networks by A. S. Tanenbaum; Pearson Education
4. Mobile Computing by Raj Kamal; Oxford University Press

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (Out of 50)
1.	6	06
2.	8	08
3.	12	14
4.	09	10
5.	06	08
6.	04	04
Total	**45**	**50**

ELECTIVE

5.6.2 BIG DATA

L	P
3	-

RATIONALE

The importance of Big Data in various domain disciplines has increased tremendously in recent years. The subject provides an overview of the historical and modern context and operation of Big Data for beginners. The objective of the curriculum is that the students can begin to study/practice Big Data tools and techniques.

Note: Teachers should demonstrate and expose the students to various practical applications of Big Data through tutorials and exercises.

LEARNING OUTCOMES

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

- Understand the challenges of Big Data
- Install and run Big Data analytic tools.
- Use tools such as MapReduce/Hadoop to analyze big data.
- Analyze data using different statistical techniques.
- Explain the utility of popular Big Data tools like Hadoop, Hive, Pig, Map Reduce.
- Deploy a structured life cycle approach to data science and big data analytics projects

DETAILED CONTENTS

1. Introduction to Data Science and Big Data (12 hrs)

   Data science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modeling and validation – big data, Evolution of big data, Future of big data, Challenges in big data, Batch computing models for Big Data computing. Introduction to NoSQL.

2. Hadoop (6 hrs)
   Components of Hadoop, Installation, Hadoop Commands, Analysing data with Hadoop.

3. HDFS (Hadoop Distributed File System) (10 hrs)

The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

4. Map Reduce (7 hrs)

Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

5 Hadoop Eco System (10 hrs)

Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases.
Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.
Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS.

Suggested list of exercises to be done by students to understand and use big data applications:

1. Installation of Hadoop, pig and Hive on GNUlinux/Debian/ubuntu
2. Practice of various Hadoop commands
3. Getting started with Pig.
4. Using Hive.
5. Installation of MapReduce

INSTRUCTIONAL STRATEGY

The teachers should lay emphasis on demonstration and application of big data along with the theoretical inputs in the class. Experts may by invited to deliver lectures and share experiences.

RECOMMENDED BOOKS

1. Boris lublinsky, Kevin T. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071, 2015.
2. Chris Eaton, Dirk deroos et al. , “Understanding Big data ”, McGraw Hill, 2012.
3. Tom White, “HADOOP: The definitive Guide” , O Reilly 2012.
4. Big Data:Principles and Best Practices of Scalable Real Time Data Systems (Englisch),von Nathan Marz (Autor), James Warren (Autor)

SUGGESTED DISTRIBUTION OF MARKS

Topic	**Time Allotted (Hrs)**	**Marks Allotted (Out of 50)**
1	12	14
2	06	06
3	10	12
4	7	08
5	10	10
Total	**45**	**50**

5.6.3 INTERNET OF THINGS (IoT)

L	P
3	-

RATIONALE

This course will enable the students to familiarize with the basics of Internet of Things, some of the application areas where IoT can be applied, understand the middleware for IoT, concepts of web of Things and IoT protocols.

LEARNING OUTCOMES

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

- Understand the concepts of Internet of things (IoT).
- Assess the vision of IoT.
- Classify Real World IoT applications in various Domains.
- Understand design methodology for IoT platforms.

DETAILED CONTENTS

1. Introduction to Internet of things (16 hrs)

1.1. Definition and characteristics of IoT

1.2. Physical Design of IoT - Things in IoT, IoT Protocols

1.3. Logical Design of IoT - Functional Blocks and Communication Models

1.4 IoT architecture model

1.5 IoT Basic building Blocks – Sensors, Actuators and Gateways

1.6. IoT Enabling Technologies - Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems

1.7. IoT Levels

2. Applications of IoT (10 hrs)

2.1. Home Automation

2.2. Smart Cities

2.3. Smart Agriculture

2.4 Industrial IoT

2.5 Transportation and logistics

2.6 Health care

3. IoT and M2M (03 hrs)

3.1. Introduction, Working and Applications of M2M

3.2. IoT vs M2M

4. IoT Platform (10 hrs)

4.1. Major IoT boards – Arduino and Raspberry pi

4.2 Arduino block diagram

4.3. Basics of Arduino Programming

5. Privacy, Security and Governance (06 hrs)

5.1. Introduction

5.2. Challenges faced in IoT

5.3. Privacy and Security Issues in IoT

5.4. Common Attacks on IoT Systems

5.5. Best Practices for ensuring security of IoT Systems - Smart Devices, IoT Network, Data

RECOMMENDED BOOKS

1. Arshdeep Bahga and Vijay Madisetti," Internet of Things – A Hands on Approach", Universities Press

2. Adrian McEwen & Hakim Cassimality," Designing the Internet of Things", Wiley India

Websites:

3. http://www.cisco.com/c/dam/en_us/solutions/trends/iot/introduction_to_IoT_november.pdf

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	16	16
2	10	12
3	03	04
4	10	12
5	06	06
Total	**45**	**50**

PERSONALITY DEVELOPMENT CAMP

This is to be organized at a stretch for two to three days.. Extension lectures by experts or teachers from the polytechnic will be delivered on the following broad topics. There will be no examination for this camp.

1. Communication Skills

2. Correspondence and job finding/applying/thanks and follow-up

3. Resume Writing

4. Interview Techniques: In-Person interviews; telephonic interviews, panel interviews; group interviews and video conferencing etc.

5. Presentation Techniques

6. Group Discussion Techniques

7. Aspects of Personality Development

8. Motivation

9. Leadership

10. Stress Management

11. Time Management

12. Interpersonal Relationship

13. Health and Hygiene

6.1 OPEN SOURCE TECHNOLOGIES

L	P
2	4

RATIONALE

The objective of this course is to provide exposure in FOSS (Free & Open Source Software), Manage open source projects and development of web applications using open source web technologies.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Understand the difference between open source software and commercial software.
- Install and use open source software.
- Develop web sites using content management systems.
- Use version control systems.
- Install and configure LAMP/WAMP Stack.
- Write shell scripts.

DETAILED CONTENTS

1. Introduction (6 hrs)

   Introduction to Open Source – Open Source vs. Commercial Software, Need of Open Sources – Advantages of Open Sources, Open Source Applications, FOSS usage - Free Software Movement, Commercial aspects of Open Source movement, Open Source Software Development Model.

2. Licensing (4 hrs)

   Widely used open source software licenses, Apache License, BSD license, GNU General Public License, GNU Lesser General Public License, MIT License, Eclipse Public License and Mozilla Public License. Copyrights, copy left and patent.

3. Introduction to GitHub (10 hrs)

   Git and version control, Getting oriented with Git, Making and using a Git repository, Using Git with a GUI, Tracking and updating files in Git, Committing parts of changes, Cloning, Collaborating with remotes, Pushing your changes, Working with GitHub.

4. Open Source Softwares for developing Web Applications (7 hrs)

Introduction of Linux, Apache, Mysql, PHP, Word Press, Drupal and Joomla.

5. Shell Scripting (3 hrs)

Concepts of Shell Scripting, Basic Linux commands (read, echo, test, pwd, cd, ping, chmod etc.), Executing Script, Working with Variables and Input, Using Control Structure.

LIST OF PRACTICALS

1 Setting up an account on github and configure Git.
2 Creating and cloning repository.
3 Creating branches and merging branches in Git.
4 Installation of WAMP/LAMP/XAMP server.
5 Installation of Wordpress and exploring its various features
6 Installation of Drupal
7 Installation of Joomla and exploring its various features
8 Write a simple shell script that takes any number of arguments on the command line, and prints the arguments with “Hello” in front.
9 Write a simple shell script that takes two numbers as parameters and uses a while loop to print all the numbers from the first to the second inclusive, each number separated only by a space from the previous number.

RECOMMENDED BOOKS

1. Feller, Joseph, Brian Fitzgerald, Scott A. Hissam and Karim R. Lakhani, “Perspectives On Free And Open Source Software”, ISBN: 9780262562270, MIT Press.
2. Chacon, Scott , Ben Straub, “Pro Git”, Paperback.
3. Silverman, Richard E., “Git Pocket Guide”, Paperback.
4. Jones, Caimin, "Wordpress Websites Step-by-Step”, Wordpress.
5. Feller, J., and B. Fitzgerald, “Understanding Open Source Software Development”, Addison Wesley.

RECOMMENDED WEBSITES

1 Karl Fogel and Moshe Bar, Open Source Development with CVS, Third Edition,URL: http://cvsbook.red-bean.com

2 www. sourceforge.net

3 freeopensourcesoftware.org/

4 Philosophy of GNU URL: http://www.gnu.org/philosophy/

5 Version control system , URL: http://git-scm.com/

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted Hrs)	Marks Allotted (Out of 50)
1	6	10
2	4	6
3	10	18
4	7	10
5	3	6
Total	**30**	**50**

6.2 ARTIFICIAL INTELLIGENCE

L	P
2	4

RATIONALE

Artificial intelligence is a field that studies how to realise intelligent human behaviour on a machine. The objective of this course is to make the students aware about fundamental concepts of artificial intelligence.

LEARNING OUTCOMES

Upon completion of the course, the student will be able to

- Understand the basic concepts of Artificial Intelligence and Machine Learning.
- Use Probability and Distribution for solving AI Problems.
- Explain the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities
- Know the importance of AI for various Gaming Techniques
- Use various Knowledge representation techniques.
- Explain the concept of Machine learning and Neural Networks.

DETAIL CONTENTS

1. Introduction to Artificial Intelligence (2 hrs)

   Introduction, Artificial Intelligence, Stages of AI, Application of AI.

2. Mathematics Foundation to Artificial Intelligence (6 hrs)

   Introduction to Probability, Importance of Probability to AI, Conditional Probability, Multiplication theorem, Bayes' Theorem

3. Problems and Search Methods in AI: Duration (6 hrs)

   Percept and Rationality, Agents and type of Agents, Environment and types of Environment, problems as a state space search, Problem Characteristics, Production System, Searching problems, solutions, Un-informed Searching strategy, Informed Searching strategy, Breadth First method.

4. Games and AI (6 hrs)

Importance of AI for Games, Game theory, Types of Games, Game Tree Minimax Algorithm, Alpha-Beta Pruning Algorithm

5. Knowledge Representation (4 hrs)

Knowledge representation, types of Knowledge, Knowledge representation issues, Predicate logic.

6. Machine learning (6 hrs)

Strategies of Learning, Learning Model, Classes of Learning (Supervised, Unsupervised, Reinforcement), Neural Network: Biological and Artificial, Mathematical model of a neuron

LIST OF PRACTICALS

1. Write a basic program using PROLOG .
2. Write a program to solve 8 queens problem.
3. Solve any problem using depth first search.
4. Solve any problem using breadth first search.
5. Solve any problem using best first search.
6. Solve 8-puzzle problem using best first search
7. Solve traveling salesman problem.
8. Simulating a neuron using Tensorflow.

RECOMMENDED BOOKS

1. Rich, E., and K. Knight, “Artificial Intelligence”, Tata McGraw Hill Publishers.
2. Winston, Patrick Henny, “Artificial Intelligence”, Pearson Education.
3. Goel, Shivani, “Artificial Intelligence”, Pearson Education.
4. Patterson, “Artificial Intelligence and Expert Systems”, Pearson Education.

SUGGESTED DISTRIBUTION OF MARKS

Topic	**Time Allotted Hrs)**	**Marks Allotted (Out of 50)**
1	2	2
2	6	10
3	6	12
4	6	10
5	4	06
6	6	10
Total	**30**	**50**

6.3 BASICS OF MANAGEMENT

L	P
3	-

RATIONALE

The diploma holders are generally expected to take up middle level managerial positions, their exposure to basic management principles is very essential. Topics like Structure of Organization, Leadership, Motivation, Ethics and Values, Marketing management, Financial management, Customer Relationship Management, TQM and Cyber Security etc. have been included in the subject to provide elementary knowledge about these management areas.

LEARNING OUTCOMES

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

- Explain the principles of management including its functions in an organization.
- Inculcate leadership qualities to motivate self and others.
- Manage human resources.
- Maintain and be a part of healthy work culture in an organization.
- Use marketing skills for the benefit of organization .
- Explain basics of accounting and finance.
- Explain the functions of material management.
- Use modern concepts of management.
- Understand various types of cyber crimes and cyber attacks.

DETAILED CONTENTS

1. Principles of Management (06 hrs)

    1.1. Introduction, importance and general functions of management.
    1.2. Concept and Types of an organization - Sole trading, partnership, companies, corporation, PSU's and cooperative societies.
    1.3. Structure of an organization: Line organization, Staff organization, Functional organization, Line and staff organization.
    1.4. Hierarchical Management Structure - Top, middle and lower level management
    1.5. Departmentalization - Introduction and its advantages.

2. Leadership and Motivation (06 hrs)

    2.1 Leadership - Definition and Need of Leadership, Qualities of a good leader, Manager vs. leader, Theories of leadership - trait theory and Behaviour theory.

2.2 Motivation - Definition and characteristics of motivation, Factors affecting motivation, Maslow's Need Hierarchy Theory of Motivation and X&Y need Hierarchy theory of motivation.

3. Work Culture (06 hrs)

3.1. Introduction and importance of healthy work culture in organization
3.2. Components of culture
3.3. Importance of attitude, values and behaviour
Behavioural Science – Individual and group behavior.
3.4. Professional ethics – Concept and need of professional ethics and human values.

4. Human Resource Management and its Functions (04 hrs)

Manpower Planning, recruitment and selection, Training and development of work force at the shop-floor, Performance appraisal, Wages, salary and incentive schemes

5. Marketing and sales (06 hrs)

5.1 Marketing - Introduction, importance and its functions, Marketing mix for industries and service sector, Basic Marketing strategies
5.2 Sales - Difference between marketing and selling, Advertisement- print media and electronic media, Market Survey and Sales promotion.

6. Basic of Accounting and Finance (06 hrs)

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

6.2 Objectives of Financial Management - Profit Maximization v/s Wealth Maximization

7. Material and Stores Management (04hrs)

Introduction, functions and objectives of material management, Purchasing - definition and procedure, Just in time (JIT)

8. TQM and TPM (02 hrs)

Total Quality Management (TQM) and Total Preventive Maintenance (TPM) - Concepts and importance

9. Customer Relationship Management (01 hrs)

Customer Relationship management - Concept and importance

10. Cyber Security (04 hrs)

Introduction to Cyberspace and Cyber Law, Pros and Cons of social media, Different Components of cyber Laws; Cyber Law and Netizens, Categories of Cyber Crime: Personal, Business, Financial, Office Security, Cyber Crime – Complete transparency, hacking/cracking, denial of service, IP piracy, phrasing, hetaerism etc. Cyber Attack, cyber attackers. Introduction to IPR, copyright & patent

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

1. M. Mahajan, “Industrial Management”, Dhanpat Rai & Co.
2. S. C. Sharma and T. R. Banga,”Industrial Engineering and Management”, Khanna Book Publishing Co. (P) Ltd., New Delhi
3. Narinder Pal Singh,”Basics of Management”, Eagle Prakashan, Jalandhar
4. Goel, SL, “Modern Management Techniques”, Deep and Deep Publications Pvt. Limited , New Delhi.
5. Nina Godbole and Sunit Belapure, “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley India

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1.	06	06
2.	06	06
3.	06	06
4.	04	05
5.	06	06
6.	06	06
7.	04	05
8.	02	02
9.	01	02
10.	04	06
Total	**45**	**50**

6.4 INDUSTRY 4.0 (PART II)

L	P
2	-

RATIONALE

This subject will help the students in understanding advanced concepts related to industry 4.0. This subject will give exposure to the students about Artificial Internet of Things, Machine Learning, Cloud Computing and Industrial internet of Things. It will further help the students to learn about evolution of Industry 5.0.

LEARNING OUTCOMES

At the end of the course, the student will be able to :

- Describe the components of AIoT.
- Explain the concept of machine learning
- Describe the components of block chain.
- Apply 5 G in solving IoT and industrial IoT problems.
- Understand the role and scope of Industry 5.0 for future applications.

DETAIL CONTENTS

1. Technologies in Next Generation Industry 4.0 Environment (4 hrs)
2. Artificial Intelligence of Things (AIoT) (12 hrs)
   Internet of Things (IoT) – architecture, protocols, connecting things and pushing data on Internet.
   Machine Learning – supervised vs unsupervised learning, Training/Test Dataset, selecting Machine Learning algorithm, accuracy, prediction
   Edge/Cloud Computing
3. Blockchain (8 hrs)
   Fundamentals, cryptography and crypto currency, public vs private, consensus, Blockchain explorer, wallets-metamask
4. IoT vs Industrial Iot (IIoT) in 5G perspective (3 hrs)
5. Evolution of Industry 5.0 and its role in various Industrial IoT applications, future scope, limitations (3 hrs)

INSTRUCTIONAL STRATEGY

The teachers should lay emphasis on applications of technologies being used in Industry 4.0 environment. Experts may by invited to deliver lectures and share experiences.

REFERENCE BOOKS

1. Kuno Pfister,"Getting Started with IoT", O Reilly Media.
2. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Pearson Education.
3. Ethem Appaydin,"Introduction to Machine Learning", PHI Learning.
4. F. Provost and T. Fawcett, "Data Science for Business", O'Reilly Media.
5. Kumar Sourav and Ashutosh Saxena, "Block Chain Technology", Wiley Publishers.
6. Schmalstieg and Hollerer, "Augmented Reality: Principles & Practice", Pearson Education India, ISBN-10: 9332578494
7. Steven M. LaValle, "Virtual Reality", Cambridge University Press.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (Out of 50)
1	4	06
2	12	20
3	8	14
4	3	05
5	3	05
Total	**30**	**50**

PROGRAM ELECTIVE - II
6.5.1 DIGITAL MARKETING

L	P
3	-

RATIONALE

Digital Marketing is one of the world's fastest growing domain and this course is designed to help the students to understand the important concepts in Digital Marketing including Search Engine Optimization, social media, Conversion Optimization, Web Analytics, content Marketing, Email and Mobile Marketing.

LEARNING OUTCOMES

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

- Identify the core concepts of digital marketing and role of digital marketing in business.
- Develop marketing strategies influencing the consumer behavior.
- Understand the importance of digital Marketing in business growth.
- Use Analytics Tools for report extraction and campaign measurement.
- Analyze marketing problems and provide solutions based on a critical examination of marketing information.
- Create their own business pages and implement online campaigns for their business and marketing.

DETAILED CONTENTS

1. Principles of Digital Marketing (10 hrs)

Defining Digital Marketing, Comparison of Digital and traditional marketing, Digital Marketing Platforms, objectives of Digital marketing, Activities of Digital marketing, Search Engine Optimization, online Advertising, Content marketing, Email Marketing, Social Media marketing, Mobile Marketing, Pay per Click.

2. Search Engine Optimization (SEO) (10 hrs)

Fundamentals, Keywords and SEO content plan, Essential SEO guidelines for website owner, designer, blogger and content writer, SEO and business objectives, writing SEO content, On site and Off site SEO, Adding website to Google Search Console, Improving website performance and speed, Keyword Research: steps and strategy,

creating content hierarchy, Google suggest, related searches, Google keyword planner, Google Trends: Finding search trends, most search terms, Translation of keywords.

3. Google AdWords (8 hrs)

Setting up Google Adwords Campaigns, Content Structuring, Understanding Quality Score, Finding and Selecting the right Keywords, Keyword Matching Options, Campaign Setup Procedure, Ads and Ad Groups, Organizing Ad Groups, Creating Effective Ads, Optimizing Landing Pages, Bid Management, Negative keywords, Remarketing Campaigns- Configure, setup and Monitor, YouTube Video Ad Campaigns.

4. Google Analytics (8 hrs)

Introduction, Understanding Dashboard- Audience, Advertising, Traffic Source, Content, Conversations, Taking Decisions based on Analytics Reporting, defining business Goals and Objectives, Tracking Social Media Traffic, Tracking SEO traffic, Integrating Google AdWords Campaigns into Google Analytics, Measuring tools and methods.

5. Social Media Marketing (9 hrs)

Introduction, Social media Marketing strategies on various Platforms like Facebook, Instagram, Twitter, YouTube, LinkedIn, Snapchat, Pinterest. Know your Audience, Google Alerts- Monitoring your brands, competitions, and Industry trends. Setting up a Facebook Business page, SEO for Facebook, promoting your page, Facebook/Instagram Advertising using Facebook Ads Manager, Remarketing using Facebook Custom Audiences, Sponsored content, Measuring Success- Fans, Followers, Likes, Comments and Share. Track Performance using Google Analytics.

RECOMMENDED BOOKS

1. Ahuja, Vandana, “Digital Marketing”, Oxford Publication.
2. Bhatia, Puneet, “Fundamentals of Digital Marketing”, Pearsons.

SUGGESTED DISTRIBUTION OF MARKS

Topic	**Time Allotted Hrs)**	**Marks Allotted (Out of 50)**
1	10	12
2	10	12
3	8	08
4	8	08
5	9	10
Total	**45**	**50**

6.5.2 NETWORK SECURITY

L	P
3	-

RATIONALE

This course has been designed by keeping in view the basic computer users and information system managers. The concepts needed to read through the ripe in the market place and understanding risks and how to deal with them. It is hoped that the student will have a wider perspective on security in general and better understanding of how to reduce and manage the security risks.

DETAILED CONTENTS

1. Introduction (10 hrs)

   Need for security, Security Attacks, Principals of network security, introduction to cyber-crime, cyber law-Indian Perspective (IT Act 2000), cyber ethics, Concept of hacking, ethical hacking, attacker, phreaker etc.

2. Cryptography (10 hrs)

   Concept of cryptography, Introduction to encryption and decryption, concept of symmetric and asymmetric key, overview of DES, RSA and PGP. Introduction to Hashing: MD5, SSL, SHA, Digital Signatures. Diffi-Hellman key exchange. User Authentication: password, certificate based and Biometric Authentication.

3. Computer Network Attacks (6 hrs)

   Active Attacks, Passive Attacks, Stealing Passwords, Bugs and Backdoors, Authentication Failures, Protocol Failures, Information Leakage, Denial-of- Service Attacks, Botnets, Phishing Attacks

4. Securing Data over Internet (8 hrs)

   Social Engineering, Firewalls - Definition and types of firewalls, defining access control policies, address translation, firewall logging, firewall deployment Introduction; IDS limitations – teardrop attacks, counter measures; Host based IDS set up, VPN - Basics, setting and Diagram of VPN, configuration of required objects, exchanging keys, modifying security policy

5. Disaster and Recovery (6 hrs)

Disaster categories; network disasters – cabling, topology, single point of failure, save configuration files; server disasters – UPS, RAID, Clustering, Backups, server recovery

6. OS Vulnerabilities (5 hrs)

Study of Linux and Windows OS Vulnerabilities. Importance of Original Software (Due to patches for Loopholes, Security Vulnerabilities).

Note: A visit to organizations may be organized for the demonstration about network security and exposure to available software

INSTRUCTIONAL STRATEGY

Since the facilities are not available in the polytechnic, students need exposure to various security systems and software available in some organisations, universities and engineering colleges. For this, visits may be organized for students. The teachers should also be exposed in this area. Some practicals can be conducted in the laboratory.

RECOMMENDED BOOKS

1. Forouzon, "Cryptography and Network Security", Tata McGraw Hill Education Pvt. Ltd., New Delhi.
2. Kahate, Atul, "Cryptography and Network Security", Tata McGraw Hill Education Pvt. Ltd., New Delhi.
3. Breton, Christ, "Mastering Network Security", BPB Publication, New Delhi.
4. Sood, & Mahajan, "Network Security", Eagle Prakashan, Jalandher.

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted Hrs)	Marks Allotted (Out of 50)
1	10	10
2	10	12
3	6	06
4	8	10
5	6	06
6	5	06
Total	**45**	**50**

6.5.3 MOBILE APPLICATION DEVELOPMENT

L	P
3	-

RATIONALE

Android application development is one of the rising and growing trend in the industry of mobile. This course examines the principles of mobile application design and covers the necessary concepts which are required to understand mobile based applications and develop Android based Applications in particular. After completing this course, students will design and build a variety of real-time Apps using Android.

LEARNING OUTCOMES

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

- Understand the basic mobile platforms and mobile development environments.
- Configure Android environment and development tools.
- Develop rich user interfaces by using layouts and controls.
- Develop Interactivity based Android Applications using Fragment, Intents and Event Processing.
- Develop Database oriented Android Applications using Persistent Data Storage and publish them.
- Analyze and solve the bugs using Android Security and Debugging features.

DETAILED CONTENTS

1. Introduction to Mobile Application Development (06 hrs)

   Mobile ecosystem: Operator, Network, Devices, Platforms, Operating System, Application Frameworks, Need for Mobile Applications, Types of Mobile application, Seven rules for developing mobile strategy, App Design Issues and Considerations

2. Setting Android Development Environment (10 hrs)

   Open Handset Alliance, Introduction to Android, History of Android OS, Features of Android, Android Stack, Android execution environment: Dalvik, Java vs Dalvik, Activity Life Cycle of an Android App, Introduction to Android SDK, Installing JDK and Android SDK Tools, Configuring and Setting Eclipse for Development, Creating Android Virtual Devices, Anatomy of an Android Application, Creating and running Basic Android Application

3. Apps Interactivity in Android (06 hrs)

Introduction to Activities and Activity Life Cycle, Android Fragment: Fragment Class, Fragment Life Cycle, Android Intent Class: Intent types, Intent Filters, Instantiating Intent Object, Android Context Class, Event Processing: Events, Event Listener, Event Handler.

4. Designing User Interface with View (06 hrs)

Understanding Components of Screen, Basic Views, Picker Views, List Views, Image Views, Menus with Views

5. Persistent Data Storage (06 hrs)

Databases on Android: SQLite, Database Schema and its creation, Status Contract Class, Introduction to Content Providers, Creating Content Provider: Defining URI, Inserting, Updating, Deleting and Querying Data, Updating Android Manifest File and Referesh Service

6. Android Security and Debugging (06 hrs)

Requesting permissions, creating custom Permissions, Securing application for publication and execution, Tools for debugging, Eclipse Java Editor: Java errors, Debugger, Logcat, Android Debug Bridge, DDMS: Dalvik Debug monitor service, Trace view .

7. Publishing Android Applications (05 hrs)

Preparing for Publishing: Versioning the Application, Digitally signing the Android Application, Deploying APK Files

INSTRUCTIONAL STATREGY

1 Use different Audio Visual media for concept understanding.
2 Guide student (s) in undertaking micro-projects.
3 Demonstrate students thoroughly before they start doing the practice.
4 Ensure use of latest version of tools.
5 Encourage students to refer various web sites to have detail understanding of Android and related concepts.

6 Encourage students to refer different Android-applications to have deeper understanding of layout and interactivity provided by Android Applications

RECOMMENDED BOOKS

1. Fling, Brian, “Mobile Design and Development”, O’Reilly, U.S.A.
2. Lee, Wei-Meng, “Beginning Android 4 Application Development”, John Wiley & Sons Inc., Indiana.
3. Gargenta, Marko, & Masumi Nakamura, “Learning Android”, O’Reilly, U.S.A.
4. Iversen, Jakob, & Michael Eierman, “Learning Mobile App Development”, Pearson Education, U.S.
5. Wallace Jackson, “Android Apps for Absolute Beginners”, Apress, New York.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (Out of 50)
1.	06	06
2.	10	12
3.	06	07
4.	06	07
5.	06	06
6.	06	06
7.	05	06
Total	**45**	**50**

6.5.4 DATA SCIENCE

L	P
3	-

RATIONALE

The diploma holders need to understand about data science to solve real time problems. This course will be a stepping stone to machine learning.

LEARNING OUTCOMES

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

- Understand the basics of data science
- Understand strategies of pre processing and data collection.
- Understand the model development and model evaluation.

DETAIL CONTENTS

1. Introduction (6 hrs)

   Introduction to Data Science, Evolution of Data Science, Data Science Roles, Stages in a Data Science Project, Applications of Data Science in various fields, Data Security Issues.

2. Data Collection and Data Pre-Processing (9 hrs)

   Data collection methods and Strategies, Data Pre-Processing Overview, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization

3. Exploratory Data Analytics (10 hrs)

   Descriptive Statistics, Mean, Standard Deviation, Skewness and Kurtosis, Box Plots, Pivot Table, Heat Map, Correlation Statistics.

4. Model Development (10 hrs)

   Simple and Multiple Regression, Model Evaluation using Visualization, Residual Plot, Distribution Plot, Polynomial Regression and Pipelines, Measures for In-sample Evaluation, Prediction and Decision Making.

5. Model Evaluation (10 hrs)

Generalization Error, Out-of-Sample Evaluation Metrics, Cross Validation, Overfitting, Under Fitting and Model Selection, Prediction by using Ridge Regression, Testing Multiple Parameters by using Grid Search.

RECOMMENDED BOOKS

1. Moolayil, Jojo, “Smarter Decisions: The Intersection of IoT and Data Science”, PACKT, 2016.
2. O’Neil, Cathy, and Rachel Schutt, “Doing Data Science”, O'Reilly Media Inc.
3. Dietrich, David, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”, EMC.
4. Raj, Pethuru, “Handbook of Research on Cloud Infrastructures for Big Data Analytics”, IGI Global.

SUGGESTED DISTRIBUTION OF MARKS

Topic	**Time Allotted (Hrs)**	**Marks Allotted (Out of 50)**
1	6	06
2	9	08
3	10	12
4	10	12
5	10	12
Total	**45**	**60**

6.6 PROJECT WORK

L	P
-	10

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 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, students will be able to:

- Apply in totality the knowledge and skills gained through the course work in the solution of particular problem.
- 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 abilities like interpersonal skills, communication skills, positive attitude and values etc.

General Guidelines

The individual students have different aptitudes and strengths. Project work, therefore, should match the strength 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 them as 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. There should not be more than 6 students in a group. The project work identified in collaboration with industry should be preferred.

This project work should not be considered as merely conventional industrial/field training in which students are sent to work places with either minimal or no supervision. The project work 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 industry/field organizations for providing such an experience to students. It is necessary that each organization is visited well in advance to identify the project. The chosen project needs to match with the curricular interest of students and should be of professional value to industrial/ field organizations.

The projects given to students should be such for which some one is waiting for solution. Some of the suggested project activities are given below:

- Web page designing including database connectivity
- mobile applications designed using android
- Programming customer based applications
- Database applications
- Software Development
- Algorithm designing to improve complexity
- Projects related to clouds
- Bringing improvements in the existing systems/equipment
- Projects related to Multimedia
- Projects related Application development using web framework and android
- Web Hosting
- Software development using Python
- Configuration of Network Operating System(Windows, Linux)

There is no binding to take up the above projects as it is only a suggestive list of projects.

A suggestive criterion for assessing student performance by an external and an internal (teacher) examiner is given in the table below:

Sr. No.	**Performance Criteria**	**Max. Marks**	**Rating Scale**						
			Outstanding	**Excellent**	**Very Good**	**Good**	**Above Average**	**Average**	**Pass**
1.	Planning	10	10	9	8	7	6	5	4
2.	Execution	30	30	27	24	21	18	15	12
3.	Quality of Project	20	20	18	16	14	12	10	8
4.	Report Writing	20	20	18	16	14	12	10	8
5.	Presentation/ Viva voce	20	20	18	16	14	12	10	8
Total marks		**100**	**100**	**90**	**80**	**70**	**60**	**50**	**40**

Important Note

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 100 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 may be a person from industry/organization, who has been associated with the project-oriented professional training of the students or a senior faculty from technical institute ,

4. It is proposed that the institute may organize an annual exhibition of the project work.

9. RESOURCE REQUIREMENT

9.1 Physical Resources

9.1.1 Space Requirement:

Norms and standards laid down by All India Council for Technical Education (AICTE) may 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.

9.1.2 Laboratories/Computer Centre

Computer Labs/ Computer Centre - 06 NoS.

Digital and Microprocessors Laboratory

General Workshop

LIST OF EQUIPMENT

	Particulars	Qty	Estimated Cost
HARDWARE			
1.	Computer Server	1	1,00,000/-
2.	Workstations (for intake of 60+3+13 =76 students) 2:1	110	50,00,000/-
3.	Switch with 24 port speed 10/100/1000 (Manageable)	4	25,000/-
4.	Connectors (RJ-45, RJ-11, BNC, SC, ST) Cables: (UTP,STP,OFC) - 25 m each	-	10,000/-
5.	Color Scanner:	2	40,000/-
6.	Plotter	1	80,000/-
7.	Laser Printer	6	60,000/-
8.	Laptop	5	3, 00,000/-
9.	Router	3	20,000/-
10.	UPS for computer labs	-	5,00,000/-
11.	Modem cum Router	2	10,,000/-
12.	Compact Disk/DVD R/W:	100	2000/-
13.	Hardware kit (for computer Assembling/de-assembling)	2	1,00,000/-
14.	Touch screen	1	25,000/-

15.	Digital Camera	1	15,000/-
16.	External Hard Disk	4	20,000/-
17.	Handy Cam	1	25,000/-
18.	Networking Printers	1	1,25,000/-
19.	Leased Line Connectivity	1	3,00,000/-
20.	Photocopier Compatible with Computer System: Colour/Mono Photo-copier	1	50,000/-
21.	LCD/DLP Projector	5	75,000/-
22.	Video Conferencing System	1	2,00,000/-
23.	Software as per subject requirement	LS	
24.	Multimedia Tools – Software	1	1,20,000/-
25.	Oracle Work Group Server – Software	1	4,00,000/-
26.	Python	1	10,000/-
27.	Coral Draw 11.0 latest version or equivalent FOSS	1	40,000/-
28.	Macromedia of Director 6.0 or latest version or equivalent FOSS	1	50,000/-
29.	Antivirus	1	5,000/-
30.	Multimedia authoring Tools	1	50,000/-
31.	Java for Internet Environment (latest version) – software	1	20,000/-
32.	Windows8 OR Latest or equivalent FOSS	1	2,000/-
33.	MS Office 2010 or equivalent FOSS	1	20,000/-
34.	Page Maker or equivalent FOSS	1	5,000/-
35.	Compiler TURBO C, C++ or equivalent FOSS	1	10,000/-
36.	Photo shop or equivalent FOSS	1	35,000/-
37.	Digital Board	1	10,000/-
38.	Web camera, Mike and speakers	1	10,000/-
39.	COST OF COMPONENTS Components cables, and connectors, computer stationery, printer consumables (inks)	LS	1,00,000/-

NOTE:

In addition to above laboratories, computer centre will be required for effective implementation of the course. Provision for overhead projector, LCD/LED with DVD player, LCD projection System, photocopier, has also to be made.

9.1.3 Furniture Requirement

Norms and standards laid down by AICTE be followed for working out furniture requirement for this course.

-	Furniture for laboratories	10 lacs
-	Furniture for Computer Centre	2.0 lacs
-	Cost of Air Conditioners	5 lacs

9.2 Human Resources

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. The website www.aicte.ernet.in may be referred for downloading current norms and standards pertaining to technician courses.

10. LIST OF CONTRIBUTORS/EXPERTS

a) Online Curriculum Workshops for Designing the Contents of First Year Subjects for Diploma Programmes for Punjab State on 22nd April, 2022, 26th April, 2022, 28th April, 2022, 12th May, 2022 13th May, 2022, 16th May, 2022, 17th May, 2022, 24th May, 2022 and 6th June, 2022 at NITTTR, Chandigarh

S. No.	Name, Designation and Official Address
1.	Ms. Kanwaldeep Kaur, HOD, Applied Mathematics, SGHS Govt Polytechnic College, Ranwan
2.	Ms. Ravneet Kaur, HOD, Architecture Assistantship, Govt Polytechnic College for Girls, Patiala
3.	Mr. Harsh Kumar, HOD, Chemical Engg., Govt Polytechnic College GTB Garh
4.	Ms. Raman Rani Mittal, Senior Lecturer, Chemistry, Govt Polytechnic College for Girls, Patiala
5.	Ms. Monica Sethi, Senior Fashion Designer, Fashion Design, Govt. Institute of Garment Technology, Amritsar
6.	Ms. Jaspreet Kaur, HOD, Garment Manufacturing Technology, SRS Govt Polytechnic College for Girls, Ludhiana
7.	Ms. Gurleeen Kaur, Principal, Interior Design & Decoration, Govt Polytechnic for Women, Chandigarh
8.	Mr. Rohit Dalia, Lecturer, Leather Technology & Leather Technology(Footwear), Govt. Institute of Leather and Footwear Technology, Jalandhar
9.	Ms. Mandeep Kaur, Senior Lecturer, Library & Information Science, Govt Polytechnic College for Girls, Jalandhar
10.	Ms. Jagminder Kaur Mann, HOD, Medical Lab. Technology, Govt Polytechnic College for Girls, Patiala
11.	Ms. Parveen Kaur, HOD, Modern Office Practice, Govt Polytechnic College, Khuni Majra
12.	Mr. Kulwinder Singh Bedi, HOD, Physics, Govt Polytechnic College, Behram

13.	Mr. Parveen Kumar Randev, Lecturer Textile Chemistry, Textile Processing & Textile Technology (Knitting), Govt. Institute of Textile Chemistry & Knitting Technology, Ludhiana
14.	Mr. Amrik Singh Rakhra, HOD, Textile Technology/Textile Design, Punjab Institute of Textile Technology, Amritsar
15.	Mr. Kuldip Rai, Workshop Superintendent, Govt Polytechnic College, Khuni Majra
16.	Mr. Harkesh Kumar, Workshop Instructor, Govt Polytechnic College, Khuni Majra
17.	Mr. Prabhpreet Singh, HOD, Automobile Engineering, Guru Nanak Dev Polytechnic College, Ludhiana
18.	Mr. Rajinder Kumar, Senior Lecturer, Civil Engg., Govt Polytechnic College, Amritsar
19.	Mr. Vipan Arora, HOD, Computer Science Engineering, Govt Polytechnic College for Girls, Jalandhar
20.	Mr. Madan Lal Rana, HOD, Electrical Engineering, Chandigarh College of Engineering and Technology (Diploma Wing), Chandigarh
21.	Mr. Sanjeev Goyal, HOD, Electronics & Communication Engineering, SGHS Govt Polytechnic College Ranwan
22.	Ms. Jasdeep Kaur, HOD, English & Communication Skills, Govt Polytechnic College, Khuni Majra
23.	Mr. Lakhbir Singh, Senior Lecturer, Information Technology, SRS Govt Polytechnic College for Girls, Ludhiana
24.	Mr. Jasvinder Singh, HOD, Mechanical Engineering, Govt Polytechnic College, Bathinda
25.	Mr. Kashhmiri Lal, HOD, Production and Industrial Engg., Govt Polytechnic College, Amritsar
26.	Dr G H Hugar, Cecturer Chandigarh College of Engineering and Technology Diploma Wing, Deptt of Applied Science Chandigarh
27.	Mr. Amarjit Singh, Sr Lect, Govt Polytechnic College Bathinda
28.	Mr. Jasbir Singh Waraich, Sr Lect, SRS Govt Polytechnic College for Girls Ludhiana

29.	Ms. Shelly Singla, Lect, Govt Polytechnic College Khuni Majra
30.	Ms. Narinder Kaur, Lect, Chandigarh College of Engineering and Technology (Diploma Wing), Chandigarh
31.	Dr Bhupinder Singh, HOD, Govt Polytechnic College, Chheherta, Amritsar
32.	Mr. S A Khan, HOD, SRS Govt Polytechnic College for Girls, Ludhiana
33.	Mr. Ritwinder Singh, Workshop Instructor, Govt Polytechnic, Badbar
34.	Mr. Jasvir Singh, Foreman Instructor, S R S Govt Polytechnic College For Girls Ludhiana
35.	Mr. Gurjit Singh, Foreman Instructor, Govt Polytechnic College Bathinda
36.	Mr. H S Kalra, Ex-Principal, ITI, Sector 28, Chandigarh
37.	Mr. Balwan Singh, Officer Inchage- Mechanical Workshop, ABIT
38.	Mr. SS Ubhi, Ex Workshop Supdtt., Guru Nanak Dev Polytechnic College, Ludhiana
39.	Mr. Harinderjit Singh, Lecturer, Thapar Polytechnic Patiala
40.	Mr. Manmohan Krishan, Senior Lecturer, Govt Polytechnic College Kotkapura
41.	Ms. Manninder Kaur, Lecturer, Govt Polytechnic College For Girls Ropar
42.	Mr. Gagandeep Singh, Lecturer, Govt Polytechnic College Bathinda
43.	Mr. Pankaj Chawla, Lecturer, Env Studies, Pt JR Govt Polytechnic Hoshiarpur
44.	Mr. Rajesh Kumar, Lecturer Env. Studies, Mehr Chand Poly Jalandhar
45.	Ms. Shavinder Kaur, Lecturer (Chemistry), Thapar Polytechnic Patiala
46.	Mr. Ajay Kumar, Lecturer, Chemistry, Pt JR Govt Polytechnic Hoshiarpur
47.	Ms. Rekha Gupta, Sr Lecturer., SRS Govt Polytechnic College For Girls Ludhiana
48.	Mr. Rakesh Mittal, Sr Lecturer, Govt Polytechnic College Kotkapura
49.	Mr. Yogesh Kumar, Lecturer, Govt Polytechnic College For Girls Patiala
50.	Ms. Anchal Jain, Lect., SGHS Govt Polytechnic College Ranwan

51.	Ms. Suman Sharma, Lecturer, Govt Polytechnic College Khunimajra Mohali
52.	Mr. Kuldeep Kumar, Lecturer, Pt JR Govt Polytechnic Hoshiarpur
53.	Ms. Jyoti Ghai, Lecturer, Thapar Polytechnic, Patiala
54.	Ms. Jasmeet Kaur, Sr Lect, Govt Polytechnic College Amritsar
55.	Ms. Sandeep Kaur, Lect, SRS Govt Polytechnic College For Girls Ludhiana
56.	Ms. Amandeep Kaur, Lect, Govt Polytechnic College Khuni Majra
57.	Ms. Shubhashree Chakraborty, Lecturer (English), Thapar Polytechnic, Patiala
58.	Ms. Meenu Dutta, Lecturer, Pt JR Govt Polytechnic, Hoshiarpur
59.	Ms. Sharanjit Kaur, Lecturer, Mehr Chand Polytechnic
60.	Ms. Aman Singla, Lecturer, CSE, Thapar Polytehnic, Patiala
61.	Ms. Tarandeep Kaur , Lecturer, CSE, Thapar Polytehnic, Patilala
62.	Ms. Divya Jyoti, Lecturer, Pt. J R Govt. Polytechnic, Hoshiarpur
63.	Mr. Manoj Jambla, HOD, CSE, Govt Polytechnic College For Girls, Ludhiana
64.	Dr. Anshu Sharma, Sr Lecturer, Govt Polytechnic College, Khunimajra
65.	Mr. Kulwinder Singh Pannu, HOD, Electronics & Communication Engineering, SGHS GPC, Ranwan
66.	Dr. A B Gupta, Professor and Head, Curriculum Development Centre, NITTTR, Chandigarh

b) Online Curriculum Workshops for Designing the Contents of Open Electives for Diploma Programmes for Punjab State on 27th March, 2023, and 8th May, 2023, at NITTTR, Chandigarh

S. No.	Name, Designation and Official Address
1.	Ms. Raman Rani Mittal, Sr Lecturer, Chemistry, Govt Polytechnic College For Girls, Patiala
2.	Ms. Monica Sethi, Senior Fashion Designer, Fashion Design, GIGT, Amritsar
3.	Ms. Jaspreet Kaur, HOD, Garment Manufacturing Technology, SRS GPCG Ludhiana
4.	Ms. Gurleeen Kaur, Principal, Interior Design & Decoration, GPW, Chandigarh
5.	Ms. Jagminder Kaur Mann, HOD, Medical Lab. Technology, Govt Polytechnic College For Girls, Patiala
6.	Mr. Amrik Singh Rakhra, HOD, Textile Technology/Textile Design, PITT, Amritsar
7.	Mr. Prabhpreet Singh, HOD, Automobile Engineering, GNDP College, Ludhiana
8.	Mr. Madan Lal Rana, HOD, Electrical Engineering, CCET, Chandigarh
9.	Mr. Lakhbir Singh, Senior Lecturer, Information Technology, SRS Govt Polytechnic College For Girls, Ludhiana
10.	Mr. Rajinder Kumar, HOD, Civil Engg., Govt Polytechnic College, Amritsar
11.	Ms. Monica Jaggi, Lecturer, Govt Polytechnic College For Girls, Patiala
12.	Mr. Suresh Gandhi, PITT, Amritsar
13.	Mr. Naresh Kumar, PITT Amritsar
14.	Ms. Ramanpreet Kaur, Lecturer Spinning, Textile Technology, Amritsar
15.	Ms. Ravneet Kaur, HOD, Architecture Assistantship, Govt Polytechnic College For Girls, Patiala
16.	Dr. A B Gupta, Professor and Head, Curriculum Development Centre, NITTTR, Chandigarh

c) Online Workshops to Develop the Curriculum of Diploma Programme in 'Computer Science and Engineering' for the State of Punjab on 16th June, 2022, 4th July, 2022, 21st October, 2022, 2nd November, 2022, 16th November, 2022, 8th December, 2022 and 5th April, 2023 at NITTTR, Chandigarh

S. No.	Name, Designation and Official Address
1.	Sh. Vipan Arora, HOD, Government Polytechnic College for Girls, Jalandhar
2.	Sh. Narinder Singh Dhindsa, Sr Lecturer, Government Polytechnic College for Girls, Patiala
3.	Sh. Lakhbir Singh, Sr Lecturer, SRS Government Polytechnic College for Girls, Ludhiana
4.	Sh. Pankaj Singla, Lecturer, Government Polytechnic College for Girls, Patiala
5.	Ms. Ramandeep Kaur, Lecturer, SRS Government Polytechnic College for Girls, Ludhiana
6.	Sh. Inderjeet Singh Bamrah, Lecturer, Government Polytechnic College, Bathinda
7.	Ms. Amandeep Kaur, Lecturer, Government Polytechnic College for Girls, Patiala
8.	Ms. Jasbinder Kaur, Lecturer, Government Polytechnic College for Girls, Ropar
9.	Ms Aman Singla, Lecturer, CSE, Thapar Polytehnic, Patiala
10.	Sh. Prince Madaan, Lecturer, Mehr Chand Polytechnic, Jalandhar
11.	Ms Neeta Kalra, Sr Lecturer, SRS Government Polytechnic College for Girls, Ludhiana
12.	Ms Simranjeet Kaur, Lecturer, Government Polytechnic College for Girls, Ropar
13.	Sh. Sanjeev Goyal, HOD - ECE, SGHS, Government Polytechnic College, Ranwan
14.	Sh. Bhagwan Das Sharma, Workshop Instructor (Electronics), Government Polytechnic College for Girls, Ludhiana
15.	Ms Rachita Mahajan, Incharge, ECE , Government Polytechnic College for Girls, Dinanagar
16.	Sh. Navdeep Singh, Sr Lecturer, Government Polytechnic College, Ranwan

17.	Sh. Satnam Singh, Lecturer, Government Polytechnic College, Kotkapura
18.	Sh. Mukul Mittal, Lecturer, Eltx., Government Polytechnic College for Girls, Patiala
19.	Sh. Kulwinder Singh Pannu, HOD, Electronics & Communication Engineering, SGHS GPC, Ranwan
20.	Ms Mala Kalra, CSE Deptt, NITTTR, Chandigarh
21.	Dr. A B Gupta, Professor and Head, Curriculum Development Centre **Coordinator**