

Curriculum for
Diploma Programme in
COMPUTER SCIENCE &
ENGINEERING
For the State of Uttar Pradesh



Prepared by:

Curriculum Development Centre

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

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

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

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

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Coordinator

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

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

Practice

- 8) Industrial Training
Four weeks of industrial training is included after IV semester during summer vacation.
Total marks allotted to industrial training will be 50.
- 9) Ecology and Environment :
As per Govt. of India directives, a subject on Environmental Studies has been incorporated in the curriculum.
- 10) Energy Conservation
A subject on Energy Conservation has been incorporated in the curriculum.
- 11) Entrepreneurship Development

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

12) Student Centred Activities

A provision of 3-6 hrs per week has been made for organizing Student Centred Activities for overall personality development of students. Such activities will comprise of co-curricular activities such as expert lectures, self study, games, hobby classes like photography, painting, singing etc. seminars, declamation contests, educational field visits, NCC, NSS and other cultural activities, disaster management and safety etc.

13) Project work

A minor project work in the 5th semester and a major project work in the 6th semester have been included in the curriculum to enable the students to get familiar 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 and 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) Mobile Applications Development
- (6) Junior Level Data Analytics
- (7) Industry Automation
- (8) E-Commerce Support Engineer
- (9) News and Newspaper/Agencies, Magazines
- (10) Data Entry and MIS/ERP Operator
- (11) Lab. Assistant/Technician
- (12) Hospitals/Healthcare/Institutions/Schools
- (13) Cloud Services Support Engineer
- (14) Publishing Industry
- (15) Animation Industry
- (16) Data Processing Industry
- (17) Marketing Division(Corporate Handling, SME, Institutional Segment, Government Tender Business)
- (18) Telecommunication Sector
- (19) Teaching Organizations (Polytechnics, Vocational Institutions etc)
- (20) Networking(LAN, WAN etc)
- (21) Defence Services/Police Services/Cyber Services/Forensic Services
- (22) Call Centres, BPO etc.

While in employment, the following areas of activity in different organisations (industry and service sector) are visualized for diploma holders in Computer Science and Engineering:

- Assembly and installation of computer systems, peripherals and software
- Programming customer based applications including web page designing
- Testing and maintenance of computer systems
- Marketing of software and hardware
- Teaching and training at educational institutions
- Self employment – call centres, BPO, EPO etc.
- Network installation and maintenance
- Cyber Cafés

Various Designations for Diploma Holders in Computer Science and Engineering

- (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

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

After undergoing this programme, students will be able to:

1.	Communicate effectively in English with others
2.	Apply basic principles of mathematics and physics to solve engineering problems
3.	Use cutting tools, equipment and tools for fabrication of jobs by following safe practices at the workplace
4.	Work on different software for word processing, powerpoint presentation, spreadsheets and communicate ideas electronically
5.	Use electronic instruments to measure various engineering parameters
6.	Assemble, troubleshoot and maintain computer and peripherals and install various software
7.	Use appropriate procedures for energy conservation and for preventing environmental pollution
8.	Design page layouts for digital and electronic publications by combining different media elements
9.	Write, compile and debug programmes using different programming constructs
10.	Identify the software process model for specific software application and interpret different phases of software development life cycle

11.	Create, manage and secure database
12.	Design multimedia graphics and create script of multimedia animations using authoring tools
13.	Design, develop and host websites using internet technologies
14.	Plan and execute given task and project as a team member or a leader
15.	Manage resources NIS/ERP effectively at the workplace
16.	Implement OOPS concepts and data structure concepts.
17.	Use various functions and components of different operating systems
18.	Set-up, diagnose problems, troubleshoot computer networks and maintain security of the networks
19.	Write and debug simple as well as complex programmes in Python/PHP/R
20.	Use various mobile technologies and their use in different application scenarios
21.	Use and implement various services on cloud such as SAAS, PAAS, IAAS
22.	Apply the acquired knowledge and skills in solving live problems in the Computer and I.T. industry
23.	Demonstrate appropriate values and attitude.
24.	Apply statistical tools for data analysis and report generation
25.	Maintain hardware and software
26.	Perform data backups
27.	Develop mobile Applications

28.	Use open source tools and software
29.	Manage cloud application
30.	Set up and troubleshoot networks
31.	Handle malware and viruses
32.	Install and manage operating system and application softwares
33.	Perform network cable and fiber optic trouble shooting
34.	Set up IOT devices and wireless networking
35.	Use digital Marketing tools

4. DERIVING CURRICULUM AREAS FROM LEARNING OUTCOMES OF THE PROGRAMME

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

Sr. No.	Learning Outcomes	Curriculum Areas/Subjects
1.	Communicate effectively in English with others	– Communication Skill – Student Centred Activities
2.	Apply basic principles of mathematics and science to solve engineering problems	– Applied Mathematics – Applied Physics
3.	Use cutting tools, equipment and tools for fabrication of jobs by following safe practices at the workplace	Workshop Practice
4.	Work on different software for word processing, powerpoint presentation, spreadsheets and communicate ideas electronically	Fundamentals of Computer and Information Technology
5.	Use electronic instruments to measure various engineering parameters	Basics of Electrical and Electronics Engineering
6.	Assemble, troubleshoot and maintain computer and peripherals and install various software	Computer Architecture and Hardware Maintenance
7.	Use appropriate procedures for energy conservation and for preventing environmental pollution	Environmental Studies
8.	Design page layouts for digital and electronic publications by combining different media elements	Internet and Web Technology
9.	Write, compile and debug programmes using different programming constructs	Concept of Programming Using C

10.	Identify the software process model for specific software application and interpret different phases of software development life cycle	Software Engineering
11.	Create, manage and secure database	Database Management System
12.	Design multimedia graphics and create script of multimedia animations using authoring tools	Multimedia & Animation
13.	Design, develop and host websites using internet technologies	Internet and Web Technology

14.	Plan and execute given task and project as a team member or a leader	Minor and Major Project Work
15.	Manage resources MIS/ERP effectively at the workplace	Industrial Management and Entrepreneurship Development
16.	Implement OOPS concepts and data structure concepts.	Object Oriented Programming Using Java
17.	Use various functions and components of different operating systems	Operating Systems
18.	Set-up, diagnose problems, troubleshoot computer networks and maintain security of the networks	Data Communication and Computer Networks
19.	Write and debug simple as well as complex programmes in Python/PHP/R	– Web Development using PHP – Computer Programming using Python
20.	Use various mobile technologies and their use in different application scenarios	Development of Android Applications
21.	Use and implement various services on cloud such as SAAS, PAAS, IAAS	Cloud Computing
22.	Apply the acquired knowledge and skills in	– Minor Project Work

	solving live problems in the Computer and I.T. industry	– Major Project Work
23.	Demonstrate appropriate values and attitude.	Student Centred Activities
24.	Apply statistical tools for data analysis and report generation	Data Science and Machine Learning
25.	Maintain hardware and software	Computer Architecture and Hardware Maintenance
26.	Perform data backups	Cloud Computing
27.	Develop mobile Applications	Development of Android Applications
28.	Use open source tools and software	<ul style="list-style-type: none"> – Office Automation Tools – Web Development using PHP – Computer Programming using Python – Development of Android Applications
29.	Manage cloud application	Cloud Computing
30.	Set up and troubleshoot networks	<ul style="list-style-type: none"> – Data Communication and Computer Networks – Computer Architecture and Hardware Maintenance

31.	Handle malware and viruses	Fundamentals of Computer and Information Technology
32.	Install and manage operating system and application softwares	Fundamentals of Computer and Information Technology
33.	Perform network cable and fiber optic trouble shooting	Data Communication and Computer Networks
34.	Set up IOT devices and wireless networking	Internet of Things

35.	Use digital Marketing tools	E-Commerce and Digital Marketing
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5. ABSTRACT OF CURRICULUM AREAS

a) General Studies

1. Communication Skill
2. Environmental Studies
3. Energy Conservation
4. Industrial Management and Entrepreneurship Development

b) Applied Sciences

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

c) Basic Courses in Engineering/Technology

8. Fundamentals of Computer and Information Technology
9. Technical Drawing
10. Workshop Practice
11. Basics of Electrical and Electronics Engineering

d) Applied Courses in Engineering/Technology

12. Multimedia & Animation
13. Concept of Programming Using C
14. Office Automation Tools

15. Internet and Web Technology
16. Data Communication and Computer Networks
17. Data Structure Using C
18. Digital Electronics
19. Database Management System
20. Object Oriented Programming Using Java
21. Operating Systems
22. E-Commerce and Digital Marketing
23. Software Engineering
24. Web Development using PHP
25. Computer Programming using Python
26. Computer Architecture and Hardware Maintenance
27. Internet of Things
28. Development of Android Applications
29. Cloud Computing

e) Industrial Training

30. Minor Project Work
31. Major Project Work

f) Elective

32. Advance Java

33. Dot Net Technologies
34. Data Science and Machine Learning

6. HORIZONTAL AND VERTICAL ORGANISATION OF THE SUBJECTS

Sr. No.	Subjects	Distribution in Periods per week in Various Semesters					
		I	II	III	IV	V	VI
1.	Communication Skill	6	-		6	-	-
2.	Applied Mathematics	5	5	5	-	-	-
3.	Applied Physics	7	7	-	-	-	
4.	Applied Chemistry	7	-	-	-	-	-
5.	Fundamentals of Computer and Information Technology	7	-	-	-	-	-
6.	Technical Drawing	6	-	-	-	-	-
7.	Workshop Practice	8	-	-	-	-	-
8.	Basics of Electrical and Electronics Engineering	-	9	-	-	-	-
9.	Multimedia & Animation	-	8	-	-	-	-
10.	Concept of Programming Using C	-	11	-	-	-	-
11.	Office Automation Tools	-	6	-	-	-	-
12.	Internet and Web Technology	-	-	8	-	-	-
13.	Environmental Studies	-	-	5	-	-	-
14.	Data Communication and Computer Networks	-	-	9	-	-	-
15.	Data Structure Using C	-	-	11	-	-	-
16.	Digital Electronics	-	-	8	-	-	-
17.	Database Management System	-	-	-	9	-	-

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18.	Object Oriented Programming Using Java	-	-	-	10	-	-
19.	Operating Systems	-	-	-	8	-	-
20.	E-Commerce and Digital Marketing	-	-	-	6	-	-
21.	Energy Conservation	-	-	-	5	-	-
22.	Universal Human Values				3		
23.	Software Engineering	-	-	-	-	6	-
24.	Web Development using PHP	-	-	-	-	10	-
25.	Computer Programming using Python	-	-	-	-	8	-
26.	Computer Architecture and Hardware Maintenance	-	-	-	-	8	-
27.	Internet of Things	-	-	-	-	8	-
28.	Minor Project Work	-	-	-	-	6	-
29.	Development of Android Applications	-	-	-	-	-	12
30.	Cloud Computing	-	-	-	-	-	8
31.	Industrial Management and Entrepreneurship Development	-	-	-	-	-	5
32.	Elective	-	-	-	-	-	12
33.	Major Project Work	-	-	-	-	-	8
34.	Student Centred Activities	2	2	2	1	2	3
Total		48	48	48	48	48	48

**7. STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN COMPUTER SCIENCE AND ENGINEERING
FIRST SEMESTER**

Sr. No.	SUBJECTS	STUDY SCHEME			Credits	MARKS IN EVALUATION SCHEME									Total Marks of Internal & External
		Periods/Week				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
		<i>L</i>	<i>T</i>	<i>P</i>		<i>Th</i>	<i>Pr</i>	<i>Tot</i>	<i>Th</i>	<i>Hrs</i>	<i>Pr</i>	<i>Hrs</i>	<i>Tot</i>		
1.1	*Communication Skill-I	4	-	2	4	20	10	30	50	2 ½	20	3	70	100	
1.2	*Applied Mathematics-I	5	-	-	4	20	-	20	50	2 ½	-	-	50	70	
1.3	*Applied Physics-I	5	-	2	5	20	10	30	50	2 ½	20	3	70	100	
1.4	*Applied Chemistry	5	-	2	5	20	10	30	50	2 ½	20	3	70	100	
1.5	Fundamentals of Computer and Information Technology	3	-	4	4	20	10	30	50	2 ½	20	3	70	100	
1.6	Technical Drawing	-	-	6	2	-	40	40	60	3	-	-	60	100	
1.7	Workshop Practice	-	-	8	2	-	40	40	-	-	60	4	60	100	
#Student Centred Activities		-	-	2	1		30	30	-	-	-	-	-	30	
Total		22	-	26	27	100	150	250	310	-	140	-	450	700	

* Common course with other diploma programmes. # Student Centred Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, self study etc.

SECOND SEMESTER (COMPUTER SCIENCE AND ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME									Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
		<i>L</i>	T	P		<i>Th</i>	Pr	Tot	Th	Hrs	Pr	Hrs	Tot		
2.1	*Applied Mathematics-II	5	-	-	4	20	-	20	50	2 ½	-	3	50	70	
2.2	*Applied Physics-II	5	-	2	5	20	10	30	50	2 ½	20	3	70	100	
2.3	Basics of Electrical and Electronics Engineering	5	-	4	5	20	30	50	50	2 ½	50	3	100	150	
2.4	Multimedia & Animation	4	-	4	5	20	30	50	50	2 ½	50	3	100	150	
2.5	Concept of Programming Using C	5	-	6	6	20	30	50	50	2 ½	50	3	100	150	
2.6	Office Automation Tools	-	-	6	2		30	30	-	-	50	3	50	80	
#Student Centred Activities		-	-	2	1		30	30	-	-	-	-	-	30	
Total		24	-	24	28	100	160	260	250	-	220	-	470	730	

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

THIRD SEMESTER (COMPUTER SCIENCE AND ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME			Credits	MARKS IN EVALUATION SCHEME									Total Marks of Internal & External
		Periods/Week				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
			T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot		
3.1	*Applied Mathematics-III	5	-	-	4	20	-	20	50	2 ½	-	-	50	70	
3.2	Internet and Web Technology	4	-	4	5	20	30	50	50	2 ½	50	3	100	150	
3.3	*Environmental Studies	3	-	2	3	20	10	30	50	2 ½	20	3	70	100	
3.4	Data Communication and Computer Networks	5	-	4	6	20	30	50	50	2 ½	50	3	100	150	
3.5	Data Structure Using C	5	-	6	6	20	30	50	50	2 ½	50	3	100	150	
3.6	**Digital Electronics	4	-	4	5	20	30	50	50	2 ½	50	3	100	150	
#Student Centred Activities		-	-	2	1		30	30	-	-	-	-	-	30	
Total		26	-	22	30	120	160	280	300	-	220	-	520	800	

FOURTH SEMESTER (COMPUTER SCIENCE AND ENGINEERING)

Sr. No .	SUBJECTS	STUDY SCHEME			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
		Periods/Week				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		<i>L</i>	T	P		<i>Th</i>	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
4.1	*Communication Skill-II	4	-	2	4	20	10	30	50	2 ½	20	3	70	100
4.2	Database Management System	5	-	4	6	20	30	50	50	2 ½	50	3	100	150
4.3	Object Oriented Programming Using Java	4	-	6	6	20	30	50	50	2 ½	50	3	100	150
4.4	Operating Systems	4	-	4	5	20	30	50	50	2 ½	50	3	100	150
4.5	E-Commerce and Digital Marketing	2	-	4	3	20	30	50	50	2 ½	50	3	100	150
4.6	*Energy Conservation	3	-	2	3	20	10	30	50	2 ½	20	3	70	100
4.7	Universal Human Values	2	-	1	1	-	20	20	-	-	30	3	30	50
# Student Centred Activities		-	-	1	1	-	30	30	-	-	-	-	-	30
Total		24	-	24	29	120	190	310	300	-	270	-	570	880

* Common course with other diploma Programmes

- **4 weeks industrial training will be organised after 4th semester**

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

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FIFTH SEMESTER (COMPUTER SCIENCE AND ENGINEERING)

Sr.No.	SUBJECTS	STUDY SCHEME			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
		Periods/Week				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		<i>L</i>	T	P		<i>Th</i>	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
-	Industrial Training	-	-	-	2	-	-	-	-	-	50	3	50	50
5.1	Software Engineering	4	-	2	4	20	30	50	50	2 ½	50	3	100	150
5.2	Web Development using PHP	4	-	6	6	20	30	50	50	2 ½	50	3	100	150
5.3	Computer Programming using Python	4	-	4	5	20	30	50	50	2 ½	50	3	100	150
5.4	Computer Architecture and Hardware Maintenance	4	-	4	5	20	30	50	50	2 ½	50	3	100	150
5.5	Internet of Things	4	-	4	5	20	30	50	50	2 ½	50	3	100	150
5.6	Minor Project Work	-	-	6	3	-	60	60	-	-	60	-	60	120
#Student Centred Activities		-	-	2	1	-	30	30	-	-	-	-	-	30
Total		20	-	28	31	100	240	340	250	-	360	-	610	950

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

SIXTH SEMESTER (COMPUTER SCIENCE AND ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
		Periods/Week				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		<i>L</i>	T	P		<i>Th</i>	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
6.1	Development of Android Applications	6	-	6	7	20	30	50	50	2 ½	50	-	100	150
6.2	Cloud Computing	4	-	4	5	20	30	50	50	2 ½	50	-	100	150
6.3	*Industrial Management and Entrepreneurship Development	5	-	-	4	20	-	20	50	2 ½	-	-	50	70
6.4	**Elective:	6	-	6	7	20	30	50	50	2 ½	50	-	100	150
6.5	Project	-	-	8	3	-	50	50	-	-	100	4	100	150
#Student Centred Activities		-	-	3	1	-	30	30	-	-	-	-	-	30
Total		<i>21</i>	-	27	<i>27</i>	<i>80</i>	170	250	200	-	250	-	450	700

* Common Course with other diploma programmes** Elective :- Any one of the following:Advanced Java,Dot Net Technologies,Data Science and Machine Learning # Student Centred Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

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

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

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

- ii. 5 Marks for attendance as per following:
(by HODs in consultation with all the teachers of the department)
 - a) 75 - 80% 2 Marks
 - b) 80 - 85% 4 Marks
 - c) Above 85% 5 Marks

- iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/ NSS activities as per following: (by In-charge Sports/NCC/Cultural/Co-curricular/NSS)
 - a) 15 - State/National Level participation
 - b) 10 - Participation in two of above activities
 - c) 5 - Inter-Polytechnic level participation

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

3.1 APPLIED MATHEMATICS –III

L T P

5 - -

RATIONALE

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

LEARNING OUTCOMES

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

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

DETAILED CONTENTS

1. Matrices

(16 Periods)

1.1 Algebra of Matrices, Inverse

Addition, Multiplication of matrices, Null matrix and a unit matrix, Square matrix, Symmetric, Skew symmetric, Hermitian, Skew hermitian, Orthogonal, Unitary, diagonal and Triangular matrix, Determinant of a matrix. Definition and Computation of inverse of a matrix.

1.2 Elementary Row/Column Transformation

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

1.3 Linear Dependence, Rank of a Matrix

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

1.4 Eigen Pairs, Cayley-Hamilton Theorem

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

2. Differential Calculus (15 Periods)

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

2.2 Partial Differentiation

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

2.3 Vector Calculus

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

3. Differential Equation (15 Periods)

3.1 Formation, Order, Degree, Types, Solution

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

3.2 First Order Equations

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

3.3 Higher Order Linear Equation :

Property of solution, Linear differential equation with constant coefficients

(PI for $X = e^{ax}$, $\sin ax$, $\cos ax$, X^n , $e^{ax}V$, XV)

3.4 Simple Applications

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

4. Integral Calculus-II (12 Periods)

4.1 Beta and Gamma Functions

Definition, Use, Relation between the two, their use in evaluating integrals.

4.2 Fourier Series

Fourier series of $f(x)$, $-n < x < n$, Odd and even function, Half range series.

4.3 Laplace Transform

Definition, Basic theorem and properties, Unit step and Periodic functions, inverse laplace transform, Solution of ordinary differential equations

5. Probability and Statistics (12 Periods)

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

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

INSTRUCTIONAL STRATEGY

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

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

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

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

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	16	24
2.	15	20
3.	15	20
4	12	18
5	12	18
Total	70	100

3.2 INTERNET AND WEB TECHNOLOGY

L T P
4 - 4

RATIONALE

The diploma holders in Computer Science and Engineering needs to understand about Internet, Web Space and how to develop static website. They should be able to develop basic static websites by using different front-end Technologies . Hence this subject.

LEARNING OUTCOMES

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

- understand working of Internet/ Websites, Client Server Model and Internet Tools.
- understand and develop HTML Web pages.
- provide logics on the web pages by using JavaScript
- use Bootstrap to develop responsive website
- control the Look and feel of web pages by using CSS
- use JQuery for developing the Web Pages
- develop Static webpage/web portal

DETAILED CONTENTS

5. Web Development Introduction (06 Periods)

Internet, WWW, Browser, Search engine Client Server Model, URL, Web Pages, Website and Web Services, Types of Websites (Static, Dynamic and Responsive), Developer options of Browser (View page source, Developer Tools, Inspect Element etc) ,Need of cyber security & IT Laws

6. HTML (10 Periods)

Basics:

HTML Document, Basic Structure of HTML, Syntax, HTML Tags and Attributes, Types of HTML Tags, Rules of nesting, Basic Tags (HTML Tag, Head Tag, Title Tag, Body Tags).

Page Formatting:

Adding a new Paragraph, Adding a line break, Inserting a blank space , changing page background , Div and Span tags

Text Formatting:

Html Headings, Formatting elements (Bold text , Important text ,<i> Italic text , Emphasized text , <mark> Marked text, <small> Small text, Deleted text, <ins> Inserted text, <sub> Subscript text, <sup> Superscript text), Comments, Horizontal Lines

Creating Lists: Ordered List, Unordered Lists, Definition Lists

Others:

Images, Text Links, Image Links, opening a page in New Window or Tab, Linking to an area of same page, Introduction to Table Tags, Advantages and limitations of tables, Frames & IFrame, HTML Forms , XHTML

7. Cascading Style Sheets (08 Periods)

Introduction, Benefits of CSS, CSS Syntax, CSS Implementation (inline, internal and external), CSS Selectors (ID Selectors, Class Selectors, Grouping Selectors, Universal Selectors, CSS Pseudo-classes), CSS properties (background-color, background-image, border-style, height, width, color, text-align, font-family, font-style, font-size, font-weight), Box Model in CSS (margin, border, padding)

8. Java Scripts (08 Periods)

Java Script Introduction , variables , data types , operators, control flow (if-else, for loop , while loop , do-while loop) , Declaring Functions , Calling functions with parameters, Adding JavaScript to Web Documents, JavaScript Objects , Document Object Models, HTML Events and calling Java Script functions on Events.

9. JQUERY (09 Periods)

JQuery Concept, Adding JQuery to Web Page, JQuery Selectors, JQuery Event Methods, JQuery Effects (Hide/Show, Fade, Slide), Insertion of header /footer in HTML Pages using JQuery

10. Bootstrap (09 Periods)

Color Management, Buttons, Table, drop-down, navigation-bar, images, pagination, jumbotron, alerts, forms, progress bar, grid, utilities & filters

11. XML & JSON (06 Periods)

Introduction and use of XML, Difference between XML and HTML, XML Elements, Attribute, Name space, Syntax Rules, XML DTD and XML Schema, RSS FEED, JSON Introduction and uses, JSON v/s XML, JSON Syntax.

LIST OF PRACTICALS

16. Install, configure and start using developer tools /Code Editor/Browser
17. Creating Web Pages using different HTML tags
18. Control the look and feel of Web Page Styling by using CSS.
19. Write JavaScript functions and control the different companionets of Web page by predeifnd javascript objects
20. Validation of Form fields using Java Script
21. Use jQuery library to apply different features on web pages.
22. Use Bootstrap library and icons to develop a responsive websites

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of websites/WebPages to students while doing practical exercises. The students should be made familiar with developing web pages by code editor/browsers, working on internet. The student should be made capable of developing static websites by using HTML, JavaScript, CSS and jQuery

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Head First HTML and CSS: A Learner's Guide to Creating Standards-Based Web Pages , O Reilly Publications by Elisabeth Robson Eric Freeman
2. Head First JavaScript Programming, O Reilly Publications by Eric FREEMAN
3. Head First jQuery, O Reilly by Ryan Benedetti, Ronan Cranley
4. Web Technologies, Black Book ,Kogent Learning Solutions Inc
5. Developing Web Applications, 2ed ,Wiley Publications, M.T.Savaliya
6. Mastering Bootstrap 4 ,by Benjamin Jakobus and Jason Marah, Packt Publishing
7. e-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR, Chandigarh.

Websites for Reference:

1. <http://swayam.gov.in>
2. <http://spoken-tutorial.org>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	06	10
2	10	18
3	08	15
4	08	15
5	09	16
6	09	16
7	06	10
Total	56	100

3.3 ENVIRONMENTAL STUDIES

L T P

3 - 2

RATIONALE

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

LEARNING OUTCOMES

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

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

DETAILED CONTENTS

1. Introduction (04 Periods)
 - 1.1 Basics of ecology, eco system- concept, and sustainable development, Resources renewable and non renewable.
2. Air Pollution (04 Periods)

- 2.1 Source of air pollution. Effect of air pollution on human health, economy, plant, animals. Air pollution control methods.
3. Water Pollution (08 Periods)
- 3.1 Impurities in water, Cause of water pollution, Source of water pollution. Effect of water pollution on human health, Concept of dissolved O₂, BOD, COD. Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.
4. Soil Pollution (06 Periods)
- 4.1 Sources of soil pollution
- 4.2 Types of Solid waste- House hold, Hospital, From Agriculture, Biomedical, Animal and human, excreta, sediments and E-waste
- 4.3 Effect of Solid waste
- 4.4 Disposal of Solid Waste- Solid Waste Management
5. Noise pollution (06 Periods)
- Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimize noise pollution.
6. Environmental Legislation (08 Periods)
- Introduction to Water (Prevention and Control of Pollution) Act 1974, Introduction to Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board and National Green Tribunal (NGT), Environmental Impact Assessment (EIA).
7. Impact of Energy Usage on Environment (06 Periods)
- Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain. Eco-friendly Material, Recycling of Material, Concept of Green Buildings.

LIST OF PRACTICALS

1. Determination of pH of drinking water
2. Determination of TDS in drinking water
3. Determination of TSS in drinking water
4. Determination of hardness in drinking water
5. Determination of oil & grease in drinking water
6. Determination of alkalinity in drinking water

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

INSTRUCTIONAL STRATEGY

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

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

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

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

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

3.4 DATA COMMUNICATION AND COMPUTER NETWORKS

L T P

5 - 4

RATIONALE

The future of computer technology is in Data Communication and Computer Networks. Global connectivity can be achieved through computer networks. A diploma holder in Computer Science and Engineering should therefore understand the function of networks and get exposure to different existing and upcoming communication technologies. Knowledge about hardware and software requirements of networks is essential.

LEARNING OUTCOMES

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

- know about signal types, transmission media
- know about different communication methodologies
- setup computer networks
- setup basic wireless network
- diagnose & solve network problems
- diagnose & solve network problems remotely
- provide security to networks
- manage & handle wan
- prevent external network attacks
- identify network troubleshooting methods.

DETAILED CONTENTS

1. Introduction to Data Communication

(07 Periods)

- 1.1 Basics of the Communications
 - 1.2 Direction of the Data flow (simplex, half-duplex, full-duplex)
 - 1.3 Network Topologies, signals and transmission (analog and digital)
 - 1.4 Transmission media (guided and unguided)
 - 1.5 Concept of digital signals, Bit rate, Bit length, Transmission impairment (attenuation, distortion, noise).
2. Communication Methodologies (10 Periods)
- 2.1 Need for modulation in communication system
 - 2.2 Concepts AM, FM, PM, FSK, TSK, PCM (No Mathematical model)
 - 2.3 Concept of bandwidth and channel capacity of different communication systems such as radio, microwave etc.
 - 2.4 Multiplexing techniques (TDM, FDM, WDM, CDMA)
3. Networks Basics (14 Periods)
- 3.1 Concept of network
 - 3.2 Models of network computing
 - 3.3 Networking models
 - 3.4 Peer-to-peer Network
 - 3.5 Client-Server Network
 - 3.6 LAN, MAN and WAN
 - 3.7 Network Services
 - 3.8 Switching Techniques
4. Networking Models (05 Periods)
- 4.1 OSI model: Definition, Layered Architecture
Functions of various layers
 - 4.2 TCP/IP Model: Definition, Functions of various layers
 - 4.3 Comparison between OSI and TCP/IP model
5. TCP/IP Addressing (10 Periods)

- 5.1 Concept of physical and logical addressing
- 5.2 IPV4 addresses – Address space, Notations
- 5.3 Classful Addressing- Different IP address classes, Classes & Blocks, Net-id & Host-Id, Masks, Address depletion
- 5.4 Classless Addressing – Address blocks, Masks
- 5.5 Special IP Addresses
- 5.6 Subnetting and Supernetting
- 5.7 Loop back concept
- 5.8 Network Address Translation
- 5.9 IPV4 Header
- 5.10 IPV6 Header
- 5.11 Comparison between IPV4 and IPV6

6. Network Architecture (04 Periods)

Ethernet specification and standardization: 10 Mbps (Traditional Ethernet), 10 Mbps (Fast Ethernet) and 1000 Mbps (Gigabit Ethernet)

7. Network Connectivity (05 Periods)

- 7.1 Network connectivity Devices
- 7.2 NICs
- 7.3 Hubs, Switches, Routers, Repeaters, Modem, Gateway
- 7.4 Configuration of Routers & Switches

8. Network Administration (10 Periods)

- 8.1 Network Security Principles, Cryptography, using secure protocols
- 8.2 Trouble Shooting Tools: PING,IPCONFIG, IFCONFIG, NETSTAT, TRACEROOT,

- Wireshark, Nmap, TCPDUMP, ROUTEPRINT
 - 8.3 DHCP Server
 - 8.4 Workgroup/Domain Networking
9. Introduction to Wireless Networks. (05 Periods)
- 9.1 Introduction to wireless LAN IEEE 802.11, WiMax and Li-Fi
 - 9.2 Wireless Security
 - 9.3 Introduction to bluetooth - architecture, application
 - 9.4 Comparison between bluetooth and Wifi

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. Managing user accounts in windows and LINUX
7. Sharing of Hardware resources in the network.
8. Use of Netstat and its options.
9. Connectivity troubleshooting using PING, IPCONFIG, IFCONFIG
10. Installation of Network Operating System(NOS)
11. Visit to nearby industry for latest networking techniques
12. Create a network of at least 6 computers.

Required Software

Windows Server/Linux Server

Required Tools and Supplies

Crimping tool, Cable tester,

- 1) RJ 45 connectors, RJ-11, BNC, SCST
- 2) Coaxial Cable, UTP, STP, OFC cable
- 3) Screw Driver Kit

- 4) Switch/Hub
- 5) Manageable Switch

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.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Computer Networks by Tanenbaum, Prentice Hall of India, New Delhi
2. Data Communications and Networking by Forouzan, (Edition 2nd and 4th), Tata McGraw Hill Education Pvt Ltd , New Delhi
3. Data and Computer Communication by William Stallings, Pearson Education, New Delhi
4. Local Area Networks by Peter Hudson
5. Network+ Lab manual,- BPB Publications -by Tami Evanson
6. Networking Essentials – BPB Publications New Delhi
7. Computer Network and Communications By V.K. Jain and Narija Bajaj, Cyber Tech Publications, New Delhi.
8. Cloud Computing Bible by Berrie Sarinby
9. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	07	10
2.	10	15
3.	14	20
4.	05	07
5.	10	15
6.	04	05
7	05	06
8.	10	15
9.	05	07
Total	70	100

3.5 DATA STRUCTURES USING C

L T P
5 - 6

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 best data structures to solve the problem
- Store data, process data using appropriate data structures
- Sort the data in ascending or descending order.
- Implement trees and various traversing techniques.
- Implement various searching and sorting algorithms and to compare them for checking efficiency.

DETAILED CONTENTS

1. Fundamental Notations (08 Periods)
 - 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
 - 1.4 Categories of Data structure
2. Arrays (08 Periods)
 - 2.1 Concept of Arrays

- 2.2 Storage representation of multi-dimensional arrays.
- 2.3 Operations on arrays with Algorithms (searching, traversing, inserting, deleting)

3. Linked Lists (12 Periods)

- 3.1 Introduction to linked list
- 3.2 Representation of linked lists in Memory
- 3.3 Operations on linked list (Insertion, deletion and traversals)
- 3.4 Application of linked lists
- 3.5 Doubly linked lists
- 3.6 Operations on doubly linked lists (Insertion, deletion and traversals)

4. Stacks, Queues and Recursion (12 Periods)

- 4.1 Introduction to stacks
- 4.2 Representation of stacks
- 4.3 Implementation of stacks
- 4.4 Applications of stacks
- 4.5 Introduction to queues
- 4.6 Implementation of queues
- 4.7 Circular Queues
- 4.8 De-queues
- 4.9 Application of Queues
- 4.10 Recursion

5. Trees (12 Periods)

- 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
- 5.5 Introduction to Heap
- 5.6 Application of Trees

6. Sorting and Searching (12 Periods)

- 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, Heap Sort)
- 7. Graph (06 Periods)
 - 7.1 Introduction to Graph
 - 7.2 Basic Operations
 - 7.3 Depth First Search
 - 7.4 Breadth First Search

LIST OF PRACTICALS

Write programmes in C to implement

1. Addition of two matrices using functions
2. Multiplication of two matrices
3. Push and pop operation in stack
4. Inserting and deleting elements in queue
5. Inserting and deleting elements in circular queue
6. Insertion and deletion of elements in linked list
7. Insertion and deletion of elements in doubly linked list
8. Factorial of a given number with recursion and without recursion
9. Fibonacci series with recursion and without recursion
10. Program for pre-order, post order and in order traversal of binary tree.
11. The selection sort technique
12. The bubble sort technique
13. The quick sort technique
14. The merge sort technique
15. The binary search procedures to search an element in a given list
16. 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 algorithms in detail in theory sessions. The students should be asked to convert their ideas about a problem into an algorithm in theory class and implement it in practical class. This will help the students to have clear concepts of programming.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Data Structure using C by Robert Kruse; Prentice Hall of India
2. Data Structure through C by Yashwant Kanekar; BPB Publications
3. Data structures – Schaum's Outline Series by Lipschutz; McGraw Hill Education Pvt Ltd , New Delhi
4. Data Structure using C by ISRD Group ; Tata McGraw Hills Education Pvt Ltd , New Delhi
5. Expert Data Structures with C by R.B. Patel ; Khanna Publishers, New Delhi.
6. Data Structures and Algorithm Using C by RS Salaria; Khanna Book Publishing Co. (P) Ltd. New Delhi
7. Data Structure through C in depth by SK Srivastava, Deepali Srivastava; BPB Publications
8. Data Structure through "C" Language by Sameeran Chattopadhyay, MatanginiChottopadhyay; BPB Publications
9. Data Structure through "C" Language by DOEACC; BPB Publications
10. Data Structure using "C" Lab Workbook by Shukla; BPB Publications
11. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	08	10
2	08	15
3	12	15
4	12	15
5	12	15
6	12	15
7	06	15
Total	70	100

3.6 DIGITAL ELECTRONICS

L T P

4 - 4

RATIONALE

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

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

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

DETAILED CONTENTS

1. Introduction (03 Periods)
 - 1.1 Distinction between analog and digital signal.
 - 1.2 Applications and advantages of digital signals.
2. Number System (03 Periods)
 - 2.1 Binary, octal and hexadecimal number system: conversion from decimal and hexadecimal to binary and vice-versa.
 - 2.2 Binary addition and subtraction including binary points. 1's and 2's complement method of addition/subtraction.

3. Codes and Parity (04 Periods)
 - 3.1 Concept of code, weighted and non-weighted codes, examples of 8421, BCD, excess-3 and Gray code.
 - 3.2 Concept of parity, single and double parity and error detection

4. Logic Gates and Families (06 Periods)
 - 4.1 Concept of negative and positive logic
 - 4.2 Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates, NAND and NOR as universal gates.
 - 4.3 SSI, MSI, LSI, VLSI (Definition)
 - 4.4 Propagation delay, Noise Margin, Fan in, Fan out, Power dissipation.
 - 4.5 Comparison between TTL, CMOS, ECL, MOS on basis of diff parameter.
 - 4.6 Introduction to Bipolar logic, MOS, ECL, TTL and CMOS logic families
 - 4.7 Basic logic gate using NMOS, PMOS, CMOS

5. Logic Simplification (06 Periods)
 - 5.1 Postulates of Boolean algebra, De Morgan's Theorems. Implementation of Boolean (logic) equation with gates
 - 5.2 Karnaugh map (upto 4 variables) and simple application in developing combinational logic circuits

6. Arithmetic circuits (03 Periods)
 - 6.1 Half adder and Full adder circuit, design and implementation.
 - 6.2 Half subtractor and Full subtractor or Circuit, design and implementation.

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

8. Introduction to Sequential circuit (06 Periods)
 - 8.1 Introduction to Sequential
 - 8.2 Comparison between combinational and sequential circuit

- 8.3 Concept and types of latch with their working and applications
- 8.4 Operation using waveforms and truth tables of RS, T, D, Master/Slave JK flip flops.
- 8.5 Difference between a latch and a flip flop
9. Counters (06 Periods)
- 9.1 Introduction to Asynchronous and Synchronous counters
- 9.2 Binary counters
- 9.3 Divide by N ripple counters, Decade counter, Ring counter and twisted Ring counter.
10. Shift Register (05 Periods)
- 10.1 Introduction and basic concepts including shift left and shift right.
- a) Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out.
- b) Universal shift register
11. A/D and D/A Converters (04 Periods)
- 11.1 Working principle of A/D and D/A converters
- 11.2 Brief idea about different techniques of A/D conversion and study of :
- Stair step Ramp A/D converter
 - Dual Slope A/D converter
 - Successive Approximation A/D Converter
- 11.3 Brief idea of :
- Binary Weighted D/A converter
 - R/2R ladder D/A converter
- 11.4 Applications of A/D and D/A converter.
12. Semiconductor Memories (04 periods)
- Memory organization, classification of semiconductor memories (RAM, ROM, PROM, EPROM, EEPROM), static and dynamic RAM.

LIST OF PRACTICALS

1. Verification and interpretation of truth tables for AND, OR, NOT NAND, NOR and Exclusive OR (EXOR) and Exclusive NOR(EXNOR) gates

2. Realisation of logic functions with the help of NAND or NOR gates
3. - Design of a half adder using XOR and NAND gates and verification of its operation
- Construction of a full adder circuit using XOR and NAND gates and verify its operation
4. Verification of truth table for positive edge triggered, negative edge triggered, level triggered IC flip-flops (At least one IC each of D latch , D flip-flop, JK flip-flops).
5. Verification of truth table for encoder and decoder ICs, Mux and DeMux
6. To design a 4 bit SISO, SIPO, PISO, PIPO shift registers using JK/D flip flops and verification of their operation.
7. To design a 4 bit ring counter and verify its operation.
8. Use of Asynchronous Counter ICs (7490 or 7493)

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

INSTRUCTIONAL STRATEGY

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

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

1. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi
2. Digital Electronics by RP Jain, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Digital Electronics by BR Gupta, Dhanpat Rai & Co., New Delhi

4. Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi
5. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

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

4.1 COMMUNICATION SKILLS – II

L T P

4 - 2

RATIONALE

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

LEARNING OUTCOMES

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

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

DETAILED CONTENTS

- | | |
|-----------------------|--------------|
| 1. Functional Grammar | (16 periods) |
| 1.1 Prepositions | |
| 1.2 Framing Questions | |
| 1.3 Conjunctions | |
| 1.4 Tenses | |

2 Reading

(16 periods)

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

3 Writing Skill

(24 periods)

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

LIST OF PRACTICALS

Note: Teaching Learning Process should be focused on the use of the language in writing reports and making presentations.

Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project oriented manner where the learning happens as a byproduct.

Speaking and Listening Skills

1. Debate
2. Telephonic Conversation: general etiquette for making and receiving calls
3. Offering- Responding to offers.

4. Requesting – Responding to requests
5. Congratulating
6. Exploring sympathy and condolences
7. Asking Questions- Polite Responses
8. Apologizing, forgiving
9. Complaining
10. Warning
11. Asking and giving information
12. Getting and giving permission
13. Asking for and giving opinions

INSTRUCTIONAL STRATEGY

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

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

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

Websites for Reference:

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

SUGGESTED DISTRIBUTION OF MARKS

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

4.2 DATABASE MANAGEMENT SYSTEM

L T P
5 - 4

RATIONALE

The diploma holders in Computer Science and Engineering need to understand about Relational Data base to manage the data at backend for different applications. They should be able to develop basic table and write query to fetch the required data. Hence this subject.

LEARNING OUTCOMES

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

- understand the concept of Database system and Client Server Architecture
- understand and develop the concepts of Data Modeling, Security and Integrity.
- convert and compare the designs and differentiate between the keys
- understand and execute different SQL queries and PL / SQL programs
- convert database in the form of table
- normalize the database using normal forms.
- understand the concept of query processing and Transaction processing

DETAILED CONTENTS

12. Database System Concept & Data Modeling (10 Periods)

Basic concepts, Advantages of a DBMS over file processing system, Data Abstraction, Database Languages, Data Independence. , Components of a DBMS and overall structure of a DBMS. ,Three views of Data (External View, Conceptual View, Internal View), Three level architecture of DBMS, Data Independence, , Client Server Architecture

13. Data Model (10 Periods)

Define data model, Data Models : Network Model Hierarchical Model, E-R Model, Advantage & Disadvantages of each Data Model

ER Model :

Entity sets and relationship sets- Attributes - Keys in entity and relationship sets : (a) Super Key (b) Candidate Key (c) Primary Key (e) Unique Key - Mapping constraints, Participation Constraint, E-R diagram, Notations. Strong Entity Set and Weak Entity Set

14. Relation Model (10 Periods)

Advantages, Disadvantages, Codd's 12 rules , Definition of Relations, Schema, Sub schema. Relational Model Constraints (Domain, Tuple Uniqueness, Key Constraints, Integrity Constraints, Entity constraints).

Relations algebra (Basic operation: Union intersection difference and Cartesian product), Additional Relational Algebraic Operations (Projection, Selection rows, Division, rename and join) , Converting ER Model to Relational Model.

15. Relational Database Design (11 Periods)

Purpose of Normalization, Data redundancy and updating anomalies, Functional Dependencies and Decomposition, Process of Normalization using 1NF, 2NF, 3NF, multivalued dependencies and BCNF , Forth Normal Form, Fifth Normal Form,

16. MYSQL/SQL (11 Periods)

Data definition language, Data manipulation language, SQL, Object naming conventions, Object naming guidelines, Data types, Tables (Creating , Inserting, Updating and deleting tables and using constraints), Views, Indexes,

SQL Command :- DESCRIBE, SELECT, WHERE CLAUSE, DISTINCT CLAUSE, ORDER BY, HAVING, LOGICAL OPERATIONS, SQL OPERATORS, JOIN

Aggregate functions, String functions and date time functions, Null values

17. PL-SQL (10 Periods)

User defined function, Control of flow statement of PL/SQL, Procedures/Stored procedures, transaction, triggers, cursors, granting and revoking.

18. NO-SQL: Inroducton , Usages, And Application. (03 Periods)

19. SECURITY (05 Periods)

Authorization and View- Security constraints - Integrity Constraints- Encryption

LIST OF PRACTICALS

STRUCTURED QUERY LANGUAGE

1. Creating Database
 - Creating a database
 - Creating a table
 - Specifying relational data types
 - Specifying constraints
 - Creating indexes

2. Table and Record Handling
 - INSERT statement
 - Using SELECT and INSERT together
 - DELETE, UPDATE, TRUNCATE Statement.
 - DROP, ALTER statement

3. Retrieving Data From a Database
The SELECT statement
 - Using the WHERE clause
 - Using Logical Operators in the WHERE clause
 - Using In, BETWEEN, LIKE, ORDER BY, GROUP BY & HAVING clause
 - Using Aggregate Functions
 - Combining Tables Using JOINS

4. 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.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. An Introduction to Database System - C. J. Date
2. Database System Concepts - A. Silberschatz, S. Sudarshan & H. F. Korth
3. Database Concepts and Systems - LvanBayroos/SPD
4. Fundamental of Database System - R. Elmashri & S. B. Navathee-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR.

Websites for Reference:

<http://swayam.gov.in>

<http://spoken-tutorial.orgs>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	15
2	10	15
3	10	15
4	11	17
5	11	17
6	10	10
7	03	04
8	05	07
Total	70	100

4.3 OBJECT ORIENTED PROGRAMMING USING JAVA

L T P

4 - 6

RATIONALE

Object orientation 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 will help the students to implement the various concept of object orientation practically. The students will be able to program in the object oriented technology with the usage of JAVA.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- install Java IDE, Compiler, Java virtual machines
- debug and compile the program written in Java.
- explain and implement class programs.
- explain and execute the language construct concepts.
- explain and execute member functions.
- explain the concepts of OOPS
- describe and implement inheritance concepts.
- explain and implement Polymorphism using Java program.
- explain and implement the abstract class and interface.
- implement the exception handling in projects
- develop and understand multithreaded programs

DETAILED CONTENTS

1. Introduction and Features (05 Periods)

Fundamentals of object oriented programming – procedure oriented programming Vs. object oriented programming (OOP), Object oriented programming concepts – Classes, object, object reference, abstraction, encapsulation, inheritance, polymorphism, Introduction of eclipse (IDE) for developing programs in Java

2. Language Constructs (07 Periods)

variables, types and type declarations, data types : Integer, floating point type, character, boolean, all Operators, iteration and jump statement, if then else clause; conditional expressions, input using scanner class and output statement, loops, switch case, arrays, methods.

3. Classes and Objects (08 Periods)

Class fundamentals, constructors, declaring objects (Object & Object Reference), creating and accessing variables and methods, static and non static variables/methods defining packages, Creating and accessing a package, Importing packages, Understanding CLASSPATH, auto boxing , String , String Buffer

4. Inheritance (06 Periods)

Definition of inheritance, protected data, private data, public data, constructor chaining, order of invocation, types of inheritance, single inheritance, multilevel inheritance, hierarchical inheritance, hybrid inheritance , access control (Private Vs PublicVs Protected Vs Default)

5. Abstract Class and Interface (08 Periods)

Defining an interface, difference between classes and interface, Key points of Abstract class & interface, difference between an abstract class & interface, implementation of multiple inheritance through interface.

6. Polymorphism (06 Periods)

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

7. Exception Handling (07 Periods)

Definition of exception handling, implementation of keywords like try, catches, finally, throw & throws, built in exceptions, creating own exception sub classes importance of exception handling in practical implementation of live projects

8. Multithreading (09 Periods)

Difference between multi threading and multi tasking, thread life cycle, creating threads, thread priorities, synchronizing threads.

LIST OF PRACTICALS

1. WAP to create a simple class to find out the area and perimeter of rectangle and box using super and this keyword.
2. WAP to design a class account using the inheritance and static that show all function of bank (withdrawal, deposit).
3. WAP to design a class using abstract methods and classes.

4. WAP to design a string class that perform string method (equal, reverse the string, change case).
5. Consider we have a Class of Cars under which Santro Xing, Alto and Wagon R represents individual Objects. In this context each Car Object will have its own, Model, Year of Manufacture, Colour, Top Speed, etc. which form Properties of the Car class and the associated actions i.e., object functions like Create(), Sold(), display() form the Methods of Car Class.
6. In a software company Software Engineers, Sr. Software Engineers, Module Lead, Technical Lead, Project Lead, Project Manager, Program Manager, Directors all are the employees of the company but their work, perks, roles, responsibilities differs. Create the Employee base class would provide the common behaviors of all types of employee and also some behaviors properties that all employee must have for that company.
7. Using the concept of multiple inheritance create classes: Shape, Circle, Square, Cube, Sphere, Cylinder. Your classes may only have the class variable specified in the table below and the methods Area and/or Volume to output their area and/or volume.

Class	Class Variable	Constructor	Base class
Shape	String name	Shape()	
Circle	double radius	Circle(double r, String n)	Shape
Square	double side	Square(double s, String n)	Shape
Cylinder	double height	Cylinder(double h, double r, String n)	Circle
Sphere	None	Sphere(double r, String n)	Circle
Cube	None	Cube(double s, String n)	Square

8. WAP to handle the exception using try and multiple catch block.
9. WAP that implement the Nested try statements.
10. WAP to create a package that access the member of external class as well as same package.
11. WAP that show the partial implementation of interface.
12. WAP to create a thread that implement the Runnable interface.

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).

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Programming with Java: A Primer; E. Balagurusamy
2. Head First Java, O-REILLY, Kathy Sierra & Bert Bates.
3. OCA Java SE Programmer I Certification Guide , Wiley Publisher , Mala Gupta
4. PROGRAMMER'S GUIDE TO JAVA SE 8 , Pearson , Khalid E Mughal
5. e-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR.

Websites for Reference:<http://www.spoken-tutorial.org> , <http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	5	14
2.	7	12
3.	8	13
4.	6	13
5.	8	13
6.	6	12
7.	7	12
8.	9	11
Total	56	100

4.4 OPERATING SYSTEMS

L T P
4 - 4

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:

- describe various types and services of operating system
- identify the concept of process, various states in the process and their scheduling.
- classify different types of schedulers and scheduling algorithms.
- identify the significance of inter-process communication and synchronization.
- describe deadlock and the various ways to recover from deadlock
- identify memory management techniques
- describe virtual memory and its underlying concepts.
- describe the features and brief history of Linux
- use General purpose commands and filters of Linux
- use of shell scripts in Linux

DETAILED CONTENTS

1. Overview of Operating Systems (10 Periods)

Definition of Operating Systems, Types of Operating Systems, Operating System Services, User operating system interface, System Calls, Types of System Calls, System Programs, Operating System Structure, Virtual Machine, Benefits of Virtual Machine

2. Process Management (Principles and Brief Concept) (10 Periods)

Process concept, Process State, Process Control Block, Scheduling Queues, Scheduler, Job Scheduler, Process Scheduler, Context Switch, Operations on Processes, Interprocess Communication, Shared Memory Systems, Message-Passing Systems, CPU Scheduler, Scheduling Criteria, Scheduling Algorithms, Preemptive and Non Preemptive, First come first serve (FCFS), Shortest Job first (SJF), Round Robin (RR), Multiprocessor scheduling, Process Synchronization.

3. Deadlocks (Principles and Brief Concept) (06 periods)

Deadlock, Conditions for Dead lock, Methods for handling deadlocks, Dead Prevention, Deadlock Avoidance, Deadlock detection, Recovery from deadlock.

4. Memory Management Function (Principles and Brief Concept) (10 periods)

Definition – Logical and Physical address Space, Swapping, Memory allocation, Contiguous Memory allocation, Fixed and variable partition, Internal and External fragmentation and Compaction, Paging – Principle of operation, Page allocation, Hardware support for paging, Protection and sharing, Disadvantages of paging, Segmentation, Virtual Memory.

5. I/O Management Functions (Principles and Brief Concept) (04 periods)

Dedicated Devices, Shared Devices, I/O Devices, Storage Devices, Buffering, Spooling.

6. File Management (Principles and Brief Concept) (06 periods)

Types of File System; Simple file system, Basic file system, Logical file system, Physical file system, Various Methods of Allocating Disk Space

7. Linux Operating System (10 Periods)

History of Linux and Unix, Linux Overview, Structure of Linux, Linux releases, Open Linux, Linux System Requirements, Linux Commands and Filters: mkdir, cd,rmdir,pwd, ls, who, whoami, date, cat,chmod, cp, mv, rm,pg,more, pr, tail, head, cut, paste, nl, grep, wc, sort, kill, write, talk,mseg,wall, merge,mail, news Shell: concepts of command options, input, output,redirection,pipes, redirecting and piping with standard errors, Shell scripts,vi editing commands

LIST OF PRACTICALS

1. Demonstration of all the controls provided in windows control panel.
2. Exercise on Basics of windows.
3. Installation of Linux Operating System
4. Usage of directory management commands of Linux: ls, cd, pwd, mkdir, rmdir
5. Usage of File Management commands of Linux: cat, chmod,cp, mv, rm, pg, more, find
6. Use the general purpose commands of Linux: wc, od, lp, cal , date, who, whoami
7. Using the simple filters: pr, head, tail, cut, paste, nl, sort
8. Communication Commands: news, write, talk, mseg, mail, wall
9. Write a shell program that finds the factorial of a number.
10. Write a shell program that finds whether a given number is prime or not.
11. Write a shell program to find the average of three numbers.
12. Write a shell program that will convert all the text of the file from lowercase to uppercase.

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.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Operating System Concepts by Silberschatz, Galvin; Wiley Publication
2. Operating Systems by Stallings; Tata McGraw Hill.
3. Operating Systems- A Concept Based Approach by DhamDhare; Tata McGraw Hill Education Pvt Ltd , New Delhi

4. Operating Systems by Achyut S Godbole and AtulKahate; Tata McGraw Hill Education Pvt Ltd , New Delhi
5. Unleashed Linux by Tech Media Publishers, New Delhi
6. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

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

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	10	18
2.	10	18
3.	06	10
4	10	18
5	04	8
6	06	10
7	10	18
Total	56	100

4.5 E-COMMERCE AND DIGITAL MARKETING

L T P
2 - 4

RATIONALE

The course is designed to help you master the essential disciplines in digital marketing, including search engine optimization (SEO), social media, conversion optimization, web analytics, content marketing, email and mobile marketing. Digital marketing is one of the world's fastest growing disciplines.

LEARNING OUTCOMES

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

- understand concepts of E-Commerce.
- identify core concepts of digital marketing and the role of digital marketing in business.
- develop marketing strategies based on product, price, place and promotion objectives.
- understand how they can use digital marketing to increase sales and grow their business
- formulate marketing strategies that incorporate psychological and sociological factors which influence consumers.
- hands on experience in using Analytics Tools eg: Google Analytics for report extraction and campaign measurement.
- analyze marketing problems and provide solutions based on a critical examination of marketing information.
- understand the opportunities for deploying emerging digital marketing media and techniques.
- implement online campaigns for your business and marketing problems within the organization by learning AdWords Campaign Management

DETAILED CONTENTS

1. Electronics Commerce, advantages and disadvantages. E-Commerce Business model B2B, B2C, C2C, E-Governance. Four C's (Convergence, collaborative, computer content management and call center), Supply Chain Management.
(10 Periods)
2. E-Commerce Payment: (06 Periods)
Payment Gateway, Modes of Electronic Payment, Threats & protections for e-commerce payment system
3. Principles of Digital Marketing (06 Periods)
Defining Digital Marketing , Setting Digital Marketing Objectives, Set of activities of digital marketing: Search Engine Optimization, SEO, Search Engine Marketing – Google AdWords, Social Media Marketing: Facebook, LinkedIn, YouTube, Display Advertising – Contextual, Behavioral, Targeted, Content Marketing & Blogging,

Lead Generation : Marketing Offer – Attractive / Relevant Offer, Landing Page – Offer’s details with form, Conversion Page – Thank you page, Email Marketing, Video Marketing, Responsive Design, Google Analytics

4. Search Engine Optimization (10 Periods)

What is SEO?, Why SEO?, How Search Engine works?, Essential SEO guidelines for website owner, designer, blogger and content writer : Keyword Research - Creating Content Hierarchy, Brainstorming – Think and discuss them, Google Suggest, Related Searches, Google Keyword Planner, Keyword Tools, Google Trends – Finding Search Trends, Most Search Terms, How to translate keywords?, Organizing the keywords, Writing Headlines (Page Titles) with examples, Writing Summary (META Descriptions) with examples, SEO for Images, Structuring the Content- SEO-friendly Domain Name, SEO-friendly URL Structure, Plan your Site’s Hierarchy, Internal Linking – Site Navigation, How Google reads our pages?, Localized SEO, Website Speed Testing, HTML Improvements using Google Search Console, Links from YouTube Videos, Users’ Engagement , Links to Related Stories , Enable Social Sharing , Embedding videos , Enabling site search feature

5. Google AdWords (06 Periods)

Setting up Google AdWords Campaigns – that avails high ranking at low cost, Content Structuring, Understanding Quality Score, Finding and selecting the right Keywords, Keywords Matching Options, Campaign Setup procedure, Ads and Ad Groups, Organizing Ad Groups, Creating Effective Ads, Optimizing Landing Pages, Bid Management, Negative Keywords, Analytics – Measure and fine-tune, Remarketing Campaigns – How to configure, Setup and Monitor them?, YouTube Video Ad Campaigns

6. Google Analytics (08 Periods)

Getting Started with Google Analytics, Understanding Dashboard – Audience | Advertising | Traffic Source | Content | Conversions, Taking decisions based on Analytics Reporting, Defining Business Goals and Objectives, Tracking Social Media Traffic, Tracking SEO Traffic, Integrating your Google AdWords campaigns into Google Analytics, Measuring Tools and Methods, Measuring your Site’s ROI, Introduction to Goal Conversion – Tracking the Conversions, Configuring UTMs (Custom URLs), Google Tag Manager – a brief overview.

7. Social Media Marketing (10 Periods)

Social Media Marketing Strategy : Setting up Goals- Finding out where your targeted people connect, Popular Social Media Networks, KnowEm – Check Social Media Username Availability, Knowing your Audience - Google Alerts – Monitoring your brands, competitions, and industry trends using, TweetDeck – a monitoring tool similar to Google Alerts for Twitter, Hashtags – Best Practices & Tools, Facebook / Instagram / LinkedIn- Setting up a Facebook Business Page, Facebook Graph Search – SEO for Facebook, Facebook Fans vs Talking about this, Promoting your Page, Boost Post, Facebook/Instagram Advertising using Facebook Ads Manager, Remarketing/Retargeting using Facebook Custom Audiences, LinkedIn Advertising: Text Ads | Sponsored Content, Measuring Success- Fans, Likes, Comments & Share, Track performance using Google Analytics, UTM's – URL Builder, Bounce Rate, Time Spent on Site and Conversions!, Tracking Offline Conversions, Tracking your emails, Viral Videos Examples, Instagram, Facebook and Pinterest – Best Practices, Tips and Tools

INSTRUCTIONAL STRATEGY

Since the entire course content is web based, students can practice it online. The teachers should have practice on this framework. Entire course is hands-on based so practicals should be conducted in the laboratory.

MEANS OF ASSESSMENT

- Assignments
- Viva-voce
- Written examination
- Practical Tasks

LIST OF PRACTICALS

1. *Create SEO Friendly Web Pages*
2. *Submit Website in various search Engines*
3. *Content Writing*
4. *Build a Network of Partner Websites to Get Influence on the SERP and Jump up to 30+ Positions*
5. *Develop a Facebook Customized Page Tab*
6. *Create and Write a blog.*
7. *Write an email newsletter*
8. *Make a video and Youtube Channel*
9. *Create infographics*
10. *Create Google Adword Account and make use of Keyword Planner*

11. *Create and Use Google Analytics Account*
12. *Create “refer-a-friend” or “bookmark this page” links on your site*
13. *Create Google Map on Places for Business*
14. *Understanding Plagiarism Checker tools*
15. *Understanding various SEO Tools like woorank, seositecheckup, seoquake, similarweb, siteliner, etc.*
16. *Creating XML Sitemap and robot.txt files*

RECOMMENDED BOOKS

1. Digital Marketing by Vandana Ahuja, published by Oxford Publication
2. Fundamentals of Digital Marketing by Puneet Bhatia, published by Pearson.
3. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Times Allocated (Hrs.)	Marks Allocated (%)
1.	10	15
2.	06	10
3.	06	08
4.	10	15
5.	06	15
6.	08	15
7.	10	22
Total	56	100

4.6 ENERGY CONSERVATION

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RATIONALE

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

LEARNING OUTCOMES

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

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

DETAILED CONTENTS

1. Basics of Energy

- 1.1 Classification of energy- primary and secondary energy, commercial and non-commercial energy, non-renewable and renewable energy with special reference to solar energy, Capacity factor of solar and wind power generators.
 - 1.2 Global fuel reserve
 - 1.3 Energy scenario in India and state of U.P. Sector-wise energy consumption (domestic, industrial, agricultural and other sectors)
 - 1.4 Impact of energy usage on climate
2. Energy Conservation and EC Act 2001
 - 2.1 Introduction to energy management, energy conservation, energy efficiency and its need
 - 2.2 Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation.
 - 2.3 Standards and Labeling: Concept of star rating and its importance, Types of product available for star rating
3. Electrical Supply System and Motors
 - 3.1 Types of electrical supply system
 - 3.2 Single line diagram
 - 3.3 Losses in electrical power distribution system
 - 3.4 Understanding Electricity Bill: Transformers Tariff structure, Components of power (kW, kVA and kVAR) and power factor, improvement of power factor, Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)
 - 3.5 Transformers: Introduction, Losses in transformer, transformer Loading, Tips for energy savings in transformers
 - 3.6 Electric Motors
Types of motors, Losses in induction motors Features and characteristics of energy efficient motors, Estimation of motor loading, Variation in efficiency and power factor with loading, Tips for energy savings in motors
4. Energy Efficiency in Electrical Utilities
 - 4.1 Pumps: Introduction to pump and its applications, Efficient pumping system operation, Energy efficiency in agriculture pumps, Tips for energy saving in pumps
 - 4.2 Compressed Air System: Types of air compressor and its applications, Leakage test, Energy saving opportunities in compressors.

- 4.3 Energy Conservation in HVAC and Refrigeration System: Introduction, Concept of Energy Efficiency Ratio (EER), Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems.
5. Lighting and DG Systems
 - 5.1 Lighting Systems: Basic definitions- Lux, lumen and efficacy, Types of different lamps and their features, Energy efficient practices in lighting
 - 5.2 DG Systems: Introduction, Energy efficiency opportunities in DG systems, Loading estimation
6. Energy Efficiency in Thermal Utilities
 - 6.1 Thermal Basics: Thermal energy, Energy content in fuels, Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE)
 - 6.2 Energy Conservation in boilers and furnaces : Introduction and types of boilers, Energy performance assessment of boilers, Concept of stoichiometric air and excess air for combustion, Energy conservation in boilers and furnaces, Do's and Don'ts for efficient use of boilers and furnaces
 - 6.3 Cooling Towers: Basic concept of cooling towers, Tips for energy savings in cooling towers
 - 6.4 Efficient Steam Utilization
7. Energy Conservation Building Code (ECBC)
 - 7.1 ECBC and its salient features
 - 7.2 Tips for energy savings in buildings: New Buildings, Existing Buildings
8. Waste Heat Recovery and Co-Generation
 - 8.1 Concept, classification and benefits of waste heat recovery
 - 8.2 Concept and types of co-generation system
9. General Energy Saving Tips
Energy saving tips in:
 - 9.1 Lighting
 - 9.2 Room Air Conditioner
 - 9.3 Refrigerator
 - 9.4 Water Heater

- 9.5 Computer
 - 9.6 Fan, Heater, Blower and Washing Machine
 - 9.7 Colour Television
 - 9.8 Water Pump
 - 9.9 Cooking
 - 9.10 Transport
10. Energy Audit
- 10.1 Types and methodology
 - 10.2 Energy audit instruments
 - 10.3 Energy auditing reporting format

PRACTICAL EXERCISES

1. To conduct load survey and power consumption calculations of small building.
2. To check efficacy of different lamps by measuring power consumption and lumens using lux meter.
3. To measure energy efficiency ratio (EER) of an air conditioner.
4. To measure effect of valve throttling and variable frequency drive (VFD) on energy consumption by centrifugal pump.
5. To measure and calculate energy saving by arresting air leakages in compressor.
6. To measure the effect of blower speed on energy consumed by it.

STUDENT ACTIVITIES ON ENERGY CONSERVATION/ENERGY EFFICIENCY

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

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

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

Important Links:

- (i) Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India. www.beeindia.gov.in.
- (ii) Ministry of New and Renewable Energy (MNRE), Government of India. www.mnre.gov.in.
- (iii) Uttar Pradesh New and Renewable Energy Agency (UPNEDA), Government of Uttar Pradesh. www.upneda.org.in.
- (iv) Central Pollution Control Board (CPCB), Ministry of Environment, Forest and Climate Change, Government of India. www.epcb.nic.in.
- (v) Energy Efficiency Services Limited (EESL). www.eeslindia.org.
- (vi) Electrical India, Magazine on power and electrical products industry. www.electricalindia.in.

4.7 Universal Human Values

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Course Objectives

This introductory course input is intended

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

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

Course Methodology

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

The syllabus for the lectures is given below:

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

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

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self-Exploration—what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

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

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

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

1. *Understanding Harmony in the family – the basic unit of human interaction*
2. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;
 - a. Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship
3. Understanding the meaning of *Vishwas*; Difference between intention and competence

4. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
5. Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva*as comprehensive Human Goals
6. Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to world family!
 -Practice Exercises and Case Studies will be taken up in Practice Sessions.

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

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

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

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in professional ethics:
 - a) Ability to utilize the professional competence for augmenting universal human order
 - b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
 - c) Ability to identify and develop appropriate technologies and management patterns for above production systems.
5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order:
 - a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b) At the level of society: as mutually enriching institutions and organizations

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

Practical Session also Includes Different Yogic Exercises and Meditation Session

INSTRUCTIONAL STRATEGY

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

MEANS OF ASSESSMENT

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

Reference Material

The primary resource material for teaching this course consists of

a. The text book (Latest Edition)

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

b. The teacher's manual (Latest Edition)

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

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

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

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

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

Relevant websites, movies and documentaries: Value Education websites, <http://uhv.ac.in>, <http://www.aktu.ac.in>

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

SUGGESTED DISTRIBUTION OF MARKS

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

INDUSTRIAL TRAINING OF STUDENTS

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

This document includes guided and supervised industrial training of 4 weeks duration to be organised during the semester break starting after second year i.e. after 4th semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

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

An external assessment of 50 marks has been provided in the study and evaluation scheme of 5th Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

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

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

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