# Curriculum for
# Diploma Programme
# in

# COMMUNICATION AND COMPUTER NETWORKING

## For the State of Uttar Pradesh


**Compiled by:**

**IRDT, Kanpur**

**APPROVED AND IMPLEMENTED BY:**

**BOARD OF TECHNICAL EDUCATION,UTTAR PRADESH ,LUCKNOW**

**APPROVED IN CDC COMMITTEE MEETING OF BTE,UP,LKO DATED 26-09-2021**

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## PREFACE

An important issue generally debated amongst the planners and academician's 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 have 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 opens 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 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 from 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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## 1. SALIENT FEATURES OF DIPLOMA PROGRAMME IN COMMUNICATION AND COMPUTER NETWORKING

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

8) Industrial Training

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

9) Ecology and Environment :

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

10) Energy Conservation

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

11) Entrepreneurship Development

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

12) Student Centred Activities

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

13) Project work

A 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 COMMUNICATION AND COMPUTER NETWORKING

Diploma holders in Communication and Computer Networking 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) Tele-Communication Engineering and related Departments
(23) AIR, Doordarshan
(24) Radar and Wireless domain
(25) Defence Services, Para-military Forces

(26) Civil Aviation

(27) Electricity Boards and Corporations etc.

(28) PCB Design and Fabrication Industry

(29) Consumer Electronics Industry

(30) Electronic Components and Devices Manufacturing and Installation Organizations

(31) Computer Assembling and Computer Peripheral Industry;

(32) Instrumentation and Control Industries

(33) Internet Server Providers

(34) Mobile Phone assembly Industries

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

- 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
- Marketing and Sales (Distributors - whole sale and retailers)
- Service Sector( repair and Maintenance; job work)
- Cable laying and jointing DBs etc.
- Preparing Simulated Models

Various Designations for Diploma Holders in Communication and Computer Networking

(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 COMMUNICATION AND COMPUTER NETWORKING

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 |
| 36. | Use cutting tools, equipment and tooling for fabrication of jobs by following safe practices at workplace |
| 37. | Use appropriate instruments to measure various engineering parameters. |
| 38. | Measure and compute parameters related to basic electrical engineering |
| 39. | Assemble, test and troubleshoot electronic circuits consisting of passive and active components by applying appropriate soldering, testing and measurementtechniques at workplaces. |
| 40. | Understand principles of communication engineering. |
| 41. | Understand basic principles of digital electronics and design combinational and sequential circuits. |
| 42. | Use microprocessor and microcontroller based system using assembly levellanguage programming |
| 43. | Carryout trouble shooting of different basic consumer electronic products like TV, Audio system and mobile. |

## 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<br>Student Centred Activities |
| 2. | Apply basic principles of mathematics and science to solve engineering problems | Applied Mathematics<br>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. | Repair & Maintenance of Computer System & it‟s peripherals | PC & Peripheral Architecture |
| 7. | Write, compile and debug programmes using different programming constructs | Computer Programming Using Python |
| 8. | Different Logic and concept of programming | Data Structure Using Python |
| 9. | Use appropriate procedures for energy conservation and for preventing environmental pollution | Environmental Studies |
| 10. | Assemble, test and troubleshoot electronic circuits consisting of passive and active components by applying appropriate soldering, testing and measurement techniques at workplaces. | Electronic Devices and Circuits |
| 11. | Creating network cables, Setting up network (Wired & Wireless), Perform soldering & desoldering of circuits & components | Basic Networking |
| 12. | Understand basic principles of digital electronics and design combinational and sequential circuits. | Digital Electronics |
| 13. | Network Routing Handling, Setup & Configuration of network switches, Managing network server | Advance Networking |
| 14. | Implement OOPS concepts and data structure concepts. | Object Oriented Programming Using Java |

| | | |
|---|---|---|
| 15. | Use appropriate instruments to measure various engineering parameters . | Electronic Instruments and Measurement |
| 16. | Use different digital communication systems | Principles of Communication Engineering |
| 17. | Manage resources MIS/ERP effectively at the workplace | Industrial Management and Entrepreneurship Development |
| 18. | Use microprocessor and microcontroller based system using assembly level language programming | Microprocessors and peripheral devices |
| 19. | Understand principles of communication engineering . | Digital Communication |
| 20. | Installation and configuration of Servers, Linux based network operations | System administration |
| 21. | Use various functions and components of different operating systems | Operating Systems |
| 22. | Use open source tools and software, Handle malware and viruses | Information Security And IT Laws |
| 23. | Set up IOT devices and wireless networking | Internet of Things |
| 24. | Use modern communication system | Wireless and Mobile communication System |
| 25. | Manage cloud application | Cloud Computing |
| 26. | understand the network protocols governing the mobile communication | Mobile Communication |
| 27. | Learn WAN basics.<br>Knowledge the ISDN services | Wide Area Network |
| 28. | Apply the acquired knowledge and skills in solving live problems in the Computer and I.T. industry | – Minor Project Work<br>– Major Project Work |

## 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. PC & Peripheral Architecture
13. Computer Programming using Python
14. Office Automation Tools
15. Data Structure Using Python
16. Electronic Devices and Circuits
17. Basic Networking
18. Digital Electronics
19. Advance Networking
20. Object Oriented Programming with java
21. Electronic Instruments and Measurement
22. Principles of Communication Engineering
23. Microprocessors and Peripheral device
24. Digital Communication
25. System Administration
26. Operating System
27. Information security & IT Laws

28. Internet of Things

29. Wireless and Mobile Communication System

**e) Industrial Training**

30. Minor Project Work

31. Major Project Work

**f) Elective**

32. Cloud Computing

33. Mobile Computing

34. Wide Area Network

## 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. | PC & Peripheral Architecture | - | 9 | - | - | - | - |
| 10. | Computer Programming using Python | - | 10 | - | - | - | - |
| 11. | Office Automation Tools | - | 6 | - | - | - | - |
| 12. | Data Structure Using Python | - | - | 8 | - | - | - |
| 13. | Environmental Studies | - | - | 5 | - | - | - |
| 14. | Electronic Devices and Circuits | - | - | 10 | - | - | - |
| 15. | Basic Networking | - | - | 8 | - | - | - |
| 16. | Digital Electronics | - | - | 8 | - | - | - |
| 17. | Universal Human Values | - | - | 3 | - | - | - |
| 18. | Advance Networking | - | - | - | 12 | - | - |
| 19. | Object Oriented Programming with java | - | - | - | 8 | - | - |
| 20. | Electronic Instruments and Measurement | - | - | - | 8 | - | - |
| 21. | Principles of Communication Engineering | - | - | - | 8 | - | - |
| 22. | Energy Conservation | - | - | - | 5 | - | - |
| 23. | Industrial Management & Entrepreneurship Development | - | - | - | - | 5 | - |
| 24. | Microprocessors and Peripheral device | - | - | - | - | 8 | - |
| 25. | Digital Communication | - | - | - | - | 10 | - |
| 26. | System Administration | - | - | - | - | 10 | - |
| 27. | Operating System | - | - | - | - | 8 | - |
| 28. | Minor Project Work | - | - | - | - | 6 | - |
| 29. | Information security & IT Laws | - | - | - | - | - | 8 |
| 30. | Internet of Things | - | - | - | - | - | 12 |
| 31. | Wireless and Mobile Communication System | - | - | - | - | - | 10 |
| 32. | Elective | - | - | - | - | - | 8 |
| 33. | Major Project Work | - | - | - | - | - | 8 |
| 34. | Student Centred Activities | 2 | 2 | 1 | 1 | 1 | 2 |
| **Total** | | **48** | **48** | **48** | **48** | **48** | **48** |

**7.STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN COMMUNICATION AND COMPUTER NETWORKING**

**FIRST SEMESTER**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 1.1 | *Communication 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 and self study etc.

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN COMMUNICATION AND COMPUTER NETWORKING

**SECOND SEMESTER**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 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 ElectronicsEngineering | 5 | - | 4 | 5 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 2.4 | ^PC & Peripheral Architecture | 3 | - | 6 | 5 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 2.5 | Computer Programming using Python~ | 4 | - | 6 | 5 | 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** | | **22** | **-** | **26** | **27** | **100** | **160** | **260** | **250** | **-** | **220** | **-** | **470** | **730** |

* Common with other Engineering diploma Programmes

** Common course with Computer Science and Engineering

~ Common with PGDCA

^ Common with PGCHN

\+ Common with Diploma in Electronics Engineering

\# 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.

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN COMMUNICATION AND COMPUTER NETWORKING

**THIRD SEMESTER**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 3.1 | *Applied Mathematics-III | 5 | - | - | 4 | 20 | - | 20 | 50 | 2 ½ | - | | 50 | 70 |
| 3.2 | ~Data Structure Using Python | 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 | + Electronic Devices and Circuits | 5 | - | 5 | 7 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 3.5 | ^Basic Networking | 4 | | 4 | 6 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 3.6 | **Digital Electronics | 4 | - | 4 | 6 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 3.7 | Universal Human Values | 2 | - | 1 | 1 | - | 20 | 20 | - | - | 30 | 3 | 30 | 50 |
| # Student Centred Activities | | - | - | 1 | 1 | - | 30 | 30 | - | - | - | - | - | 30 |
| **Total** | | 27 | **-** | **21** | 33 | 120 | **180** | **300** | **300** | **-** | **250** | **-** | **550** | **850** |

* Common with other Engineering diploma Programmes

** Common course with Computer Science and Engineering

~ Common with PGDCA

^ Common with PGCHN

\+ Common with Diploma in Electronics Engineering

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

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN COMMUNICATION AND COMPUTER NETWORKING

**FOURTH SEMESTER**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 4.1 | *Communication Skill-II | 4 | - | 2 | 4 | 20 | 10 | 30 | 50 | 2 ½ | 20 | 3 | 70 | 100 |
| 4.2 | ~ Advance Networking | 6 | - | 6 | 6 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 4.3 | **Object Oriented Programming with java | 4 | -- | 4 | 5 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 4.4 | +Electronic Instruments andMeasurement | 4 | - | 4 | 5 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 4.5 | +Principles of Communication Engineering | 4 | - | 4 | 5 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 4.6 | *Energy Conservation | 3 | - | 2 | 3 | 20 | 10 | 30 | 50 | 2 ½ | 20 | 3 | 70 | 100 |
| #Student Centred Activities (SCA) | | - | - | 1 | 1 | - | 30 | 30 | - | - | - | - | - | 30 |
| **Total** | | 25 | **-** | **23** | 29 | 120 | **170** | **290** | **300** | **-** | **240** | **-** | **540** | **830** |

* Common with other Engineering diploma Programmes

** Common course with Computer Science and Engineering

~ Common with PGDCA

^ Common with PGCHN

\+ Common with Diploma in Electronics Engineering

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

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

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN COMMUNICATION AND COMPUTER NETWORKING

**FIFTH SEMESTER**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| - | Industrial Training | - | | - | 2 | - | - | - | - | - | 50 | 3 | 50 | 50 |
| 5.1 | *Industrial Management & Entrepreneurship Development | 5 | - | - | 4 | 20 | - | 20 | 50 | 2 ½ | - | - | 50 | 70 |
| 5.2 | +Microprocessors and Peripheral device | 4 | - | 4 | 5 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 5.3 | Digital Communication | 4 | - | 6 | 6 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 5.4 | ^System Administration | 4 - | | 6 | 6 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 5.5 | **Operating System | 4 | - | 4 | 5 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 5.6 | Minor Project Work | - | - | 6 | 2 | - | 40 | 40 | - | - | 60 | 3 | 60 | 100 |
| #Student Centred Activities (SCA) | | - | - | 1 | 1 | | 30 | 30 | - | - | - | - | - | 30 |
| **Total** | | 21 | **-** | **27** | 31 | 100 | **190** | **290** | **250** | **-** | **310** | **-** | **560** | **850** |

* Common with other Engineering diploma Programmes

** Common course with Computer Science and Engineering

~ Common with PGDCA

^ Common with PGCHN

+ Common with Diploma in Electronics Engineering

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

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN COMMUNICATION AND COMPUTER NETWORKING**

**SIXTH SEMESTER**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 6.1 | ^Information security & IT Laws | 4 - | | 4 | 5 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 6.2 | **Internet of Things | 6 | - | 6 | 7 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 6.3 | +Wireless and Mobile Communication System | 4 | - | 6 | 6 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 6.4 | Elective | 4 | - | 4 | 5 | 20 | 30 | 50 | 50 | 2 ½ | 50 | 3 | 100 | 150 |
| 6.5 | Project Work | - | - | 8 | 3 | - | 50 | 50 | - | - | 100 | 4 | 100 | 150 |
| #Student Centred Activities (SCA) | | - | - | 2 | 1 | | 30 | 30 | - | - | - | - | - | 30 |
| **Total** | | 18 | | **30** | 27 | 80 | **200** | **280** | **200** | **-** | **300** | **-** | **500** | **780** |

* Common with other Engineering diploma Programmes
** Common course with Computer Science and Engineering
~ Common with PGDCA
^ Common with PGCHN
+ Common with Diploma in Electronics Engineering

Elective: Any one out of the following:
6.4.1 Cloud Computing ** 6.4.2 Mobile Computing 6.4.3 Wide Area Network
# Student Centred Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g.photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

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

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

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

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

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

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

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

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

## 1.1 COMMUNICATION SKILLS – I

| L | T | P |
|---|---|---|
| 4 | - | 2 |

**RATIONALE**

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

**LEARNING OUTCOMES**

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

.

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

.

**DETAILED CONTENTS**

1 Basics of Communication (13 periods)

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

2 Application of Grammar (18 periods)

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

3 Reading Skill (10 periods)

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

4 Writing Skill (15 periods)

4.1 Picture composition
4.2 Writing paragraph
4.3 Notice writing

## LIST OF PRACTICALS

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

**Listening and Speaking Exercises**

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

## INSTRUCTIONAL STRATEGY

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

## MEANS OF ASSESSMENT

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

## RECOMMENDED BOOKS


1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; DhanpatRai Publications, New Delhi.
3. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. Excellent General English-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra

5. The Functional aspects of Communication Skills – Dr. P. Prsad, S.K. Katria & Sons, New Delhi
6. Q. Skills for success – Level & Margaret Books, Oxford University Press.
7. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.


**Websites for Reference:**

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

## SUGGESTED DISTRIBUTION OF MARKS

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

## 1.2 APPLIED MATHEMATICS - I

| L | T | P |
|---|---|---|
| 5 | - | - |

**RATIONALE**

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

**LEARNING OUTCOMES**

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

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

**DETAILED CONTENTS**

1. Algebra -I (12 Periods)

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

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

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

2. Algebra- II (12 Periods)

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

   2.2 Complex number.

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

3. Trigonometry (10 Periods)

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

   3.2 Inverse circular functions : Simple case only

4. Differential Calculus - I (18 Periods)

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

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

5. Differential Calculus - II (18 Periods)

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

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

**INSTRUCTONAL STRATEGY**

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

**MEANS OF ASSESSMENT**

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

**RECOMMENDED BOOKS**


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

## SUGGESTED DISTRIBUTION OF MARKS

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

## 1.3 APPLIED PHYSICS – I

| L | T | P |
|---|---|---|
| 5 | - | 2 |

**RATIONALE**

Applied physics includes the study of a diversified topics related to the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this course content.

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

**LEARNING OUTCOMES**

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

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

**DETAILED CONTENTS**

1. Units and Dimensions (10 Periods)

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

   1.2 Dimensions and dimensional formulae of physical quantities.

1.3 Principle of homogeneity of dimensions

1.4 Dimensional equations and their applications, conversion of numerical values of physical quantities from one system of units into another, checking the correctness of physical equations and deriving relations among various physical quantities

1.5 Limitations of dimensional analysis

1.6 Error in measurement, accuracy and precision of instruments, random and systematic errors, absolute error, relative error, and percentage error, Estimation of probable errors in the results of measurement (combination of errors in addition, subtraction, multiplication, division and powers), rules for representing significant figures in calculation.

1.7 Application of units and dimensions in measuring length, diameter, circumference, volume, surface area etc. of metallic and non metallic blocks, wires, pipes etc (at least two each).

2. Force and Motion (10 periods)

2.1 Scalar and vector quantities – examples, representation of vector, types of vectors

2.2 Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Scalar and Vector Product.

2.3 Resolution of Vectors and its application to lawn roller.

2.4 Force, Momentum, Statement and Derivation of Conservation of linear momentum, its applications such as recoil of gun.

2.5 Impulse and its Applications

2.6 Circular motion (Uniform and Non-uniform), definition of angular displacement, angular velocity, angular acceleration, frequency, time period.

2.7 Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical)

2.8 Central force, Expression and Applications of Centripetal and centrifugal forces with examples such as banking of roads and bending of cyclist, Principle of centrifuge.

2.9 Application of various forces in lifts, cranes, large steam engines and turbines

3. Work, Power and Energy (10 periods)

3.1 Work: and its units, examples of zero work, positive work and negative work, conservative and non-conservative force,

3.2 Friction: modern concept, types, laws of limiting friction, Coefficient of friction and its Engineering Applications.

3.3 Work done in moving an object on horizontal and inclined plane for rough and plane surfaces with its applications

3.4 Energy and its units: Kinetic energy and potential energy with examples and their derivation, work energy theorem.

3.5 Principle of conservation of mechanical energy for freely falling bodies, examples of transformation of energy.

3.6 Power and its units, calculation of power in numerical problems

3.7 Application of Friction in brake system of moving vehicles, bicycle, scooter, car trains etc.

4 Rotational Motion (10 periods)

4.1 Concept of translatory and rotatory motions with examples

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

5 Motion of planets and satellites (08 periods)

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

6. Properties of Matter (12 periods)

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

7. Heat and Thermodynamics (10 periods)
7.1 Difference between heat and temperature
7.2 Modes of transfer of heat (Conduction, convection and radiation with examples)
7.3 Different scales of temperature and their relationship
7.4 Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them
7.5 Heat conduction in a metal rod, Temperature gradient, Concept of Co-efficient of thermal conductivity, Uses and effects of Heat conduction in Daily life.
7.6 Isothermal and Adibatic process
7.7 Zeroth, First and second law of thermodynamics, Heat engine (concept Only), Carnot cycle.
7.8 Application of various systems of thermometry in refrigeration and air-conditioning etc.

**LIST OF PRACTICALS (to perform minimum six experiments)**

1 To find radius of wire and its volume and the maximum permissible error in these quantities by using both vernier calipers and screw gauge.
2 To find the value of acceleration due to gravity on the surface of earth by using a simple pendulum.
3 To determine the Radius of curvature of (i) convex mirror, (ii) concave mirror by spherometer
4 To verify parallelogram law of forces
5 To study conservation of energy of a ball or cylinder rolling down an inclined plane.
6 To find the Moment of Inertia of a flywheel about its axis of rotation

7 To determine the atmospheric pressure at a place using Fortin's Barometer
8 To determine the viscosity of glycerin by Stoke's method
9 To determine the coefficient of linear expansion of a metal rod
10 To determine force constant of spring using Hooks law

**INSTRUCTIONAL STATREGY**

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

**MEANS OF ASSEMENTS**

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

**RECOMMENDED BOOKS**


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

## SUGGESTED DISTRIBUTION OF MARKS

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

## 1.4 APPLIED CHEMISTRY

| L | T | P |
|---|---|---|
| 5 | - | 2 |

**RATIONALE**

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

**LEARNING OUTCOMES**

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

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

**DETAILED CONTENTS**

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

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

   1.5 Aufbau's principle, Pauli's exclusion principle and Hund's rule electronic configuration of elements with atomic number (Z) = 30 only. (Electronic configurations of elements with atomic number greater than 30 are excluded).
   1.6 Modern periodic law and periodic table, groups and periods, classification of elements into s, p, d and f blocks (periodicity in properties - excluded)
   1.7 Chemical bonding and cause of bonding and types such as ionic bond in NaCl sigma ($\sigma$) and pi ($\pi$) covalent bonds in $H_2$, HCl, $Cl_2$, elementary idea of hybridization in $BeCl_2$, $BF_3$, $CH_4$, $NH_3$ and $H_2O$, VSEPR, Molecular orbital Theory

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

2. Fuels and Lubricants (18 periods)

2.1 Definition of fuel, classification of fuels, characteristics of good fuel, relative merits of gaseous, liquid and solid fuels
2.2 Calorific value-higher calorific value, lower calorific value, determination of calorific value of solid or liquid fuel using Bomb calorimeter and numerical examples.
2.3 Coal - types of coal and proximate analysis of coal
2.4 Fuel rating – Octane number and Cetane number, fuel-structural influence on Octane and Cetane numbers
2.5 Gaseous fuels – chemical composition, calorific value and applications of natural gas (CNG), LPG, producer gas, water gas and biogas.
2.6 Elementary ideal on – hydrogen as future fuels, nuclear fuels.
2.7 Lubricants: Definition and properties, mechanism, industrial application and its function in bearings.
2.8 Synthetic lubricants and cutting fluids.

3. Water (14 periods)

3.1 Demonstration of water resources on Earth using pie chart.
3.2 Classification of water – soft water and hard water, action of soap on hard water, types of hardness, causes of hardness, units of hardness – mg per liter ($mgL^{-1}$) and part per million (ppm) and simple numerical, pH and buffer solutions and their applications.
3.3 Disadvantages caused by the use of hard water in domestic and boiler feed water. Primming and foaming and caustic embrittlement in boilers.
3.4 Removal of hardness -Permutit process and Ion-exchange process.
3.5 Physico-Chemical methods for Water Quality Testing
a) Determination of pH using pH meter, total dissolved solids (TDS)
b) Testing and Estimation of- alkalinity, indicator their types and application total hardness by EDTA method and O'Hener's Method. (chemical reaction of EDTA method are excluded).
c) Understanding of Indian Water Quality standards as per WHO
3.6 Natural water sterilization by chlorine and UV radiation and reverse osmosis.

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

4. Electrochemistry (4 periods)

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

5. Corrosion and its Control (10 periods)

5.1 Definition of corrosion and factors affecting corrosion rate.
5.2 Theories of
a) Dry (chemical) corrosion- Pilling Bedworth rule
b) Wet corrosion in acidic atmosphere by hydrogen evolution mechanism
5.3 Definition of passivity and galvanic series
5.4 Corrosion control:

a) Metal coatings – Cathodic protection, Cementation on Base Metal Steel –Application of Metal Zn (Sheradizing),Cr (Chromozing) and Al (Calorizing), Sacrificial protection and impressed current voltage
b) Inorganic coatings – Anodizing and phosphating,
c) Organic coatings - use of paints varnishes and enamels
d) Internal corrosion preventive measures- alloying (with reference to passivating, neutralizing and inhibition) and heat treatment (quenching, annealing)

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

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

**LIST OF PRACTICALS**

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

**INSTRUCTIONAL STRATEGY**

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

**MEANS OF ASSEMENTS**

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

**RECOMMENDED BOOKS**


1. Chemistry in Engineering by J.C. Kuricose & J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C. Jain & Monika Jain, Dhanapat Rai Publishing Company, New Delhi.
3. Eagle's Applied Chemistry - I by S. C. Ahuja & G. H. Hugar, Eagle Prakashan, Jalandhar.
4. Engineering Chemistry – A Text Book by H. K. Chopra & A. Parmar, Narosa Publishing House, New Delhi.
5. Applied Chemistry - I by Dr. P. K Vij & Shiksha Vij, Lords Publications, Jalandhar.

6. Engineering Chemistry by Dr. Himanshu Pandey, Goel Publishing House, Meerut, India
7. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

**SUGGESTED DISTRIBUTION OF MARKS**

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

## 1.5 FUNDAMENTALS OF COMPUTER AND INFORMATION TECHNOLOGY

| L | T | P |
|---|---|---|
| 3 | - | 4 |

**RATIONALE**

The diploma holders in Computer Engineering needs to understand computer fundamentals and information technology. They should be able to operate basic software related to computer. Hence this subject is introduced in the curriculum.

**LEARNING OUTCOMES**

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

- Understand a computer system that has hardware and software components, which controls and makes them useful.
- Understand the operating system as the interface to the computer system.
- Outline various application of IT
- Differentiate between assembly and high level language
- Identify various web browser
- Use the Internet to send mail and surf the World Wide Web

**DETAILED CONTENTS**

1. Fundamentals of Computer (12 Periods)

   Historical evolution of computers, Generations of computers, Classification of computers - based on size, processor, Usefulness of Computers. Applications of computers, Block Diagram along its components and characteristics, Interaction between the CPU, Memory Input/output devices, function of CPU and major functional parts of CPU. State the relevance of speed and word length for CPU Performance, Recognize the current family of CPUs used in Computers, Types of Memory- RAM ROM, Monitor, Mouse, Keyboard, Disk, joysticks, Storage Devices, floppy disk, CD, DVD, Pen drive, trackballs, Printers Types of printers, Scanner, Modem, Video, Sound cards, Speakers

2. Data Representation (08 Periods)

   Definition Of Information, difference between data and information ,importance of Binary Number System, various number systems, Conversion from Decimal to Binary, Conversion from Binary to Decimal, binary number into hexadecimal number, hexadecimal number into binary number System, Memory Addressing and its Importance, ASCII and EBCDIC coding System

3. DOS & Windows Operating Systems (10 Periods)

   Hardware and Software, Types of Softwares, Introduction and need of operating system, Types of operating system, dos operating system, Types of dos Commands, operating system as a resource manager; BIOS; System utilities - Editor, Loader, Linker, File Manager. Concept of GUI and CUI standards. Directories and files , wild cards, autoexec.bat, config.says, features of Window desktop, components of Window, function of each component of Window, method of starting a program using

start button, Understand maximize, minimize, restore down and close button, uses of file and folder, method of viewing the contents of hard disk drive using explore option, control panel,disk defragmentation installation and un installation of the application software.

4. Fundamentals of Internet (12 Periods)

Concepts of computer Network, Client Server Model, Peer to Peer Model, Networking Devices: Switch, Router, Hub, Bridge, Gateway, LAN, MAN, WAN, Topology, Internet, Intranet, Extranet, internet service provider and its relevance, role of the modem in accessing the internet, installation procedure of a modem using control panel, purpose of web browser software, URL,URI, URN, WWW, FTP,HTTP,RDC(Remote Desktop Connection), Telnet, Email, process of sending and receiving e-mail, transmission modes, IP address and its format, MAC Address, DNS, search engines, social network sites, internet security, Firewall, Cloud Computing and its services

**LIST OF PRACTICALS**

1. Familiarization with Computer System and its peripheral devices
2. Familiarization with Operating System
3. Practice of internal and external commands of DOS
4. Working practice on windows operating system : creating file, folder. Copying, moving, deleting file, folder
5. Installing and uninstalling of new software using control panel.
6. Installation and uninstallation of new hardware drivers using control panel.
7. Disk defragmentation using system tool
8. Procedure of disk partition and its operation (Shrinking, Extending, Delete, Format).
9. Installation of Operating Systems
10. Changing resolution, colour, appearances, and screensaver option of the display
11. Changing System Date and Time.
12. User Account creation and its feature on Windows Operating System
13. Email Account creation, reading, writing and sending emails with attachments.
14. Internet browsing using browsers.
15. Using of Search Engine to get information from internet

**INSTRUCTIONAL STRATEGY**

Since this subject is practice oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts, peripherals, connectors etc. and proficient in making use of operating system functionalities in addition to working on internet. The student should be made capable of working on computers independently

**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. Fundamentals of Computer by E Balagurusamy,Tata McGraw Hill EducationPvt. Ltd, New Delhi
2. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
3. Computer Fundamentals by RS Salaria; Khanna Book Publishing Co. (P) Ltd., New Delhi
4. Computers Today by SK Basandara, Galgotia publication Pvtltd. Daryaganj, New Delhi.
5. Computer Fundamentals and Programming in C by ReemaThareja; Oxford University Press, New Delhi
6. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
7. e-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 | 12 | 30 |
| 2 | 08 | 20 |
| 3 | 10 | 25 |
| 4 | 12 | 25 |
| **Total** | **42** | **100** |

## 1.6 TECHNICAL DRAWING

| L | T | P |
|---|---|---|
| - | - | 6 |

**RATIONALE**

The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. Understand the fundamentals of Engineering Drawing. Read and interpret object drawings.

**LEARNING OUTCOMES**

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

- Draw orthographic projections of different objects.
- Visualize three dimensional objects and draw Isometric Projections.
- Use the techniques and able to interpret the drawing in Engineering field.
- Draw exploded views of components & assemblies in preparation of service drawing.
- Draw free hand sketches of the schematic diagrams of electronic circuits, using standard symbols.
- Prepare drawing from the rough sketches provide and/or enlarge/reduce the given drawing to the desired scale.

**DETAILED CONTENTS**

1. Drawing Instruments and their uses

   Letters and numbers (single stroke vertical), Convention of lines and their applications. Scale (reduced, enlarged & full size) plain scale and diagonal scale. Sheet layout. Geometrical constructions.

2. Active Devices

   Semiconductor : Rectifier diode, Zener diode, Varacter diode, Tunnel diode, Photo, Light emitting diode (LED), Bipolar transsitor, junction field effect transistor (JFET), Mosfet, Photo transistor, Uni junction transistor (UTJ), Silicon control rectifier (SCR), Diac, Triacs outlines ( with their types numbers e.g TO3, TO5, TO18, TO39, TO65 etc) of the different types of semiconductor diodes, Transistors Scrs, Diacs, Triacs and ICs (along with indicators for pin identification etc.)

3. Orthographic projections

   Introduction to Orthographic projections. Conversion of pictorial view into Orthographic, Views (First Angle Projection Method Only), Dimensioning technique as per SP-46

4. Isometric projection

   Isometric scale, Conversion of orthographic views into isometric View/projection(Simple objects) Projection of Straight Lines and Planes. (First Angle Projection Method only)

**5.** Logic gates (With the help of rough sketch/clues given)

   Draw standard symbols of NOT, AND, NAND, OR, NOR XOR, Expandable & Tristate gates, Op, Amp, Ic, Flip-flops (Combination of 2,3,4 input gates should be drawn).

6. Graphical Representation of data

   General concept, selection of variables & curve fitting, curve indentification zero-point location. Use of various graph paper and preparation of diagram from given data. Bar charts, pie graph, pictorial graph.

**7.** Circuit Diagram (With the help of rough sketch/clues given**)**

   Circuit of UPS, Block diagram of an Electronic multimeter, Circuit of Modem, Circuit diagram of Voltage stabilizers, Connection wiring diagrams, Point to point pictorial, P.C.B layout of a single electronic circuit on a graph sheet. Keeping in view the actual size of the components.

**INSTRUCTIONAL STRATEGY**

Teacher should show model of realia of the component/part whose drawing is to be made. Emphasis should be given on cleanliness, dimensioning and layout of sheet. Focus should be on proper selection of drawing instruments and their proper use. Students must use H grade pencils for the first few (10 sheets), till they are familiar with the proper thickness of all type of lines. Relevant IT tools to be used to state that 3D solid modelling, which is to be taught at the starting point. Also how 2D views can be obtained from 3D solid modelling to 2D views rather than the conventional method of making the students visualize the 3D view of an object by mentally constructing it from the 2D views

**MEANS OF ASSESSMENT**

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

**RECOMMENDED BOOKS**


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


**Websites for Reference:**

http://swayam.gov.in
http://spoken-tutorial.org

## 1.7 WORKSHOP PRACTICE

**(**Common for Computer Science and Engineering and Information Technology )

| L | T | P |
|---|---|---|
| - | - | 8 |

**RATIONALE**

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

**LEARNING OUTCOMES**

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

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

**DETAILED CONTENTS (PRACTICAL EXERCISES)**

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

The following shops are included in the syllabus:

1 Fitting Shop
2 Sheet Metal Shop
3 Carpentry Shop
4 Painting and Polishing Shop

**1. FITTING SHOP**

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

1.7 Job Practice

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Job I Marking of job, use of marking tools, filing and use of measuring instruments. (Vernier caliper, Micrometer and Vernier height gauge).

Job II Filing a rectangular/square piece to maintain dimensions within an accuracy of ± .25 mm.

Job III **M**aking a cut-out from a square piece of MS flat using hand hacksaw and chipping

Job IV Drilling and tapping practice on MS Flat.

## 2. SHEET METAL SHOP

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

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

2.3 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine,

2.4 Introduction and demonstration of various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheet etc.

2.5 Study of various types of nuts, bolts, rivets, screws etc.

2.6 Job Practice

Job I: Shearing practice on a sheet using hand shears.

Job II: Practice on making Single riveted lap joint/Double riveted lap Joint.

Job III: Practice on making Single cover plate chain type, zig-zag type and single rivetted Butt Joint.

## 3. CARPENTRY SHOP

3.1 General Shop Talk

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

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

3.1.3 Specification of tools used in carpentry shop.

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

3.1.5 Seasoning of wood.

3.2. Practice

3.2.1 Practices for Basic Carpentry Work

3.2.2 Sawing practice using different types of saws

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

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

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

3.3 Job Practice

Job 1 Marking, sawing, planning and chiselling and their practice

Job II Half Lap Joint (cross, L or T – any one)
Job III Mortise and Tenon joint (T-Joint)
Job IV Dove tail Joint (Lap or Bridle Joint)

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

## 4. PAINTING AND POLISHING SHOP

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

4.2. Job Practice

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

Job II: To prepare metal surface for painting, apply primer and paint the same.

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

The sequence of polishing will be as follows:

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

**MEANS OF ASSESSMENT**

- Workshop jobs
- Report writing
- presentation
- Viva voce

**RECOMMENDED BOOKS**


1. Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
6. Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Co., New Delhi
7. Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi.

## 2.1 APPLIED MATHEMATICS - II

| L | T | P |
|---|---|---|
| 5 | - | - |

**RATIONALE**

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

**LEARNING OUTCOMES**

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

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

**DETAILED CONTENTS**

1. Integral Calculus - I (20 Periods)

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

2. Integral Calculus – II (20 Periods)

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

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

   3.1 Circle

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

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

   4.1 Straight lines and planes in space

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

**INSTRUCTONAL STRATEGY**

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

**MEANS OF ASSESSMENT**

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

**RECOMMENDED BOOKS**


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


**SUGGESTED DISTRIBUTION OF MARKS**

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

## 2.2 APPLIED PHYSICS – II

| L | T | P |
|---|---|---|
| 5 | - | 2 |

**RATIONALE**

Applied physics includes the study of a diversified topics related to the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this course content.

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

**LEARNING OUTCOMES**

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

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

**DETAILED CONTENTS**

1. Wave motion and its applications (12 periods)

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

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

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

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

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

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

2. Wave Optics (6 periods)

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

2.2 ,Two-Source Interference, Double-Slit interference, Interference due to thin films, Fresnel's biprism.

2.3 use of interference making highly efficient solar panel.

2.4 diffraction, Single Slit diffraction, Intensity calculation etc

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

3. Electrostatics (12 periods)

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

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

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

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

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

4. Current Electricity (12 periods)

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

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

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

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

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

5. Magneto Statics and Electromagnetism (12 periods)

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

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

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

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

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

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

6. Semiconductor physics (8 periods)

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

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

6.3 Semiconductor transistor, pnp and npn (concepts only)

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

7. Modern Physics (8 Periods)

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

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

7.3 Introduction to nanotechnology, nanoparticles and nano materials,

**LIST OF PRACTICALS** (To perform minimum six experiments)

1. To determine the velocity of sound with the help of resonance tube.
2. To find the focal length of convex lens by displacement method.
3. To find the refractive index of the material of given prism using spectrometer.
4. To find the wavelength of sodium light using Fresnel's biprism.
5. To verify laws of resistances in series and parallel combination
6. To verify ohm's laws by drawing a graph between voltage and current.
7. To measure very low resistance and very high resistances using Slide Wire bridge
8. Conversion of Galvanometer into an Ammeter and Voltmeter of given range.
9. To draw hysteresis curve of a ferromagnetic material.
10. To draw characteristics of a pn junction diode and determine knee and break down voltages.
11. To find wave length of the laser beam.
12. To find numerical aperture of an optical fiber.

## INSTRUCTIONAL STATREGY

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

## MEANS OF ASSESSMENT

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

## RECOMMENDED BOOKS


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


## SUGGESTED DISTRIBUTION OF MARKS

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

## 2.3 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

| L | T | P |
|---|---|---|
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**RATIONALE**

The objective of the course is to impart basic knowledge and skills regarding basic electrical engineering, which diploma holders will come across in their professional life. This course will provide the students to understand the basic concepts and principles of d.c. and a.c. fundamentals, electromagnetic induction, batteries, transformers, motors distribution system, domestic installation, electrical safety etc. The students will also learn basic electronics including diodes and transistors and their applications.

**LEARNING OUTCOME**

After Undergoing the subject, the students will be able to

- Understand the meaning of basic electrical quantities such as voltage, current, power etc.
- Use working principle of transformer.
- Use basic Network Theorem and Kirchoff's laws.
- Understand the concept of Junction Diode, transistor and field effect transistor.

**DETAILED CONTENTS**

1. Application and Advantages of Electricity (03 periods)

   Difference between ac and dc, various applications of electricity, advantages of electrical energy over other types of energy

2. Basic Electrical Quantities (06 periods)

   Definition of voltage, current, power and energy with their units, name of instruments used for measuring above quantities, connection of these instruments in an electric circuit

3. AC Fundamentals (08 periods)

   Electromagnetic induction-Faraday's Laws, Lenz's Law; Fleming's rules, Principles of a.c. Circuits; Alternating emf, Definition of cycle, frequency, amplitude and time period. Instantaneous, average, r.m.s and maximum value of sinusoidal wave; form factor and Peak Factor. Concept of phase and phase difference. Concept of resistance, inductance and capacitance in simple a.c. circuit. Power factor and improvement of power factor by use of capacitors. Concept of three phase system; star and delta connections; voltage and current relationship (no derivation)

4. Transformers (06 periods)

   Working, principle and construction of single phase transformer, transformer ratio, emf equation, losses and efficiency, cooling of transformers, isolation transformer, CVT, auto transformer (brief idea), applications.

5. D.C. Circuits (10 periods)

5.1 Ohm/s law, resistivity, effect of temperature on resistance, heating effect of electric current, conversion of mechanical units into electrical units.

5.2 Kirchoff's laws, application of Kirchoff's laws to solve, simple d.c. circuits

5.3 Thevenin's theorem, maximum power transfer theorem, Norton's theorem and superposition theorem, simple numerical problems.

6. Basic Electronics (22 periods)

6.1 Basic idea of semiconductors – P and N type; diodes, zener diodes and their applications,

6.2 Introduction to BJT : NPN and PnP transistors, other symbols and mechansim of current flow, explanation of fundamental current relations. Comparison of CB, CE and CC configuration transistor as amplifier in CE configuration.

6.3 Field Effect Transistor (FET) : Construction, Operation and Characteristics of Junction FET, Comparison of SFET, MOSFET & CMOS.

**LIST OF PRACTICALS**

1. Identification of Resistor, Capacitor, Inductor, Transformer, LBD etc
2. Familiarization with multimeters/CPO etc.
3. Measurement of wave shapes of half wave rectifier and full wave rectifier.
4. Plot the P&T characteristics and determination of its parameter from this characteristics.
5. Connection and reading of an electric energy meter
6. Use of ammeter, voltmeter, wattmeter, and multi-meter
7. Study of different types of fuses, MCBs and ELCBs
8. Study of zener as a constant voltage source and to draw its V-I characteristics
9. To draw V-I characteristics of PN junction diode
10. Verify Theoenin and Neston theorem

**INSTRUCTIONAL STRATEGY**

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

**MEANS OF ASSESSMENT**

- Class Test
- Home Assignment
- Attendance
- Sessional Test

**RECOMMENDED BOOKS**

1. Basic Electrical Engineering by PS Dhongal; Tata McGraw Hill Publishers, New Delhi
2. A Text Book of Electrical Technology, Vol. I and II by BL Thareja; S Chand and Co., New Delhi
3. Basic Electricity by BR Sharma; Satya Prakashan, New Delhi

4. Basic Electrical Engineering by JB Gupta, S Kataria and Sons, Delhi
5. Experiments in Basic Electrical Engineering by SK Bhattacharya and KM Rastogi, New Age International Publishers Ltd., New Delhi
6. Basic Electronics by VK Mehta; S Chand and Co., New Delhi
7. Electrical Machines by SK Bhattacharya; Tata McGraw Hill, New Delhi
8. Basic electronics and Linear circuits by NN Bhargava and Kulshreshta, Tata Mc Graw Hill New Delhi.
9. Electronic principles by SK Sachdev, Dhanpat Rai and Sons, New Delhi.
10. Electronic Devices and circuits by Rama Raddy Narora Publishing House Pvt. Ltd. New Delhi.
11. Principles of electrical and electronics Engineering by VK Mehta; S Chand and Co. New Delhi
12. Digital Electronics by Malvino

## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Hrs) | Marks Allotted (%) |
|---|---|---|
| 1 | 03 | 5 |
| 2 | 06 | 10 |
| 3 | 09 | 15 |
| 4 | 06 | 10 |
| 5 | 10 | 18 |
| 6 | 22 | 42 |
| **Total** | **56** | **100** |

## 2.4 PC & PERIPHERAL ARCHITECTURE

| L | T | P |
|---|---|---|
| 3 | - | 6 |

**RATIONALE**

The aim of the subject is to teach the basic working of the computer motherboard, peripherals and add-on cards. The subject helps the students to do the maintenance of the Computer, peripherals and its add-on cards. The students will be able to select the proper peripheral as per their specification and requirement. This is the core technology subject. The subject is practical oriented and will develop the debugging skills in the students.

**LEARNING OUTCOMES**

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

- Assemble Computer System & it's peripherals
- Repair & Maintenance of Computer System & it's peripherals
- Understanding of various components of a computer system

**DETAILED CONTENTS**

1. Basic building blocks of a computer system (03 Periods)
   Block diagram of a computer, Input & Output devices, CPU, Arithmetic & Logical Unit, Memory & it's Types.

2. The concept of hardware & the software - (03 Periods)
   Main components of a computer system, data & information, importance of information flow & its impact on growth & productivity.

3. Study of PC-AT/ATX System, Basics of Processor and CPU Clock , Motherboards, Chipset and Controllers, BIOS and the Boot Process. (05 Periods)

4. IDE and SATA Devices: (09 Periods)
   Hard Disk Drive and CD/DVDs Drives, SCSI Devices, Floppy Disk, Flash Drive, Solid State Drives, Backup Drive, Expansion Cards- LAN Card, IDE Card , VGA and SVGA Cards, Sound Card, Interface Cards, I/O cards, Video Cards, USB Card, Fire-Wire Cards, Internal Ports, Cables and Connector Types.

5. Switch Mode Power Supply: (04 Periods)
   Discrete components, principle of operation SMPS, converter topologies, PWM IC's and case study.

6. Monitors: (05 Periods)
   Monitors: - CRT, LCD and LED, Touch Screen Displays, CRT construction and working, 9 pin input type-monitor, block diagram of color monitor.

7. Hard Disk Drive: (04 Periods)
   Its construction, basic principle of operation, disk drive types, installation, cables, connectors and jumper details, formatting and managing hard disk drive. Various interface standards.

8. Keyboard: Block diagram of keyboard circuit. (02 Periods)

9. Printer: (07 Periods)
   Types & components of printers, printer interface with computer, function block diagram for various sub-assemblies of printer, principle of operation of Laser and Inkjet printers, various mechanical sub-assemblies, general maintenance aspects.

## LIST OF PRACTICALS

1. Study various mother boards- non-integrated, semi-integrated, integrated
2. Understand the mother board component
3. Familiarize the different types of expansion slot (ISA, EISA, PCI, AMR, PCI-E).
4. Study the expansion cards namely add-on-cards (audio, graphics, i/o, tv tuner, etc.).
5. Study different types of switch mode power supply – AT, ATX, NLX
6. Understand the power requirements for various components in a computer system
7. Study the different connectors and ports of a PC
8. Understand the various cables in a computer system
9. Familiarize the different types of memory modules: DDR1, DDR2, DDR3, DDR4.
10. Study various secondary storage- Hard disk, Flash drive, CD/DVD, SSD,
11. Understand the procedure of assembling a computer system.
12. Study the various techniques for formatting/partitioning.
13. Familiarize the hard disk partitioning using different tools.
14. Familiarize the interfacing of printers and installing driver software
15. Understand the interfacing, installation, working of various device such as Scanner, Projector, etc.
16. Understand the system Maintenance and trouble shooting.
17. Wi-Fi Concepts/Bluetooth concepts
18. Microprocessor socket types

## INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the various components of computer system and it's peripherals to students while doing practical exercises. The students should be made familiar with the various components of computer system and it's peripherals.

### 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. Electronics and Radio Engineering M.L. Gupta Dhanpat rai & Sons, New Delhi

2. PC And Clones Hardware, Troubleshooting and Maintenance B. Govinda rajalu, Tata Mc-graw-Hill Publication
3. PC Troubleshooting and Repair Stephen J. Bigelow Dream tech Press, New Delhi
4. Computer Installation & Servicing, D. Balasubramanian, Tata McGraw Hill
5. 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 | 3 | 5 |
| 2 | 3 | 5 |
| 3 | 5 | 10 |
| 4 | 9 | 20 |
| 5 | 4 | 10 |
| 6 | 5 | 15 |
| 7 | 4 | 15 |
| 8 | 2 | 10 |
| 9 | 7 | 10 |
| **Total** | **42** | **100** |

## 2.5 COMPUTER PROGRAMMING USING PYTHON

| L | T | P |
|---|---|---|
| 4 | - | 6 |

**RATIONALE**

This course introduces to the students the Python language. Upon completion of this course, the student will be able to write non trivial Python programs dealing with a wide variety of subject matter domains. Topics include language components, the IDLE/IDE environment, control flow constructs, strings, I/O, collections, classes, modules, and regular expressions.

**LEARNING OUTCOMES**

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

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

**DETAILED CONTENTS**

1. Introduction (04 Periods)

    - Brief History of Python
    - Python Versions
    - Installing Python
    - Environment Variables
    - Executing Python from the Command Line
    - IDLE
    - Editing Python Files
    - Python Documentation
    - Getting Help
    - Dynamic Types
    - Python Reserved Words
    - Naming Conventions

2. Basic Python Syntax (04 Periods)

    - Basic Syntax
    - Comments
    - String Values

- String Methods
- The format Method
- String Operators
- Numeric Data Types
- Conversion Functions
- Simple Output
- Simple Input
- The % Method
- The print Function

3. Language Components (06 Periods)

- Indenting Requirements
- The if Statement
- Relational and Logical Operators
- Bit Wise Operators
- The while Loop
- break and continue
- The for Loop

4. Collections (10 Periods)

- Introduction
- Lists
- Tuples
- Sets
- Dictionaries
- Sorting Dictionaries
- Copying Collections
- Summary

5. Functions (08 Periods)

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

6. Modules (04 Periods)

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

7. Exceptions (04 Periods)

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

8. Input and Output (04 Periods)

- Introduction
- Data Streams
- Creating Your Own Data Streams
- Access Modes
- Writing Data to a File
- Reading Data From a File
- Additional File Methods
- Using Pipes as Data Streams
- Handling IO Exceptions

9. Classes in Python (06 Periods)

- Classes in Python
- Principles of Object Orientation
- Creating Classes
- Instance Methods
- File Organization
- Special Methods
- Class Variables
- Inheritance
- Polymorphism

10. Regular Expressions (06 Periods)

- Introduction
- Simple Character Matches
- Special Characters
- Character Classes
- Quantifiers
- The Dot Character

- Greedy Matches
- Grouping
- Matching at Beginning or End
- Match Objects
- Substituting
- Splitting a String
- Compiling Regular Expressions
- Flags

**LIST OF PRACTICALS**

1. Getting started with Python and IDLE in interactive and batch modes
2. What do the following string methods do?
   - lower
   - count
   - replace
3. Write instructions to perform each of the steps below
   (a) Create a string containing at least five words and store it in a variable.
   (b) Print out the string.
   (c) Convert the string to a list of words using the string split method.
   (d) Sort the list into reverse alphabetical order using some of the list methods (you might need to use dir(list) or help(list) to find appropriate methods).
   (e) Print out the sorted, reversed list of words.
4. Write a program that determines whether the number is prime.
   What is your favorite number? 24
   24 is not prime
   What is your favorite number? 31
   31 is prime
5. Find all numbers which are multiple of 17, but not the multiple of 5, between 2000 and 2500?
6. Swap two integer numbers using a temporary variable. Repeat the exercise using the code format: a, b = b, a. Verify your results in both the cases.
7. Find the largest of n numbers, using a user defined function largest().
8. Write a function myReverse() which receives a string as an input and returns the reverse of the string.
9. Check if a given string is palindrome or not.
10. WAP to convert Celsius to Fahrenheit
11. Find the ASCII value of charades
12. WAP for simple calculator

**INSTRUCTIONAL STRATEGY**

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

## MEANS OF ASSESSMENT

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

**RECOMMENDED BOOKS**

1. Learning Python by Mark Lutz; Pratham Books, Bangalore
2. Foundations of Python Network Programming by John Goerzen and Brandeu Rhodes; Apress-eBook distributed by Springer Science and Business Media, New York
3. Dive Into Python by Mark Pilgrim; Pratham Books, Bangalore
4. Think Python by Allen B. Downey; O'Reily Media
5. Python Programming For Beginners: A Must Read Introduction to Python Programming by Robert Richards; Pratham Books, Bangalore
6. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

**Websites for Reference:**

http://swayam.gov.in

## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 04 | 06 |
| 2. | 04 | 06 |
| 3. | 06 | 10 |
| 4. | 10 | 20 |
| 5. | 08 | 14 |
| 6. | 04 | 06 |
| 7. | 04 | 06 |
| 8. | 04 | 08 |
| 9. | 06 | 12 |
| 10. | 06 | 12 |
| **Total** | **56** | **100** |

## 2.6 OFFICE AUTOMATION TOOLS

| L | T | P |
|---|---|---|
| - | - | 6 |

**RATIONALE**

This subject aims to cover the handling of whole field of word processing. It also involves various clerical tasks, such as organizing customer data or creating reports. It enables people with lower skill levels to perform higher-level tasks. In Today's commercial world, automation helps the users with a sophisticated set of commands to format, edit, and print text documents. It is used as valuable and important tools in the creation of application such as newsletters, brochures, charts, presentation, documents, drawings and other graphic images. This will make the students proficient in office automation applications.

**LEAR NING OUTCOMES**

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

- Use file mangers, word processors, spreadsheets, presentation software's
- Describe the features and functions of the categories of application software.
- Present conclusions effectively, orally and in writing.
- Understand the dynamics of an office environment.
- Demonstrate the ability to apply application software in an office environment.
- Use Google Suite for office data management tasks.

**DETAILED CONTENTS**

1. Word Processing

   **MS Word concepts :** Creating, saving, closing, Opening an existing document, Using Featured Word Templates, Exploring Template and Formation of Documents, Selecting text, Editing text, Finding and replacing text, Character and Paragraph Formatting, Automatic Formatting And Styles, Inserting and removing page breaks, Header and footers, Page No, Border & Shading, Change Case, Checking Spelling, Working With Tables, Insert Table, Delete Cells, Merge Cell, Graphics And Frames , Page Design and Layout, Creating and Printing Merged Documents, Encrypting document with a password, Printing documents

2. SpreadSheet

   **MS Excel Concept:** Creating, Saving, closing, Editing a Workbook, Inserting, Deleting Work Sheets, entering data in a cell, Copying and Moving from selected cells, entering formula, handling operators in Formula, Functions: Mathematical, Logical, statistical, text, financial, Date and Time functions, Using Function Wizard. Formatting a Worksheet: Formatting Cells – changing data alignment, changing date, number, character or currency format, changing font, adding borders and colors, Printing worksheets, Charts and Graphs – Creating, Previewing, Modifying Charts, LOOKUP/VLOOKUP

3. Presentation

**MS Power Point Concept** : Creating, Opening and Saving Presentations, Working in Different Views, Working with Slides, Adding and Formatting Text, Formatting Paragraphs, Checking Spelling and Correcting Typing Mistakes, Making Notes Pages and Handouts, Drawing and Working with Objects, Adding Clip Art and other pictures, Designing Slide Shows using templates, Rehearse timing, Narration, Multimedia effects- Apply Transitions between Slides, Animate Slide Content, Set Timing for Transitions and Animations, Insert and Format Media, Encrypting presentations with a password, Running and Controlling a Slide Show, Printing Presentations

4. Database

**MS Access Concepts:** Database, Relational Database, Integrity. Operations: Creating, dropping, manipulating table structure. Manipulation of Data: Query, Data Entry Form, Reports

5. Google Office Tools

Creating , saving , downloading , sharing files/folders from Google drive , creating and sharing Google docs, import and export docs, creating and sharing Google sheet, import and export Google sheet, Google forms and form responses ,creating Google slides to present your ideas

**LIST OF PRACTICALS**

Tools to be used: Microsoft office/ Libre Office / Open Office / G Suite

1. Creating a document using different font, changing font size and color, changing the appearance through bold/italic/underline.
2. Creating a document using subscript and superscript, justification of the document.
3. Create a document using Bullets and Numbering.
4. Create a document using page number, header and footer.
5. Create a document using inserting page breaks and column break, line spacing.
6. How to use mail merge and macro in MS Word.
7. Creating table, formatting cells, use of different border styles, shading in tables, merging of cells, and partition of cells, inserting and deleting a row in a table in MS word document.
8. Apply spelling checker, grammar mistakes, thesaurus in a document.
9. Create a Boucher using templates, page setup and print preview, and then print that document.
10. Working on spreadsheet like adding, deleting, merging cells, layout and style.
11. Create a table and perform operation using predefined function on it.
12. In MS Excel procedure to switching between different spreadsheets and workbook.
13. Create a spreadsheet and print selected as well as full workbook.
14. Create a spreadsheet with LOOKUP/VLOOKUP features.
15. Create different charts in excel and implement formulas(automatic and use defined).
16. Create a Power Point presentation using slide template.
17. Create a Power Point presentation using animation.
18. Create a Power Point presentation using transition
19. Create a Power Point Presentation with Adding movie and sound.
20. Create a Power Point Presentation with Adding tables and chart etc.
21. Changing slide color scheme in presentation.
22. Viewing the presentation using slide navigator.

23. Create, Save, Run and Print the Power Point Presentation.
24. Create a database table using predefined template.
25. Create a database form using form wizard.
26. Create and share files/folders in Google drive
27. Create and share Google docs.
28. Create and share Google sheets.
29. Create and share Google Forms.
30. Create and share Google slides.

**INSTRUCTIONAL STRATEGY**

As the subject is practice oriented, more stress should be given to students to do the work practically. The features of software packages MS Office/ Libre Office to be demonstrated in class using LCD projector.

**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. Microsoft Office 2010 For Dummies By Wallace Wang
2. 2007 Microsoft Office System Plain & Simple by Jerry Joyce Microsoft Press
3. Office XP : The Complete Reference- Stephen L. Selson - Tata McGraw Hill Education.
4. Working in Microsoft Office - Richard Mansfield - Tata McGraw Hill Education.
5. Websites for Reference

    - http://office.microsoft.com/en-us/training/CR010047968.aspx
    - https://gsuite.google.com/learning-center
    - http://spoken-tutorial.org

## 3.1 APPLIED MATHEMATICS –III

| L | T | P |
|---|---|---|
| 5 | - | - |

**RATIONALE**

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

**LEARNING OUTCOMES**

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

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

**DETAILED CONTENTS**

1. Matrices (16 Periods)

1.1 Algebra of Matrices, Inverse
Addition, Multiplication of matrices, Null matrix and a unit matrix, Square matrix, Symmetric, Skew symmetric, Hermitian, Skew hermition, Orthagonal, Unitary, diagonal and Triangular matrix, Determinant of a matrix.
Definition and Computation of inverse of a matrix.

1.2 Elementry Row/Column Transformation
Meaning and use in computing inverse and rank of a matrix.

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

1.4 Eigen Pairs, Cayley-Hamilton Theorem

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

2. Differential Calculus (15 Periods)

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

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

2.3 Vector Calculus

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

3. Differential Equation (15 Periods)

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

3.2 First Order Equations
Variable seperable, equations reducible to seperable forms, Homogeneous equtions, equations reducible to homogeneous forms, Linear and Bernoulli form exact equation and their solutions.

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

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

4. Integral Calculus-II (12 Periods)

4.1 Beta and Gamma Functions
Definition, Use, Relation between the two, their use in evaluating integrals.

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

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

5. Probability and Statistics (12 Periods)

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

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

**INSTRUCTONAL STRATEGY**

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

**MEANS OF ASSESSMENT**

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

**RECOMMENDED BOOKS**


1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,

3 Applied Mathematics-III by Chauhan and Chauhan, Krishna Publications, Meerut**.**
4. Applied Mathematics-II by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut.
5. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

**SUGGESTED DISTRIBUTION OF MARKS**

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

## 3.2 DATA STRUCTURE USING PYTHON

**L T P**

**4 - 4**

**RATIONALE**

Data structures are the techniques of designing the basic algorithms for real-life projects. Understanding of data structures is essential and this facilitates the understanding of the language. The practice and assimilation of data structure techniques is essential for programming. The knowledge of Python language and data structures will be reinforced by practical exercises during the course of study. This 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. Data Structures: Data Structures in Python, Introduction to Built-in Data Structures, Introduction to User-defined Data Structures, Algorithms, Elements of a Good Algorithm, Basic algorithmic analysis: input size, asymptotic complexity, O() notation (08 Periods)

2. Strings: Working with series of characters that can represent plaintext messages, passwords, and more, including all the complexities of combining human language with programming code. (06 Periods)

3.List-Based Collections: definitions and examples of list-based data structures, arrays, linked lists, stacks, queues, Examine the efficiency of common list methods, Arrays vs lists (08 Periods)

4. Searching and Sorting: search and sort with list-based data structures, binary search and insertion sort, bubble sort, merge sort, quick sort, use of recursion in searching and sorting. (08 Periods)

5. Maps and Hashing: concepts of sets, maps (dictionaries), hashing, common problems and approaches to hashing, hash tables and hash maps. (08 Periods)

6. Trees: concepts and terminology associated with tree data structures, common tree types, binary search trees, heaps, self-balancing trees, efficiency of traversals and common tree functions.
(10 Periods)

7. Graph: concept of a graph and understand common graph terms, coded representations, properties, traversals and paths.
(08 Periods)

**MEANS OF ASSESSMENT**

- Assignments and quiz/class tests, mid-term and end-term written tests
- Software installation, operation, development and viva-voce

**LIST OF PRACTICALS**

1. Write a Python program to create an array contains six integers. Also print all the members of the array
2. Given a two list. Create a third list by picking an odd-index element from the first list and even index elements from second.
3. Given an input list removes the element at index 4 and add it to the 2nd position and also, at the end of the list
4. Given a list iterate it and count the occurrence of each element and create a dictionary to show the count of each element
5. Given a two list of equal size create a set such that it shows the element from both lists in the pair
6. Given a following two sets find the intersection and remove those elements from the first set
7. Iterate a given list and Check if a given element already exists in a dictionary as a key's value if not delete it from the list
8. Remove duplicate from a list and create a tuple and find the minimum and maximum number
9. Swapping of two tuples.
10. Perform Insertion sort
11. Exercise based on Bubble sort
12. Binary Search exercise
13. Exercise based on merge & quick sort
14. Use of recursion in sorting
15. Use of recursion in searching
16. Write a Python program to triple all numbers of a given list of integers. Use Python map
17. Write a Python program to square the elements of a list using map() function.
18. Write a Python program to compute the square of first N Fibonacci numbers, using map function and generate a list of the numbers.
19. Using two Arrays of equal length, create a Hash object where the elements from one array (the keys) are associated with the elements of the other (the values)
20. Exercise based on Build in Hash Functions
21. Write a Python program to create a Balanced Binary Search Tree (BST) using an array (given) elements where array elements are sorted in ascending order.
22. Write a Python program to check whether a given a binary tree is a valid binary search tree (BST) or not.
23. Write a Python program to convert a given array elements to a height balanced Binary Search Tree (BST).
24. Exercise based on graph traversal

**RECOMMENDED BOOKS**

1. Data Structures and Algorithms in Python, Publisher(s): Wiley
2. Programming and Problem Solving with Python by Ashok Namdev Kamthane and Amit Ashok Kamthane, McGraw Hill.
3. Problem Solving with Algorithms and Data Structures Using Python By Bradley N. Miller, David L. Ranum
4. Data Structures and Algorithms with Python by Kent D. Lee, Steve Hubbard
5. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

**Websites for Reference:**

- http://swayam.gov.in

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 08 | 15 |
| 2 | 06 | 10 |
| 3 | 08 | 15 |
| 4 | 08 | 20 |
| 5 | 08 | 15 |
| 6 | 10 | 15 |
| 7 | 08 | 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 $O_2$, BOD, COD. Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.

4. Soil Pollution (06 Periods)
   - 4.1 Sources of soil pollution
   - 4.2 Types of Solid waste- House hold, Hospital, From Agriculture, Biomedical, Animal and human, excreta, sediments and E-waste
   - 4.3 Effect of Solid waste
   - 4.4 Disposal of Solid Waste- Solid Waste Management

5. Noise pollution (06 Periods)

Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimize noise pollution.

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

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

**LIST OF PRACTICALS**

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

**INSTRUCTIONAL STRATEGY**

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

**MEANS OF ASSESSMENT**

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

**RECOMMENDED BOOKS**


1. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
2. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
3. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi
4. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.
5. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Co. (P) Ltd. Delhi.
6. Environmental Studies by 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 ELECTRONIC DEVICES AND CIRCUITS

| L | T | P |
|---|---|---|
| 5 | - | 5 |

**RATIONALE**

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

**LEARNING OUTCOMES**

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

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

DETAILED CONTENTS

1. Single and Multistage Amplifiers (08 Periods)

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

2. Large Signal Amplifier (08 Periods)

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

3. Feedback Amplifiers (08 Periods)

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

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

4. Sinusoidal Oscillators (07 Periods)

- Use of positive feedback
- Barkhausen criterion for oscillations
- Different oscillator circuits-tuned collector, Hartley, Colpitts, phase shift, Wien's bridge, and crystal oscillator. Their working principles (no mathematical derivation but only simple numerical problems)

5. Tuned Voltage Amplifiers (07 Periods)

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

6. Clipper and Clamper Circuit (08 Periods)

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

7. Operational Amplifiers (08 Periods)

- Characteristics of an ideal operational amplifier and its block diagram
- IC-741 and its pin configuration, equivalent circuit of OPAMP.
- Definition of differential voltage gain, CMRR, PSRR, slew rate and input offset current, offset voltage, Bias current
- Operational amplifier as an inverter, scale changer, adder, subtractor, differentiator, and integrator, log amplifiers, anti-log amplifier, comparator, Schmitt triggers, sample and hold circuit.

8. Multivibrator Circuits and IC Timer (08 Periods)

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

9. Regulated Power Supplies (08 Periods)

- Basic regulated circuit by using Zener diode
- Concept of DC power supply. Line and load regulation

- Concept of fixed voltage, IC regulators (like 78XX, 79XX) and variable voltage regulator like (IC 723)

## LIST OF PRACTICALS

1. Plot the frequency response of two stage RC coupled amplifier and calculate the bandwidth and compare it with single stage amplifier
2. To measure the gain of push-pull amplifier at 1KHz
3. To measure the voltage gain of emitter follower circuit and plot its frequency response
4. Plot the frequency response curve of Hartley and Colpitt's Oscillator
5. Plot the frequency response curve of phase shift and Wein bridge Oscillator
6. Use of IC 555 as monostable multivibrator and observe the output for different values of RC
7. Use of IC 555 as astable multivibrator and observe the output at different duty cycles
8. To use IC 741 (op-amplifier) as
   i) Inverter, ii) Adder, iii) Subtractor iv) Integrator
9. To realize positive and negative fixed voltage DC power supply using three terminal voltage regulator IC (7805, 7812, 7905)
10. Observation of output waveform of different type of Clipper and Clamper Circuit

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

## INSTRUCTIONAL STRATEGY

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

## MEANS OF ASSESSMENT

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

## RECOMMENDED BOOKS


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


**Websites for Reference:**

http://swayam.gov.in

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allocation (%) |
|---|---|---|
| 1. | 08 | 12 |
| 2. | 08 | 12 |
| 3. | 08 | 11 |
| 4. | 07 | 11 |
| 5. | 07 | 11 |
| 6. | 08 | 08 |
| 7. | 08 | 11 |
| 8. | 08 | 12 |
| 9. | 08 | 12 |
| **Total** | **70** | **100** |

## 3.5 BASIC NETWORKING

| L | T | P |
|---|---|---|
| 4 | - | 4 |

**RATIONALE**

The world in the information era has become network centric. A Computer networks has been growing with rapid technological progress. Computer communication through networking becomes essential part of our life. different applications like Railway Reservation, E-banking, E-Governance, On-Line shopping, E-learning etc. may be managed by click of a mouse from our own place. Because of this, world has emerged as the global village. By considering importance of networking towards all aspects of our life, basic concept of networks, network classification, network topologies, network devices, Transmission media, Network reference models and concept of TCP/IP is being introduced here. By exploring this knowledge students would be able to understand current network management technologies.

**LEARNING OUTCOMES**

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

- Understand networks & their significance.
- Understand and describe communication media.
- Compare different types of Topologies.
- Compare different types of network devices.
- Compare OSI and TCP/IP models.
- Understand layers of OSI Model.

**DETAILED CONTENTS**

1. Introduction to Networks (04 Periods)

Introduction to Computer Networks, Element of Networks, Types of Networks, Network Topologies: Bus, Star, Mesh, Ring

2. Media and Connectors (06 Periods)

Common LAN Media: STP, UTP, Coaxial cable, Optical fibre, TIA/EIA standards, Making & testing Cable, Straight thru Cable, Crossover Cable , Connectors, Jacks, Patch Panels

3.Networking Devices (04 Periods)

NIC, Repeaters, Hub and its types, Bridges and their types, Switches, Routers

4. Network Model (07 Periods)

Description of the seven layers of OSI Model, TCP/IP Model, Comparison of OSI & TCP/IP Model.

5. Physical and Data Link Layer (08 Periods)

MAC Sub-layer, LLC, MAC Addressing, Framing, Error control, Flow control, Token Ring, Ethernet, FDDI, Address Resolution Protocols

6. Network and Transport Layer (08 Periods)

Role of Network layer, Virtual Circuits, Datagram, Packet, Types of Routing, ICMP, Introduction to Transport layer, TCP and UDP Protocols and Comparison . Network Layer, IP address, IP address Classes, Basics of Sub-netting, Subnet Masking

7. Presentation and Session Layer (06 Periods)

Session layer function, Token Management and Session Layer Protocols, Presentationlayer function and Protocols

8. Application Layer (06 Periods)

Introduction to Application Layer Protocols and their role. The Domain name system, Electronic Mail, the World Wide Web, FTP, Telnet, HTTP, DHCP

9. Internet and its Service Providers (07 Periods)
Internet, connection types, ISP
Web hosting, Top Web Hosting Companies
IANA, IANA Root Zone Database, IANA Number Resources
Local Internet registry (LIR),National Internet Registry (NIR), AfriNIC, APNIC, ARIN, LACNIC, RIPE NCC, Regional Internet Registry (RIR).
Registration of a domain, Top Domain Registrars,Registrar for .EDU.IN, .RES.IN, .AC.IN, .GOV.IN in INDIA

## LIST OF PRACTICALS

1. To connect and built computers in different ways in a LAN (Topologies-star, ring, bus, tree)
2. To connect and understand different network devices used in LAN- Hubs, Switches, Routers, Bridges, Repeaters, Gateways, Modems.
3. To study the constructional details of transmission media- co-axial cables, twisted pair cables, optical fiber cable.
4. To create network cable using RJ 45 connectors.
5. Connections of two hubs by creating cross over connections.
6. To install a network interface card (NIC) and locate mac address of computer
7. To install TC/IP protocol and configure its advance property.
8. To discover and assign IP address in windows & linux.
9. Setting up a work group in windows PC.
10. To identify different problems and troubleshooting of network exm- no network, card problem, cable problem, server errors.

## INSTRUCTIONAL STRATEGY

Explanation of concepts using real time examples, diagrams etc. For practical sessions demonstration of various networking devices 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. Data Communications and Networks, Achyut S. Godbole ,Tata McGraw Hill
2. Data Communications and Networking (Forth Edition), Behrouz A. Forouzan, Tata McGraw Hill
3. Complete Reference Networking ,Craig Zacker ,Tata McGraw Hill
4. Computer Networking, Tularam M Bansod Dreamtech, Wiley
5. Networking + Certification (Second Edition) Microsoft Press PHI(Prentice-Hall of India Private Limited)
6. Computer Network by Andrew S. Tanenbaum Pearson
7. 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 | 04 | 10 |
| 2 | 06 | 10 |
| 3 | 04 | 10 |
| 4 | 07 | 15 |
| 5 | 08 | 10 |
| 6 | 08 | 15 |
| 7 | 06 | 10 |
| 8 | 06 | 10 |
| 9 | 07 | 10 |
| **Total** | **56** | **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 Copmparison between combinational and sequential circuit
8.3 Concept and types of latch with their working and applications
8.4 Operation using waveforms and truth tables of RS, T, D, Master/Slave JK flip flops.
8.5 Difference between a latch and a flip flop

9. Counters (06 Periods)

9.1 Introduction to Asynchronous and Synchronous counters
9.2 Binary counters
9.3 Divide by N ripple counters, Decade counter, Ring counter and twisted Ring counter.

10. Shift Register (05 Periods)

10.1 Introduction and basic concepts including shift left and shift right.
a) Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out.
b) Universal shift register

11. A/D and D/A Converters (04 Periods)

11.1 Working principle of A/D and D/A converters
11.2 Brief idea about different techniques of A/D conversion and study of :
- Simultaneous or flash type A/D converter
- Successive Approximation A/D Converter
- Single Slope A/D converter
- Dual Slope A/D converter

11.3 Brief idea of :
- Binary Weighted D/A converter

- R/2R ladder D/A converter

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

12. Semiconductor Memories (04 periods)

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

**LIST OF PRACTICALS**

1. Verification and interpretation of truth tables for AND, OR, NOT NAND, NOR and Exclusive OR (EXOR) and Exclusive NOR(EXNOR) gates
2. Realisation of logic functions with the help of NAND or NOR gates
3. - Design of a half adder using XOR and NAND gates and verification of its operation
   - Construction of a full adder circuit using XOR and NAND gates and verify its operation
4. Verification of truth table for positive edge triggered, negative edge triggered, level triggered IC flip-flops (At least one IC each of D latch , D flip-flop, JK flip-flops).
5 Verification of truth table for encoder and decoder ICs, Mux and DeMux
6. To design a 4 bit SISO, SIPO, PISO, PIPO shift registers using JK/D flip flops and verification of their operation.
7. To design a 4 bit ring counter and verify its operation.
8. Use of Asynchronous Counter ICs (7490 or 7493)

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

**INSTRUCTIONAL STRATEGY**

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

**MEANS OF ASSESSMENT**

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

**RECOMMENDED BOOKS**


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

**Websites for Reference:**

http://swayam.gov.in

## SUGGESTED DISTRIBUTION OF MARKS

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

## 3.7 Universal Human Values

**L-T-P**
**2-0-1**

**Course Objectives**

This introductory course input is intended

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

**<u>Practical Session also Includes Different Yogic Exercises and Meditation Session</u>**

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

**MEANS OF ASSESSMENT**

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

**Reference Material**
The primary resource material for teaching this course consists of
a. The text book (Latest Edition)

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

b. The teacher's manual (Latest Edition)

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

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

1. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
3. Sussan George, 1976, *How the Other Half Dies,* Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, *Energy & Equity,* The Trinity Press, Worcester, and HarperCollins, USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
6. Subhas Palekar, 2000, *How to practice Natural Farming,* Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, *Jeevan Vidya 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**

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

## SUGGESTED DISTRIBUTION OF MARKS

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

## 4.1 COMMUNICATION SKILLS – II

| L | T | P |
|---|---|---|
| 4 | - | 2 |

**RATIONALE**

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

**LEARNING OUTCOMES**

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

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

**DETAILED CONTENTS**

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

2 Reading (16 periods)

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

3 Writing Skill (24 periods)

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

**LIST OF PRACTICALS**

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

**Speaking and Listening Skills**

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

**INSTRUCTIONAL STRATEGY**

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

**MEANS OF ASSESSMENT**

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

**RECOMMENDED BOOKS**


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


**Websites for Reference:**

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

**SUGGESTED DISTRIBUTION OF MARKS**

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

## 4.2 ADVANCE NETWORKING

| L | T | P |
|---|---|---|
| 6 | - | 6 |

**RATIONALE**

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

**LEARNING OUTCOMES**

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

- Setup IP addresses in Computer network nodes
- Setup IP subnetting for network
- know about different routing methodologies
- setup & Configure L2 network Switches
- diagnose & solve network problems
- diagnose & solve network problems remotely
- provide security to networks
- manage & handle wan

**DETAILED CONTENTS**

**1. Internetworking Basics** (10 Periods)

•Internetworking Basics, Broadcast domain, Collision Domain, Hub, Switch & Router ,Ethernet Cabling: - Straight-Through Cable, Crossover Cable, Roll over Cable

•Internet Protocols: - TCP/IP Model, IP Addressing, IP Terminology, IP Addressing Scheme, Private IP Addresses ,TCP/IP Troubleshooting utilities, Troubleshooting IP Addressing

**2. IP Subnetting and Variable Length Subnet Masks (VLSM)** (10 Periods)

•Subnetting Basics, How to Create Subnets, Subnet Masks, Classless Inter- Domain Routing (CIDR), Subnetting Class C Addresses, Subnetting Class B Addresses, Subnetting Class A Addresses

•Variable Length Subnet Masks (VLSMs), VLSM Design, Implementing VLSM Network

**3. Routing Basics** (08 Periods)

•IP Routing, Routing Basics, Static Routing, Default Routing, Dynamic Routing, Routing Protocol Basics

**4.Switching Basics** (10 Periods)

• Layer 2 Switching basics, Configuring the L2 Switches,L2 Switch Startup, Setting the Passwords, Setting the Hostname, Setting IP Information, Configuring Interface Descriptions, Erasing the Switch Configuration

**5. VLAN Basics** (12 Periods)

•Virtual LANs (VLANs) VLAN Basics, Broadcast Control, Security, Flexibility and Scalability, VLAN Memberships, Static VLANs, Dynamic VLANs, Identifying VLANs, Frame Tagging, LAN Identification Methods, Inter- Switch Link (ISL) Protocol

•VLAN Trunking Protocol (VTP),VTP Modes of Operation, VTP Pruning, Routing between VLANs ,Configuring VLANs, Assigning Switch Ports to VLANs ,Configuring Trunk Ports ,Configuring Inter-VLAN Routing, Configuring VTP.

**6. Managing Traffic with Access Control Lists** (10 Periods)

•Managing Traffic with Access Lists Introduction to Access Lists, Standard Access Lists, Wildcard Masking, Standard Access List Example, Controlling VTY (Telnet) Access, Extended Access Lists, Extended Access List Example, Named Access Lists, Monitoring Access Lists

**7. Network Address Translation** (08 Periods)

•Network Address Translation NAT, Introduction to Network addresses Translation (NAT), Port address translation (PAT), Static NAT, Dynamic NAT, NAT Overloading

**8.WAN Protocols** (08 Periods)

•Introduction of WAN, Cabling the WAN, HDLC, PPP, LCP, Frame Relay, ISDN, DSL/ADSL

**9.Introduction To Wireless LAN** (08 Periods)

•ISM band, 802.11a/b/g wireless standards
•Adhoc, infrastructure mode of WLAN, Access Point in Repeater Mode
•Security in WLAN, MAC Filtering, WEP/WPA
•Evaluation of WLAN, Wireless Home Networking, IEEE 802.11 standard for WLAN

## LIST OF PRACTICALS

1 To study Router & its interface. (Console port, AUI, Serial, Auxiliary, Ethernet, Fast Ethernet, BRI)
2 To study, Switch & its interface. (Console port, Ethernet, Fast Ethernet)
3 To setup up a router , logging into a router, basic commands, saving NVRAM configuration.
4 To configure a router for different LAN segments.
5 To configure IP Routing by creating Static Routes. (Static Routing)
6 Backing Up and Restoring the IOS, Configuration File using TFTP server
7 To Setup up a Switch first time, logging into a switch, basic commands
8 To configure VLANs and Inter-VLAN Routing.
9 To manage traffic using standard IP Access list.
10 Configuring Static NAT on router
11 Configuring Dynamic NAT on router
12 Wireless LAN Setup using ADHOC mode.
13 Wireless LAN Setup using Infrastructure mode.

## INSTRUCTIONAL STRATEGY

Explanation of concepts using real time examples, diagrams etc. For practical sessions teacher may use simulator software to demonstrate various scenarios related to advance networking.

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


**Websites for Reference:**

http://swayam.gov.in

http://spoken-tutorial.orgs

## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 10 | 10 |
| 2 | 10 | 10 |
| 3 | 08 | 10 |
| 4 | 10 | 15 |
| 5 | 12 | 15 |
| 6 | 10 | 10 |
| 7 | 08 | 10 |
| 8 | 08 | 10 |
| 9 | 08 | 10 |
| **Total** | **84** | **100** |

## 4.3 OBJECT ORIENTED PROGRAMMING USING JAVA

| L | T | P |
|---|---|---|
| 4 | - | 4 |

### 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:**

## 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 ELECTRONIC INSTRUMENTS AND MEASUREMENT

| L | T | P |
|---|---|---|
| 4 | - | 4 |

**RATIONALE**

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

**LEARNING OUTCOMES**

After undergoing the subject, students will be able to:

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

## DETAILED CONTENTS

1. Basics of Measurements (10 Periods)

   - Measurement, method of measurement, types of instruments
   - Specifications of instruments: Accuracy, precision, sensitivity, resolution, range, errors in measurement, sources of errors, limiting errors, loading effect, importance and applications of standards and calibration

2. Voltage, Current and Resistance Measurement (08 Periods)

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

3. Cathode Ray Oscilloscope (12 Periods)

   - Construction and working of Cathode Ray Tube(CRT)
   - Block diagram description of a basic CRO and triggered sweep oscilloscope, front panel controls
   - Specifications of CRO and their explanation
   - Measurement of current, voltage, frequency, time period and phase using CRO
   - Digital storage oscilloscope (DSO) : block diagram and working principle
   - Working Principle of spectrum analyser

4 Impedance Bridge Q Meters (08 periods)

   - Wheat stone bridge

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

5 Signal Generators and Analytical Instruments (08 Periods)

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

6. Digital Instruments (10 Periods)

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

**LIST OF PRACTICALS**

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

## INSTRUCTIONAL STRATEGY

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

## MEANS OF ASSESSMENT

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

## RECOMMENDED BOOKS


1. Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Sons, New Delhi
2. Electronics Instrumentation by Cooper, Prentice Hall of India, New Delhi
3. Electronics Instrumentation by JB Gupta, Satya Prakashan, New Delhi
4. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.


**Websites for Reference:**

http://swayam.gov.in

**SUGGESTED DISTRIBUTION OF MARKS**

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

## 4.5 PRINCIPLES OF COMMUNICATION ENGINEERING

| L | T | P |
|---|---|---|
| 4 | - | 4 |

**RATIONALE**

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

**LEARNING OUTCOMES**

After undergoing the subject, students will be able to:

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

**DETAILED CONTENTS**

1. Introduction (04 Periods)

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

2. Amplitude modulation (06 Periods)

   2.1 Derivation of expression for an amplitude modulated wave. Carrier and side band components. Modulation index. Spectrum and BW of AM Wave. Relative power distribution in carrier and side bands.

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

3. Frequency modulation (05 Periods)

   3.1 Expression for frequency modulated wave and its frequency spectrum (without Proof and analysis of Bassel function) Modulation index, maximum frequency deviation and deviation ratio, BW of FM signals, Carson's rule.

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

3.3 Comparison of FM and AM in communication systems

4. Phase modulation (04 Periods)

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

5. Principles of AM Modulators (04 Periods)

Circuit Diagram and working operation of:

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

6. Principles of FM Modulators (04 Periods)

6.1 Working principles and applications of reactance modulator, varactor diode modulator, VCO and Armstrong phase modulator.

6.2 Stabilization of carrier using AFC (Block diagram approach).

7. Demodulation of AM Waves (04 Periods)

7.1 Principles of demodulation of AM wave using diode detector circuit

8. Demodulation of FM Waves (05 Periods)

8.1 Basic principles of FM detection using slope detector

8.2 Principle of working of the following FM demodulators

i. Foster-Seeley discriminator
ii. Ratio detector
iii. Block diagram of Phase locked Loop (PLL) FM demodulators (No Derivation)

9. Pulse Modulation (05 Periods)

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

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

10. Pulse Code Modulation (05 Periods)

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

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

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

11. Radio Transmitter (05 Periods)

11.1 Classification of transmitters on the basis of power, frequency and modulation.
11.2 Block diagram of an AM transmitters and working of each stage. Low level and High level modulation.
11.3 Block diagram and working principle of reactance tube and Armstrong FM transmitters

12. Radio Receiver. (05 Periods)

12.1 Brief description of crystal and TRF radio receivers; Need for and principles of super heterodyne radio receiver.
12.2 Block diagram of super- heterodyne AM receiver, function of each block and typical waveforms at the input and output of each block.
12.3 Block diagram of an FM receiver, function of each block and wave/forms at input and output at different blocks.

**LIST OF PRACTICALS**

1. a) To observe an AM wave on CRO produced by a standard signal generator using internal and external modulation
   b) To measure the modulation index of the wave obtained in above practical
2. a) To obtain an AM wave from a square law modulator circuit and observe waveforms
   b) To measure the modulation index of the obtained wave form.
3. To obtain an FM wave and measure the frequency deviation for different modulating signals.
4. To obtain modulating signal from FM detector.
5. To observe the sampled signal and compare it with the analog input signal. Note the effect of varying the sampling pulse width and frequency on the sampled output.
6. To observe and note the pulse amplitude modulated signal (PAM) and compare them with the corresponding analog input signal
7. To observe PPM and PWM signal and compare it with the analog input signal
8. To observe wave form of different modulation Technique (ASK, FSK, DPSK)

**INSTRUCTIONAL STRATEGY**

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

**MEANS OF ASSESSMEN T**

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

**RECOMMENDED BOOKS**


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


**Websites for Reference:**

http://swayam.gov.in

**SUGGESTED DISTRIBUTION OF MARKS**

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

## 4.6 ENERGY CONSERVATION

| L | T | P |
|---|---|---|
| 3 | - | 2 |

**RATIONALE**

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

**LEARNING OUTCOMES**

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

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

**DETAILED CONTENTS**

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

2. Energy Conservation and EC Act 2001
   - 2.1 Introduction to energy management, energy conservation, energy efficiency and its need
   - 2.2 Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation.
   - 2.3 Standards and Labeling: Concept of star rating and its importance, Types of product available for star rating

3. Electrical Supply System and Motors

3.1 Types of electrical supply system
3.2 Single line diagram
3.3 Losses in electrical power distribution system
3.4 Understanding Electricity Bill: Transformers Tariff structure, Components of power (kW, kVA and kVAR) and power factor, improvement of power factor, Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)
3.5 Transformers: Introduction, Losses in transformer, transformer Loading, Tips for energy savings in transformers

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

4. Energy Efficiency in Electrical Utilities

4.1 Pumps: Introduction to pump and its applications, Efficient pumping system operation, Energy efficiency in agriculture pumps, Tips for energy saving in pumps
4.2 Compressed Air System: Types of air compressor and its applications, Leakage test, Energy saving opportunities in compressors.
4.3 Energy Conservation in HVAC and Refrigeration System: Introduction, Concept of Energy Efficiency Ratio (EER), Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems.

5. Lighting and DG Systems

5.1 Lighting Systems: Basic definitions- Lux, lumen and efficacy, Types of different lamps and their features, Energy efficient practices in lighting
5.2 DG Systems: Introduction, Energy efficiency opportunities in DG systems, Loading estimation

6. Energy Efficiency in Thermal Utilities

6.1 Thermal Basics: Thermal energy, Energy content in fuels, Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE)
6.2 Energy Conservation in boilers and furnaces : Introduction and types of boilers, Energy performance assessment of boilers, Concept of stoichiometric air and excess air for combustion, Energy conservation in boilers and furnaces, Do's and Don'ts for efficient use of boilers and furnaces
6.3 Cooling Towers: Basic concept of cooling towers, Tips for energy savings in cooling towers
6.4 Efficient Steam Utilization

7. Energy Conservation Building Code (ECBC)

7.1 ECBC and its salient features
7.2 Tips for energy savings in buildings: New Buildings, Existing Buildings

8. Waste Heat Recovery and Co-Generation

8.1 Concept, classification and benefits of waste heat recovery
8.2 Concept and types of co-generation system

9. General Energy Saving Tips
Energy saving tips in:

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

10. Energy Audit

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

**PRACTICAL EXERCISES**

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

**STUDENT ACTIVITIES ON ENERGY CONSERVATION/ENERGY EFFICIENCY**

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

**INSTRUCTIONAL STRATEGY**

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

**RECOMMENDED BOOKS**


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


**Important Links:**

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

# INDUSTRIAL TRAINING OF STUDENTS

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

This document includes guided and supervised industrial training of 4 weeks duration to be organised during the semester break starting after second year i.e. after 4$^{th}$ 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 5$^{th}$ 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 4$^{th}$ semester for further details.

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

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

## 5.1 INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

| L | T | P |
|---|---|---|
| 5 | - | - |

**RATIONALE**

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

**LEARNING OUTCOMES**

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

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

**DETAILED CONTENTS**

**SECTION – A**

**ENTREPRENEURSHIP**

1. Introduction (04 Periods)

   1.1 Concept /Meaning and its need
   1.2 Qualities and functions of entrepreneur and barriers in entrepreneurship
   1.3 Sole proprietorship and partnership forms and other forms of business organisations

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

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

   2.1 Scanning of the business environment

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

3. Project report Preparation (06 Periods)

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

**SECTION –B**

**MANAGEMENT**

4. Introduction to Management (06 Periods)

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

5. Leadership and Motivation (08 Periods)

5.1 Leadership: Definition and Need, Qualities and functions of a leader, Manager Vs leader, Types of leadership, Case studies of great leaders

5.2 Motivation: Definition and characteristics, Importance of self motivation, Factors affecting motivation, Theories of motivation (Maslow, Herzberg, Douglas, McGregor)

6. Management Scope in Different Areas (14 Periods)

6.1 Human Resource Management: Introduction and objective, Introduction to Man power planning, recruitment and selection, Introduction to performance appraisal methods

6.2 Material and Store Management: Introduction functions, and objectives, ABC Analysis and EOQ

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

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

7. Work Culture (08 Periods)

7.1 Introduction and importance of Healthy Work Culture in organization

7.2 Components of Culture

7.3 Importance of attitude, values and behavior

7.4 Behavioural Science – Individual and group behavior.

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

8. Basic of Accounting and Finance (10 Periods)

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

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

9. Miscellaneous Topics (10 Periods)

9.1 Total Quality Management (TQM): Statistical process control, Total employees Involvement, Just in time (JIT)

9.2 Intellectual Property Right (IPR) : Introduction, definition and its importance, Infringement related to patents, copy right, trade mark

**INSTRUCTIONAL STRATEGY**

Some of the topics may be taught using question/answer, assignment, seminar or case study method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside

experts and students may be taken to nearby industrial organisations on visit. Approach extracted reading and handouts may be provided.

**MEANS OF ASSESSMENT**

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

**RECOMMENDED BOOKS**


1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development and Management by J.S.Narang; Dhanpat Rai & Sons, Delhi.
3. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
4. Handbook of Small Scale Industry by PM Bhandari
5. Entrepreneurship Development and Management by MK Garg
6. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.


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

**SUGGESTED DISTRIBUTION OF MARKS**

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

## 5.2 MICROPROCESSORS AND PERIPHERAL DEVICES

| L | T | P |
|---|---|---|
| 4 | - | 4 |

**RATIONALE**

The study of microprocessors in terms of architecture, software and interfacing techniques leads to the understanding of working of CPU in a microcomputer. The development in microprocessors of 32 bit architecture brings the students face-to-face with mainframe enabling them to get employment in R&D, assembly, repair and maintenance of hardware of microprocessors and computers. Microprocessors find application in process control industry. They also form a part of the electronic switching system between source and destination in long distance telecommunications. Thus the microprocessor is an area of specialization. Students of electronics and related engineering branches often use microprocessors to introduce programmable control in their projects, in industrial training.

**LEARNING OUTCOMES**

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

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

## DETAILED CONTENTS

1. Evolution of Microprocessor (05 Periods)

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

2. Architecture of a Microprocessor (05 periods)
   (With reference to 8085 microprocessor)

   Concept of Bus, bus organization of 8085, Functional block diagram of 8085 and function of each block, Pin details of 8085 and related signals, Demultiplexing of address/data bus generation of read/write control signals, Steps to execute a stored programme

3. Instruction Timing and Cycles (05 periods)

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

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

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

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

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

6. Interrupts (06 periods)

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

7. Data Transfer Techniques (06 periods)

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

8. Peripheral devices (06 periods)

8255 PPI, 8253 PIT and 8257 DMA controller

9. Architecture of 8086 Microprocessor (06 periods)

- Block diagram
- Minimum and Maximum mode
- Pin and Signals
- Addressing Modes

10. Advance Microprocessors (02 periods)

- Introduction to Pentium series processors and core 2 duo, dual core (core i3, i5, i7)

**LIST OF PRACTICALS**

1. Familiarization of different keys of 8085 microprocessor kit and its memory map
2. Steps to enter, modify data/program and to execute a programme on 8085 kit

3. Writing and execution of ALP for addition and subtraction of two 8 bit numbers
4. Writing and execution of ALP for multiplication and division of two 8 bit numbers
5. Writing and execution of ALP for arranging 10 numbers in ascending/descending order
6. Writing and execution of ALP for 0 to 9 BCD counters (up/down counter according to choice stored in memory)
7. Interfacing exercise on 8255 like LED display control
8. Interfacing exercise on 8253 programmable interval timer
9. Interfacing exercise on 8279 programmable KB/display interface like to display the hex code of key pressed on display
10. Writing and execution of different ALP for 8086 (any four)
11. Generation of square wave of desired frequency using 8255.

**INSTRUCTIONAL STRATEGY**

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

**MEANS OF ASSESSMENT**

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

**RECOMMENDED BOOKS**


1. Microprocessor Architecture, Programming and Applications with 8080/8085 by Ramesh S Gaonker, Willey Eastern Ltd. New Delhi
2. Microprocessor and Applications by Badri Ram: Tata McGraw Hill Education Pvt Ltd , New Delhi
3. Microprocessor programming & applications.by sudhir Goyal, North Publication.
4. Microprocessor and interfacing by Douglas.V.Hall, McGraw Hill Higher Education, New Delhi.
5. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.


**Websites for Reference:**

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

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

## 5.3 DIGITAL COMMUNICATION

**L T P**
**4 ---6**

**RATIONALE**:

Today, the growth of any industry depends upon electronics and communication. There is the need for digital techniques in each and every field. The reason behind the introduction of this subject is toimpart technical excel hence in the field of digital communication by analyzing the various digital transmission methods, error control methods and understanding about the multiple access communication.

**OBJECTIVES :**

- To know the Basics of Digital Communication
- To study about the various types of signals
- To study about the data transmission
- To understand the Baseband system and sampling
- To learn about PCM waveform types
- To study about M-ary pulse modulation
- To learn about rationale for coding
- To learn about types of coding methods
- To study about various error control codes
- To know the Digital modulation techniques
- To learn about TDM frame structure
- To study about coherent detection of PSK, FSK
- To understand the Spread spectrum communication
- To study the Jamming consideration
- To study about CDMA Digital cellular system

**DETAILED SYLLABUS**

| UNIT | NAME OF THE TOPIC |
|---|---|
| | **BASICS OF DIGITAL COMMUNICATION (12 Periods)** |
| **1** | Digital communication signal processing – Typical Block diagram and transformations - Advantages over analog communication – Channels for Digital communication- Telephone, Optical fiber, Satellite.<br>Classification of signals- deterministic and random signals - periodic and non-periodic signals – analog and discrete signals - energy and power signals - unit impulse function.<br>Information capacity (Definition only) – Shannon's limit for information capacity (Definition only) - Data transmission - Serial and parallel transmission -Synchronous and asynchronous transmission. |

## FORMATTING AND BASE BAND MODULATION (12 Periods)

Base band system - The Sampling Theorem –impulse sampling- natural sampling- sample and hold operation - Spectra- Nyquist Theorem - Aliasing
– signal interface for a digital system – sampling and quantizing effects- Quantization noise – channel effects – channel noise – PCM - Uniform and Non-uniform Quantization,

**Baseband transmission**

**2** PCM waveform types- non return-to-zero(NRZ)- return-to-zero (RZ)- phase encoded – multilevel binary – spectral attributes of PCM waveforms – Bits per PCM word and Bits per symbol- PCM word size - M-ary pulse
modulation waveforms.

## BASEBAND CODING TECHNIQUES (10 Periods)

Rationale for coding – Types of codes – Discrete memoryless channel – Error control coding methods – forward error correction – error detection with retransmission – types of errors –
**3** random error and burst error – Principles of linear block codes – Hamming code – Binary cyclic codes –
Cyclic redundancy check code (CRC) – Convolution code.

## DIGITAL MODULATION TECHNIQUES (12 Periods)

Digital modulation techniques – Listing of various types – Coherent binary modulation techniques – Coherent quadrature modulation techniques – NonCoherent binary modulation techniques - Minimum shift keying (MSK) - Block diagram of MSK transmitter and receiver - TDM-Frame structure, ASCII framing- E1 Framing, T1 Framing for telephone.

**4**

Detection of signals – coherent detection of PSK – sampled matched filter –coherent detection of FSK – Non-coherent detection - Binary differential
PSK.

## SPREAD SPECTRUM TECHNIQUES (10 Periods)

**5** Spread spectrum communication - Beneficial attributes of spread spectrum systems – Pseudo noise sequences – Randomness properties – Balance property, Run property and Correlation property - Direct sequence spread spectrum systems – Processing gain and performance – Frequency hopping systems – Frequency hopping with diversity – fast hopping versus slow hopping – Synchronization – Jamming consideration – Commercial application – CDMA Digital cellular system.

**LIST OF EXPERIMENTS:**

1. Simulate the ASK Modulation and demodulation using the simulationtool like PSPICE/ multisim/orcad/tina
2. Simulate the FSK Modulation using the simulation tool like PSPICE/ multisim/orcad/tina
3. Simulate PSK Modulation and demodulation. using the simulation toollike PSPICE/ multisim/orcad/tina.
4. Simulate the Instrumentation amplifier using the simulation tool likePSPICE/ multisim/orcad/tina
5. Construct the circuit of a FSK Modulator & determine the output.waveform
6. Construct the circuit of a FSK Demodulator & determine the output waveform.
7. Construct the circuit to determine the output of a TDM signal. .
8. Construct and test a fiber optic analog link.
9. Construct and test a fiber optic digital link.
10. Construct a suitable circuit & find the bending loss and propagationloss in fiber optics.
11. Construct and test the performance of Manchester encoder anddecoder.
12. Construct and measure the Numerical aperture of optical fiber.
13. Construct and test a voice link (with telephone handset both attransmitter and receiver using optical fiber)
14. Install a DTH system. & test it.
15. Construct a LED circuit to find the photo diode characteristics.

## INSTRUCTIONAL STRATEGY

The digital communication has significant importance in the area of computer networking. Adequate competency needs to be developed by giving sufficient practical knowledge in communication. Help may be taken in the form of charts, simulation packages to develop clear concepts of the subject. Practical exercises other than the given in the list may be given to the students.

## MEANS OF ASSESSMENT

- Assignments and quiz/class tests

- Mid-term and end-term written tests
- Actual laboratory and practical work, exercises
- Viva-voce

**REFERENCE BOOKS:**

| SL.No | Title | Author | Publisher with Edition |
|---|---|---|---|
| 1 | Digital communications Fundamentals & Applications | Bernard Sklar & Pabitra Kumar Ray | Pearson -Second edition - 2009 |
| 2 | Digital Communications | Simon Haykin | John Wiley India edition - 2006 |
| 3 | Digital communication | Dr. J.S.Chitode | Technical Publications -Pune Second edition,2011 |
| 4 | Digital and analog communication system | B.P.Lathi .Zhi Ding | International 4th Edition - OXFORD university press. |
| 5 | Digital Communication | P.Ramakrishna Rao | TMH 2011 |
| 6 | Principles of Communications system | Taub &Schilling | TMH Third edition,2008 |
| 7 | Digital communications | John G.Prokais | 2011 |
| 8 | Digital communications | Dr.K.N.Hari Bhat Dr.D.Ganesh Rao | Sanguine Technical Publisher 2005 |

**Websites for Reference:**

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

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

## 5.4 SYSTEM ADMINISTRATION

**L T P**

**4 - 6**

**RATIONALE**

The primary objective of this course is to give students a comprehensive overview of the tools and techniques needed for network administrator. The course is designed so as to cover topics that are relevant to the role of a network administrator. Topics include installation, configuration, and administration of servers on common hardware/software platforms and installation and configuration of Linux & it's services.

**LEARNING OUTCOMES**

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

- To become proficient in tasks performed by server administrator.
- To acquire an appreciation for issues relevant to network server administration
- Use of resource sharing on network.
- Manage different roles of Servers.
- Understand WAN and remote connectivity
- Work efficiently with LINUX OS
- Perform Linux Services and Network Security

**DETAILED CONTENTS**

1. Introduction and Installation of Server (06 Periods)

What is System Administration, Role of a System Administrator. Installation of server like Windows Server, Linux Server, user account administration, group management, file permissions.

2. Virtualization (06 Periods)

Concept of virtualization, Installing & configuring a virtual machine. Installing windows server and Linux in Virtual Machine. Guest Additions, Virtual Networking & security, VBox , , Dockers & containers installation & management.

3. Windows Administration Concepts (10 Periods)

Active Directory, Organizational Unit, DNS Server, DHCP Server, RAS, Volumes and Disk management, Auditing and Resource Access, Remote Desktop Services, VPN, Local and Domain security policy, Group Policies, Windows Server as a router, IIS.

4. Introduction and installation of Linux (08 Periods)

History of Linux, Linux distributions, Features of Linux, advantages of Linux, GUI, CLI, Installation of Red Hat/CentOS, Debian Family and Kali Linux, System requirements, Disk partition, Mount points, Installation method, Booting procedure, creating the boot disk, Utilities of Linux, TAR Program, Pine, Browsers.

5. Working with Linux GNOME and KDE (06 Periods)

User Management, Mounting, X- windows Desktop environment, Using Gnome and KDE Desktop environment, Linux commands, Linux file system, directories, Text Editors, Linux Shell, Feature of Shell, Types of Shell, Installing windows applications in Linux.

7 Linux Administration (08 Periods)

Installing and setting up a Network card, Setting TCP/IP parameters with Linux, Testing the network, SMTP, Bind DNS Server, DHCP, NFS and Samba Configuration, Apache Web Server configuration, FTP Server.

8 Server Hardening & Monitoring (10 Periods)

Installing Security patches, updation, Password policy & restrictions, Network Services, Proxies, Firewalls, IP tables, NIS and Host Security, Minimizing packeges, Check listening network ports, Lockdown cronjobs, System monitoring & cron scheduling, Performance monitoring tools, Disable USB, Viewing Logs, Monitoring user activities.

**LIST OF PRACTICALS**

1. Installation & configuration of Windows Server OS
2. Installation & configuration of RedHat/CentOS
3. Installing & configuring a Virtual Machine.
4. Using various Linux networking commands
5. Managing the User's Shell Environment
6. Installing Software from Tarballs, RPM and YUM.
7. Using the mount Command to Mount & Unmount the Disks, Devices.
8. Managing the GRUB Boot Loader, The GRUB Configuration File, Installing GRUB
9. Setting up SSH and Telnet.

10. Setting up FTP Server.
11. Configuring Apache Web Server.
12. Configuring an NFS Server & Client
13. Configuring the Samba Server and Client Access
14. Installing and configuring Bind DNS Server.
15. Installing and configuring DHCP.
16. Firewall and security configuration.
17. Installing dockers & containers

**INSTRUCTIONAL STATREGY**

Since this subject is practical oriented, the teacher should demonstrate the capabilities of different server to students while doing practical exercises. The students should be made familiar with server and related tools and techniques.

**MEANS OF ASSEMENTS**

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

**RECOMMENDED BOOKS**

- Steve Silva, Web Server Administration, Course Technology.
- Byron Wright, Hands-on Microsoft Windows Server 2003 Networking, CourseTechnology.
- Mark Minasi Mastering Windows Server 2008 Wiley India
- Hassell Windows Server 2008 : definitive guide Oreilly
- Doug Lowe Networking for Dummies Wiley India
- Richard Burke Network Management Concepts and practice. Pearson
- Microsoft Press MCSE Training Kit Tata Mc graw Hill
- George Reese Cloud Application architectures Oreilly
- 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 | 06 | 10 |
| 3 | 06 | 10 |
| 4 | 06 | 15 |
| 5 | 08 | 15 |
| 6 | 06 | 10 |
| 7 | 08 | 15 |
| 8 | 10 | 15 |
| **Total** | **56** | **100** |

## 5.5 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** |

## 5.6 MINOR PROJECT WORK

| L | T | P |
|---|---|---|
| - | - | 6 |

**LEARNING OUTCOMES**

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

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

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

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

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

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

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

| | Criteria | Weightage |
|---|---|---|
| (a) | Attendance and Punctuality | 15% |
| (b) | Initiative in performing tasks/creating new things | 30% |
| (c) | Relation with people | 15% |
| (d) | Report Writing | 40% |

## 6.1 INFORMATION SECURITY AND IT LAWS

| L | T | P |
|---|---|---|
| 4 | - | 4 |

**RATIONALE**

Contents of this course provide understanding of Information Security & theirs measures. Content of this course will enable students to use techniques like Cryptography, VPNs, IDS etc. and IT Laws in the field of Information Technology.

**LEARNING OUTCOMES**

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

- Understand the need for security, Security principles related to Information Management.
- Understand the various computer related attacks.
- Apply different types of cryptography techniques to encrypt/decrypt data or information.
- Understand the network security measures and the concept of VPNs.
- Understand concept of IDS, Operating system security and web security
- Understand the IT Laws and latest amendments applicable in India as well as Intellectual property laws

**DETAILED CONTENTS**

1. **INTRODUCTION AND SECURITY TRENDS :** (08 Periods)

1.1 Need for security, Security principles, Authentication, Access control.
1.2 Threats to security : Viruses and Worms, Intruders, Insiders, Criminal organization, Terrorist, Information Warfare (IW), Avenues of attack, Steps in Attack.
1.3 Types of attack : Active and Passive attacks, Denial of service, backdoors and trapdoors, sniffing, spoofing, man in the middle, replay, TCP/IP Hacking, Encryption attacks, Malware : Viruses, Logic bombs.

2. **ORGANIZATIONAL/ OPERATIONAL SECURITY :** (08 Periods)

2.1 Role of people in security : Password selection, Piggybacking, Shoulder surfing, Dumpster diving, Installing unauthorized software/hardware, Access by non-employees, Security awareness, Individual users responsibilities.
2.2 Physical security : Access controls Biometrics : Fingerprints, hand prints, retina, patterns, voice patterns, signature and writing patterns, keystrokes and physical barriers.
2.3 Network security basics, model for network security.

3. **CRYPTOGRAPHY AND PUBLIC KEY INFRASTRUCTURE :** (16 Periods)

3.1 Introduction: Cryptography, Cryptanalysis, Cryptology, Substitution techniques; Caesar's cipher, monoalphabetic and polyalphabetic transposition techniques- Rail fence technique, simple columnar, steganography.
3.2 Hashing - Concept
3.3 Symmetric and asymmetric cryptography : Introduction Symmetric encryption: DES (Data Encryption Standard) algorithm, Diffle-Hellman algorithm, Problem of key distribution, Asymmetric key cryptography : Digital signature, key escrow.

3.4 Public key encryption : Basics, digital certificates, certificate authorities, registration authorities, steps for obtaining a digital certificate, steps for verifying authenticity and integrity of a certificate.

**4. NETWORK SECURITY :** (08 Periods)

4.1 Firewalls : Concept, design, principles, limitations, trusted system, Kerberos- concept.
4.2 Security topologies - Security zones, DMZ, Internet, Intranet, VLAN, Security implication, Tunnelling.
4.3 IP security : Overview, architecture, IPSec, IPSec configuration, IPSec security.
4.4 Virtual Private Network.
4.5 Email security : Email security standards : Working principles of SMTP, PEM, PGP, S/MINE, spam.

5. **WEB SECURITY :** **(**08 Periods)

5.1 Application hardening, application patches, Web servers, Active director.
5.2 Web security threats, Web traffic security approaches, Secure socket layer and transport layer security, secure electronic transaction software development : secure code techniques, buffer overflow, code injection, least privilege, good practices, Testing.

6. **IT LAWS :** (08 Periods)

6.1 Information Security Standards - ISO, IT Act, Copyright Act, Patent Law, IPR, Cyber Laws in India. IT Act 2000 Provisions and latest amendments.

6.2 Intellectual property law : Copy Right Law, Software License, Semiconductor Law and Patent Law.

## LIST OF PRACTICAL

1. Knowledge the security provided with windows operating system.
2. Recovery the password of window machines using password recover utility (John the ripper ) or any other utility.
3. Tracing of email origin using email trace pro utility.
4. Use of Keylogger and anti-keylogger to secure yours system.
5. Encrypt and decrypt the message using simple transposition - Permutation (Cryptool)
6. Encrypt and decrypt the message using Caesar Cipher With variable key (Cryptool)
7. Encrypt and decrypt the message using 3 X 3 Hill Ciper (Cryptool)
8. Create Digital Signature document using (Cryptool)
9. Send and receive secret message using stenography techniques using steghide.
10. Recover the data from formatted Pen Drive and Hard Disk using Power Data Recovery Utility or any other utility.

**INSTRUCTONAL STRATEGY**

The content of this course is to be taught on conceptual basis with real world examples. Since this subject is practice oriented, the teacher should demonstrate the capabilities of websites/Webpages to students while doing practical exercises for information security. The students should be made familiar with preventive measures for information and computer security.

**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. Information Security Handbook by Darren Death ,Packt Publishing
2. Principles of Information Security by Whitman , Cengage Publisher
3. Cyber Security by Nina Godbole, Wiley Publisher
4. Introduction to Information Security And Cyber Laws by Dr. Surya Prakash Tripathi
5. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley Publisher
6. Cryptography and Network Security - Principles and Practice by Stallings William, Pearson Education Publisher.
7. Cyber Law & Cyber Crimes Simplified ,by Cyber Infomedia Publisher
8. Information Technology Act, 2000 Along with Rules & Regulations by Universal Law Publishing
9. e-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR, Chandigarh.


**Websites for Reference:**

http://swayam.gov.in

http://spoken-tutorial.org

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 08 | 15 |
| 2 | 08 | 15 |
| 3 | 16 | 20 |
| 4 | 08 | 15 |
| 5 | 08 | 15 |
| 6 | 08 | 20 |
| **Total** | **56** | **100** |

## 6.2 INTERNET OF THINGS

| L | T | P |
|---|---|---|
| 6 | - | 6 |

**RATIONALE**

Internet of Things (IoT) is presently a hot technology worldwide. Government, academia, and industry are involved in different aspects of research, implementation, and business with IoT. IoT cuts across different application domain like agriculture, space, healthcare, manufacturing, construction, water, and mining. IoT-based applications such as innovative shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems, are gradually relying on IoT based systems. Therefore, it is very important to learn the fundamentals of this emerging technology. This introductory syllabus will enable learners to leverage their business and/or technical knowledge across IoT-related functions in the workplace.

**LEARNING OUTCOMES**

After undergoing the subject, students will be able to:

• understand the concepts of Internet of Things.

• understand what constitutes an IoT design solution

• identify the sensors and other devices needed for different IoT solutions

• understand the component parts of an IoT network and its connections

• build small IoT applications.

**DETAILED CONTENTS**

1. Introductionto Internet Of Things (IoT) (10 Periods)

Introduction to IoT, Defining IoT, Things in IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT,IoTProtocols,IoT communication Models, IoT communication API's,IoT enabling Technologies.

**2**. IoT Devices (12 Periods(

How electronic devices fit with the Internet of Things, and why they are important : Breadboard and its internal connections, , LED and its connections ,Tri-color LED ,Resistor Introduction to the many 'end devices', sensors and actuators, differentiate between different sensor types

**3**. IoT Networks (**12** Periods)

Introduction to the components of basic IoT networks, the types of network connections and how data travels through them, and the role of Internet Protocols. understanding of microcontrollers/Arduino and communication protocols

4**.** (Internet **12** Periods() **,**feature of arduino device ,Ardunino device introductionComponents of Arduino boardC )Arduino Programming Language ,Understanding of basic of Arduino IDE**,**

function ,control statement ,loops ,datatype ,variables : (Language

5. IoT and M2M (**1**0 Periods)

Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT- Software defined networking, network function virtualization, IoT and WoT.

**LIST OF PRACTICALS**

- :

**1** Installation of Arduino IDE

2. Interfacing Light Emitting Diode (LED)- Blinking LED

3. Interfacing Button and LED – LED blinking when button is pressed**.**

4. Interfacing Light Dependent Resistor (LDR) and LED, displaying automatic night lamp

5. Interfacing Temperature Sensor (LM35) and/or humidity sensor (e.g. DHT11)

6. Interfacing Liquid Crystal Display (LCD) – display data generated by sensor on LCD

7. Interfacing Air Quality Sensor-pollution (e.g. MQ135) - display data on LCD, switch on LED when data sensed is higher than specified value.

8. Interfacing Bluetooth module (e.g. HC05)- receiving data from mobile phone on Arduino and display on LCD

9. Interfacing Relay module to demonstrate Bluetooth based home automation application. (using Bluetooth and relay).

**INSTRUCTIONAL STRATEGY**

Some of the topics may be taught using question/answer, assignment, seminar or case study method. The teacher will discuss case studies with students , since this subject is practical oriented, the teacher should demonstrate functioning of various sensors and demonstrate building of IoT applications. Solution to various regression and classification problems should also be built

**MEANS OF ASSESSMENT**

− Assignments and quiz/class tests, mid-term and end-term written tests

− viva-voce

− Actual laboratory and practical work exercises

− Software installation, operation, development

**RECOMMENDED BOOKS**

1. The Internet of Things: Connecting Objects to the Web, Wiley Publisher Hakima Chaouchi

2. Internet of Things: A Hands On Approach, University Press, Vijay Madisetti, Arshdeep Bahga.

3. 21 Internet Of Things (IOT) Experiments,BPB Publications YashavantKanetkar

4. Arduino Projects For Engineers ,BPB Publications ,Neerparaj Rai

5. Internet of Things – A Hands on Approach, By ArshdeepBahga and Vijay Madisetti Universities

Press, ISBN: 9788173719547

6. The Internet of Things , Pearson, By Michael Miller ISBN: 9789332552456

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

**Websites for Reference:**

http://www.spoken-tutorial.org , http://swayam.gov.in

**LIST OF COMPONENTS**

1. One kit for 3-4 students : Arduino Uno, sensors(Bluetooth module(HC05), MQ135, DHT11, breadboard , LCD, 2-relay module etc)

2. Consumables : LED, button, connecting wires, LDR, LM35, battery, etc

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 10 | 10 |
| 2 | 12 | 10 |
| 3 | 12 | 10 |
| 4 | 12 | 15 |
| 5 | 10 | 15 |
| **Total** | **56** | **100** |

## 6.3 WIRELESSES AND MOBILE COMMUNICATION

| L | T | P |
|---|---|---|
| 4 | - | 6 |

### RATIONALE

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

### LEARNING OUTCOMES

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

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

## DETAILED CONTENTS

1. Wireless Communication (10 Periods)
   - 1.1 Basics
   - 1.2 Advantages of wireless communication
   - 1.3 Electromagnetic waves.
   - 1.4 Frequency Spectrum used.
   - 1.5 Cellular Network Systems.

2. Cellular Concept (10 Periods)
   - 2.1. Introduction to 1G, 2G, 3G, 4G, and 5G
   - 2.2 Cell area
   - 2.3. Cell Site Structure
   - 2.4. Capacity of cell
   - 2.5. Frequency Reuse (Concept)
   - 2.6 Interference (Co-channel, Adjacent channel)
   - 2.7 Power Control for reducing Interference
   - 2.8 Fundamentals of cellular network planning
     a) Coverage planning
     b) Capacity planning
     c) Cell splitting and sectoring

3 Multiple Access Techniques for Wireless Communication (10 Periods)

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

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

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

6. Digital and Data Communication (10 Periods)

   6.1 Data Transmission Basics: Review of digital data anlog modulation and digital formats. Data rates, Baud Rates, Channel capacity, Mediums for communication, Synchronous and ashnchronous data communication.
   6.2 ISO-OSI model and TCP/IP model of network, Protocols and services. Connection oriented and connectionless services.
   6.3 IEEE 208 standards for computer networks.
   6.4 Internet and ISDN services.

**LIST OF PRACTICALS**

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

## INSTRUCTIONAL STRATEGY

Wireless and Mobile Communication is having significant impact in Electronics Market. For the proper awareness of this subject, it is must to provide the students the detailed functioning of wireless/mobile system/equipment. For this, visits must be arranged to BTS/MSC (Mobile Switching Centre) providers. The theory classes need to be application based in addition to industrial visits to mobile companies

## MEANS OF ASSESSMENT

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

## RECOMMENDED BOOKS


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


**Websites for Reference:**

http://swayam.gov.in

## SUGGESTED DISTRIBUTION OF MARKS

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

# 6.1Elective

## 6.4.1 CLOUD COMPUTING

| L | T | P |
|---|---|---|
| 4 | - | 4 |

**RATIONALE**

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

**LEARNING OUTCOMES**

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

- explain core concepts of cloud computing paradigm.
- explain various Service Models
- explain various Deployment Models.
- describe SLA management in Cloud Computing
- explain and apply the concept of virtualization.
- describe the scheduling of tasks in cloud.
- illustrate the fundamental concepts of cloud storage.
- describe various security issues in the cloud.
- make use of cloud.

**DETAILED CONTENTS**

1. Introduction (08 Periods)

   Evolution of Cloud Computing, Cloud Computing Overview, Characteristics, Applications, Benefits, Challenges.

2. Service and Deployment Models (08 Periods)

   2.1 Cloud Computing Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service;

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

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

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

4. Virtualization Concepts (08 Periods)

   Overview of Virtualization, Types of Virtualization, Benefits of Virtualization, Hypervisors.

5. Cloud Security (06 Periods)

   Infrastructure Security, Data Security & Privacy Issues, Legal Issues in Cloud Computing.

6. Cloud Storage (08 Periods)

Overview; Storage as a Service, Benefits and Challenges, Storage Area Networks (SANs).

7. Scheduling in Cloud (12 Periods)

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

**LIST OF PRACTICALS**

1. Introduction to Cloud Vendors: Amazon, Microsoft, IBM.
2. Setting up Virtualization using Virtualbox/VMWare Hypervisor
3. Introduction to OwnCloud
4. Installation and configuration of OwnCloud software for SaaS
5. Accessing Microsoft AZURE cloud-services
6. Cloud Simulation Software Introduction: CloudSim

**INSTRUCTIONAL STRATEGY**

In addition to classroom teaching, the teacher should demonstrate the practical usage of cloud using real cloud services.

**MEANS OF ASSESSMENT**

- Assignments and Quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work and Viva-Voce

**RECOMMENDED BOOKS**


1. Rajkumar Buyya, James Broberg, Andrzej Goscinski (Editors): Cloud Computing: Principles and Paradigms, Wiley, 2011
2. Kumar Saurabh, Cloud Computing, Wiley, 2012.
3. Barrie Sosinsky: Cloud Computing Bible, Wiley, 2011.
4. Judith Hurwitz, Robin Bloor, Marcia Kaufman,Fern Halper: Cloud Computing for Dummies, Wiley, 2010
5. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.


**Websites for Reference:**

http://swayam.gov.in

## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 08 | 14 |
| 2. | 08 | 14 |
| 3. | 06 | 11 |
| 4. | 08 | 14 |
| 5. | 06 | 11 |
| 6. | 08 | 14 |
| 7. | 12 | 22 |
| **Total** | **56** | **100** |

## 6.4.2 Mobile Computing

**L T P**

**4—4**

**Rationale**

Students taking this elective will develop an understanding of the ways that mobile technologies can be used for teaching and learning. They will also consider the impact of mobile computing on the field of education.

**Objectives:**

- To introduce the characteristics, basic concepts and systems issues in mobileComputing
- To illustrate architecture and protocols in Mobile computing and to identify the trends andlatest development of the technologies in the area
- To understand the network protocols governing the mobile communication
- To know the different kinds of mobile OS prevailing in the market
- To know Android OS in detail
- To understand the components of a Mobile App.
- To give practical experience in the area through the development of Mobile apps
- To design successful mobile computing applications and services
- To evaluate critical design tradeoffs associated with different mobile technologies, architectures, interfaces and business models and how they impact the usability, security, privacy and commercial viability of mobile and pervasive computing servicesand applications
- To know the development of Mobile apps using database

**DETAILED SYLLABUS**

**UNIT -I Introduction to Mobile Computing , WiFi , Bluetooth (8 Periods)**

1.1 Introduction : Evolution of Mobile Computing – Important terminologies – Mobile computing functions – Mobile computing Devices – Networks: Wired , Wireless , Adhoc - Comparison of wired and wireless mechanism - Various types of wireless communication technologies used in Mobiles, Antennas

1.2 Architecture : Architecture of Mobile Computing – 3- Tier Architecture – Presentation( Tier-1), Application ( Tier -2), Data ( Tier – 3)

1.4 Wireless LAN: Introduction - Applications of WLAN – Infrared versus Radio transmission – Features of WI-FI and WI-MAX – Bluetooth : Introduction and application

**UNIT-II Introduction to GSM , SMS ,GPRS , Mobile OS(14 Periods)**

2.1 Global System for Mobile Communication ( GSM): Introduction – GSM Architecture – GSM Entities ( Basics only) – Introduction to CDMA

2.2 Short Message Service ( SMS): Mobile computing over SMS – Short Message Service – Strength of SMS – SMS Architecture – Value added services through SMS – VAS Examples

2.3 General Packet Radio Service (GPRS): Introduction – GPRS Packet data Network : Applications for GPRS : Generic Applications, GPRS Specific Applications – Limitations of GPRS – Features of 3G and 4G Data Service

2.4 Mobile Operating Systems : Evaluation of Mobile Operating System-Handset Manufactures and their Mobile OS- Mobile OS and their features. Linux Kernelbased Mobile OS

**UNIT-III Introduction to ANDROID(8 Periods)**

3.1 ANDROID : Android Versions – Features of Android – Architecture of Android –

Android Market – Android Runtime (Dalvik Virtual Machine)

3.2 ANDROID SDK & ADT : Android SDK – Android Development Tool (ADT) – Installing and configuring Android – Android Virtual Device (AVD)

3.3 ACTIVITIES & INTENTS : Understanding Activites – Linking activities and indents –

Calling built-in applications using intents – Fragments Displaying Notifications

3.4 User Interface : Views and Viewgroups – Layouts – Display Orientation – Action Bar – Listening for UI Notifications

**UNIT-IV VIEWs(14 Periods)**

4.1 Basic Views : Textview, Button, Image Button, EditText, CheckBox, ToggleButton,RadioButton and RadioGroup Views, ProgressBar View, Auto Complete Text View

4.2 Advanced Views : Time Picker View and Date Picker View – List Views – ImageView – Menus – Analog and Digital View – Dialog Boxes

4.3 Displaying Pictures & Menus with Views: Image View – Gallery View – ImageSwitcher – GridView - Creating the Helper Methods – Options Menu –Context Menu

4.4 SMS, Phone: Sending SMS – Receiving SMS – Making phone call

**UNIT V Location Based Service and SQLite(12 Periods)**

5.1 Location Based Services : Obtaining the Maps API Key- Displaying the Map – Zoom Control – Navigating to a specific location – Adding Marker – Geo Coding and reverse Geo coding

5.2 Content Provider : Sharing data – view contacts – Add contacts – Modify contacts – Delete Contacts

5.3 Storage : Store and Retire data's in Internal and External Storage – SQLite -Creating and using databases

5.4 Android Service : Consuming Web service using HTTP , downloading binary Data – Downloading Text Content – Accessing Web Service

**LAB EXERCISES**

1. Give a presentation on call setup between two mobile phones.
2. Prepare a report and demonstrate Bluetooth technology.
3. Prepare a report on the working of GSM and GPRS
4. With a real-world example prepare a report on different mobile payment solutions for different payment schemes.
5. Prepare a report on procedure for working of location-based application.

**INSTRUCTIONAL STRATEGY**

In addition to classroom teaching, the teacher should demonstrate the practical usage of mobile using real world examples.

**MEANS OF ASSESSMENT**

– Assignments and Quiz/class tests, mid-term and end-term written tests
– Actual laboratory and practical work and Viva-Voce

**RECOMMENDED BOOKS**

| Sl.No. | Title | Author | Publisher |
|---|---|---|---|
| 1. | Beginning Android 4 Application Development | Wei-Meng Lee | Wiley IndiaEdition |
| 2. | Android Apps for Absolute Beginners | Jackson | Apress |
| 3 | Mobile Computing | Computing Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal | TMGH |
| 4 | Mobile communications | Jochen schiller | Pearson Education, |

**Websites for Reference:**

http://swayam.gov.in

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 08 | 14 |
| 2. | 14 | 25 |
| 3. | 08 | 14 |
| 4. | 14 | 25 |
| 5. | 12 | 22 |
| **Total** | **56** | **100** |

# 6.4.3 Wide Area Network

**L T P**

**4—4**

**Rationale**

This course provides an explanation and a deeper understanding of the wireless network concepts, architecture, protocols, and applications.

**Learning Outcome:**

On completion of the following units of syllabus contents, the students must be able to

- Learn WAN basics.
- Know the ISDN services.
- Describe layers in frame relay.
- Know the applications of ATM.
- Explain the architecture of VPN.
- Learn the IP based VPNs.
- Describe the queuing problem
- Understand the storage networks.
- Know the internetworking technologies.
- Understand the competing WAN technologies.

**DETAILED CONTENT**

**Unit-01 Wan Basics (8 Periods)**

**WAN BASICS:** Introduction – Defining the terms – Connection types – WAN cabling: Serial Transmission – DTE and DCE – Fixed and Modular Interfaces
– SDLC – HDLC protocol –PPP –WAN Devices: WAN Switch – Access Server – Modern – CSU/DSU – ISDN Terminal Adapter- Gateway and Router – Introduction to DTH services
**ISDN AND BISDN:** Services – History – Subscriber Access to ISDN: B, D and H channels, User Interfaces, Functional Grouping, Reference Points – ISDN layers – Broadband ISDN: Services – Physical specifications.

**Unit-02 X.25 AND FRAME RELAY(14 Periods)**

**X.25 AND FRAME RELAY:** X.25 layers – PLP Packets – Other protocol related to X.25: X.121 protocols, Triple X protocols, FRAME RELAY: Introduction – Role – operation – Congestion control

**ATM:** Design Goals – Packet Networks, Mixed Network Traffic , Cell Networks , Asynchronous TDM – ATM Architecture – Switching; VP switch, VPC switch – ATM layers –Application

**UNIT-III VPN(8 Periods)**

**VPN:** History – Private and Public Networks – Tunneling and its protocols: Characteristics of L2TP, L3TP, GRE , PPTP – Types: Voluntary Tunnels andCompulsory Tunnels – VPN Components and Requirements – VPN Architecture – Types: Access VPN, Intranet VPN, Extranet VPN, Software Based VPNs, Hardware Based VPNs, Firewall based VPNs, IP Based VPNs

**UNIT-IV QUEUEING THEORY(14 Periods)**

**QUEUEING THEORY:** Description of Queuing Problem – Characteristics of Queuing Processes – Measure of Effectiveness – Notation – Common Areasof Application – steady-state Solution for M/M/1 Model – Little's Formula.
**STORAGE NETWORKS:** NAS Architecture: Hardware Architecture –Software Architecture – Network Connectivity – NAS as a Storage system – SAN Architecture: Creating a network for storage – Network Part , Software Part , Hardware Part , Connectivity Part – SAN Configuration – Entry Level, Mid range, Enterprise Level

**UNIT-V INTERNETWORKING TECHNOLOGIES(12 Periods)**

**INTERNETWORKING TECHNOLOGIES:** Introduction – Constituents of an Internet work - Hierarchy in Internetworks – Classification –Wide Area Network Design : Practice and Trends – Competing WAN Technologies – Steps involved in Internetworking Design – Primary Design Goals of internetworking Systems – Hierarchical Internetworking Design Models

**LAB EXERCISES**

1. Installing and Configuring a Router in a network
2. Practice on Router basic operations- Book sequence, Router modes, Logging, Passwords.
3. Exercise on Router basic commands at different modes
4. Creating Individual and Group User IDs, Passwords
5. Backup and Update of IOS Images
6. Configuring Routed, Routing Protocols – IP,RIP,OSPF
7. Router Interface configuration using tools- TFTP, config maker commands
8. Changing the default buffer allocation of router , Adjusting the ARP table, Changing the number of VTYs
9. Router security configuration using Console Port, Telnet and Access List
10. Testing router status using troubleshooting tools-Ping, Traceroute etc.

**INSTRUCTIONAL STRATEGY**
In addition to classroom teaching, the teacher should demonstrate the practical usage of mobile using real world examples.

**MEANS OF ASSESSMENT**

– Assignments and Quiz/class tests, mid-term and end-term written tests
– Actual laboratory and practical work and Viva-Voce

**RECOMMENDED BOOKS**

| S.No | Title | Author | Publisher | Year of Publishing/ Editor |
|---|---|---|---|---|
| 1. | Data Communications and Networking | Behrouz A Forozan | Tata McGraw-Hill Publishing Company Ltd, | 2006 |
| 2. | Design and Analysis of Computer Communication Networks | Vijay Ahuja | Tata McGraw-Hill Publishing Company Ltd, | 1985 |
| 3. | VPNs A Beginner's Guide | John Mairs | Tata McGraw-Hill Publishing | 2002 |
| 4. | Storage Networks: The Complete Reference | Robert Spalding | Tata McGraw-Hill Publishing Company Ltd, | 2003 |
| 5. | Internetworking Technologies An Engineering Perspective | Rahul Banerjee | Prentice Hall of India | 2003 |

**Websites for Reference:**

http://swayam.gov.in

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 08 | 14 |
| 2. | 14 | 25 |
| 3. | 08 | 14 |
| 4. | 14 | 25 |
| 5. | 12 | 22 |
| **Total** | **56** | **100** |

## 6.5 PROJECT

| L | T | P |
|---|---|---|
| - | - | 8 |

**RATIONALE**

Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The students should identify themselves or accept the given project assignment at least two to three months in advance. The project work identified in collaboration with industry should be preferred. Each teacher is expected to guide the project work of 5–6 students.
The project assignments may consist of:

- Hardware based Project
- PC Repair & Maintenance Project
- Simulation of Server software services
- IoT Project

**LEARNING OUTCOMES**

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

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

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

| Sr. No | Performance criteria | Max.** marks | Rating Scale | | | | |
|---|---|---|---|---|---|---|---|
| | | | Excellent | Very Good | Good | Fair | Poor |
| 1. | Selection of project assignment | 10 | 10 | 8 | 6 | 4 | 2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2. | Planning and execution of considerations | 10 | 10 | 8 | 6 | 4 | 2 |
| 3. | Quality of performance | 20 | 20 | 16 | 12 | 8 | 4 |
| 4. | Providing solution of the problems or production of final product | 20 | 20 | 16 | 12 | 8 | 4 |
| 5. | Sense of responsibility | 10 | 10 | 8 | 6 | 4 | 2 |
| 6. | Self-expression/ communication skills | 5 | 5 | 4 | 3 | 2 | 1 |
| 7. | Interpersonal skills/human relations | 5 | 5 | 4 | 3 | 2 | 1 |
| 8. | Report writing skills | 10 | 10 | 8 | 6 | 4 | 2 |
| 9. | Viva voce | 10 | 10 | 8 | 6 | 4 | 2 |
| **Total marks** | | **100** | **100** | **80** | **60** | **40** | **20** |

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

| | **Range of maximum marks** | **Overall grade** |
|---|---|---|
| i) | More than 80 | Excellent |
| ii) | 79 <> 65 | Very good |
| iii) | 64 <> 50 | Good |
| iv) | 49 <> 40 | Fair |
| v) | Less than 40 | Poor |

In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance of undergoing 8 -10 weeks of project oriented professional training in the same industry and re-evaluated before being disqualified and declared "not eligible to receive diploma". It is also important to note that the students must get more than six "goods" or above "good" grade in different performance criteria items in order to get "Overall Good" grade.

**Important Notes**

1. **These criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.**

2. **The criteria for evaluation of the students have been worked out for 100 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.**
3. **The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.**
4. **It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.**

The teachers are free to evolve another criterion of assessment, depending upon the type of project work.
The students must submit a project report of not less than 50 pages (excluding coding). The report must follow the steps of Software Engineering Concepts
It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organizations in such an exhibition. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific industries are approached for instituting such awards.

## 10. RESOURCE REQUIREMENT

### 10.1 Physical Resources

#### *10.1.1 Space Requirement:*

Norms and standards laid down by All India Council for Technical Education (AICTE) may be followed to work out space requirement in respect of class rooms, tutorial rooms, drawing halls, laboratories, space required for faculty, student amenities and residential area for staff and students.

#### *10.1.2 Laboratoires/Shops*

- Communication Skill Lab
- Applied Physics Lab
- Applied Chemistry Lab
- Technical Drawing
- Electrical Engineering Lab
- Carpentry Shop
- Painting and Polishing Shop
- Fitting and Plumbing Shop
- Sheet Metal Shop
- Programming Lab
- Hardware and Networking Lab
- Internet of Things (IoT) Lab
- Environment Engineering Lab
- Energy Conservation Lab
- Electronics Devices and circuits Lab
- Electronic Instruments and Measurement Lab
- Electronic Communication Lab
- Microprocessor Lab
-

**LIST OF EQUIPMENT FOR COMPUTER SCIENCE AND ENGINEERING**

| Sr. No. | Description | Qty | Total Price (Rs) |
|---|---|---|---|
| **COMMUNICATION SKILL LABORATORY** | | | |
| 1. | Stools | 40 | 10,000 |
| 2. | Display Board/Screen | 2 | 6,000 |
| 3. | Sound recording and playing system | 1 | 6,000 |
| 4. | Audio cassettes | 60 | 2,000 |
| 5. | Overhead Projector | 1 | 5,000 |
| 6. | Transparencies slides | 100 | 500 |
| 7. | TV, VCR and camera for video recording | 1 each | 20,000 |
| 8. | English spoken course | 1 | 2,000 |
| 9. | A Quiz room equipped with two way audio system, back projection system and slide projector | 1 | 30,000 |
| 10. | Miscellaneous | LS | 1,500 |
| **APPLIED PHYSICS LABORATORY** | | | |
| 1. | Vernier calipers<br>Working length 160 mm, Internal and external dia with locking arrangement | 12 | 2,000 |
| 2. | Screw Gauges<br>Working length 15 mm, pitch 0.5 mm, least count .005 mm | 12 | 2,000 |
| 3. | Spherometers<br>Distance between legs 2.5 mm, pitch 0.5 mm, least count .005 mm. | 12 | 2,000 |
| 4. | Mirrors (convex, concave) | 5 Each | 1,500 |
| 5. | Pendulum Setup | 02 | 4,000 |
| 6. | Gravesand's Apparatus | 02 | 3,000 |
| 7. | Inclined Plane Setup | 02 | 2,000 |
| 8. | Flywheel Setup | 02 | 4,000 |
| 9. | Prism | 05 | 1,500 |
| 10. | Spectrometer | 02 | 25,000 |
| 11. | DC Ammeters<br>Moving coil weston-type ammeter with ebonite stand | 10 | 3,500 |
| 12. | DC Miliammeters | 2 | 1,000 |
| 13. | DC Microammeters | 2 | 700 |
| 14. | DC voltmeters | 10 | 700 |
| 15. | DC Millivoltmeters | 10 | 2,000 |
| 16. | Sensitivity Galvanometer | 2 | 800 |

| Sr. No. | Description | Qty | Total Price (Rs) |
|---|---|---|---|
| 17 | Student Galvanometers | 10 | 4,000 |
| 18. | Demonstration type DC Ammeters<br>Range; 0 to 1 Amp. | 2 | 1,000 |
| 19. | D type DC Voltmeter<br>Range : 0 to 1 Volt | 2 | 1,000 |
| 20. | D type Galvanometers<br>Sensitivity : 20 microamperes per scale division, | 8 | 8,000 |
| 21. | Resistance boxes (dial type) assorted | 8 | 8,000 |
| 22. | Rheostats | 10 | 4.000 |
| 23. | Miscellaneous items (Spring, Pan, Glycerine, Optic fibre, Ferromagnetic material) | LS | 2,000 |
| 24. | Fortin's Barometer (Wall type) | 2 | 20,000 |
| 25. | Stoke's Apparatus | 2 | 10,000 |
| 26. | Gumther's Apparatus | 2 | 16,000 |
| 27. | Resonance Tube Apparatus with accessories and Tuning fork set | 2 | 14,000 |
| 28. | Sodium Lamp setup with Biprism | 2 | 10,000 |
| 29. | Ohmic resistance coil | 10 | 5,00 |
| 30. | Slide wire bridge | 2 | 8,000 |
| 31. | PN Junction diode Apparatus | 2 | 10,000 |
| 32. | Laser (as per requirement) | 1 | 1,00,000 |
| 33. | Numerical aperture setup | 1 | 25,000 |
| 34. | Miscellaneous | LS | 3,000 |
| **APPLIED CHEMISTRY LABORATORY** | | | |
| 1. | Digital Balance | 1 | 80,000 |
| 2. | Burette 50ml | 30 | 3,000 |
| 3. | Pipette 25ml | 60 | 4,000 |
| 4. | Beakers 100ml | 60 | 4,000 |
| 5. | Burette stand | 30 | 30,000 |
| 6. | Glazed tile | 30 | 1,000 |
| 7. | Conical flask 50ml (Titration flask) | 60 | 4,000 |
| 8. | Standard (Measuring) flask (to prepare standard solution) 250ml/100ml | 30 | 6,000 |
| 9. | Able's Flash Point apparatus | 2 | 10,000 |
| 10. | (1/10)°C thermometer | 06 | 6,000 |
| 11. | Candles | 20 | 100 |
| 12. | Crucible with lid | 06 | 2,000 |
| 13. | Muffle furnace | 1 | 18,000 |

| Sr. No. | Description | Qty | Total Price (Rs) |
|---|---|---|---|
| 14. | Decicators | 06 | 8,000 |
| 15. | Pair of tongue (small and big) | 24 (small)<br>2 (big) | 2,000 |
| 16. | Chemicals<br>- EDTA-1 kg<br>- Eriochrome Black-T(solochrome black T)-200g<br>- Buffer solution ($NH_3$ - 2.5 ltr, $NH_4Cl$ – 1 kg)<br>- Zinc sulphate- 500g<br>- $H_2SO_4$- 2.5 ltr<br>- Phenolphthalein indicator (as per requirement)<br>- Methyl orange indicator (as per requirement)<br>- Charcoal (as per requirement)<br>- Kerosene- 1 ltr | LS | 20,000 |
| 17. | Miscellaneous | LS | 2,000 |
| **TECHNICAL DRAWING** | | | |
| 1. | Drawing Boards (700 x 500mm) | 60 | 25,000 |
| 2. | Draughtsman Tables | 60 | 1,80,000 |
| 3. | Draughtsman Stools | 60 | 40,000 |
| 4. | Computer Aided Drawing (CAD) Software | 30 User | 5,00,000 |
| 5. | Model of different wooder joints | 1 | 1,000 |
| 6. | Model of different screw threads | 1 | 1,000 |
| 7. | Model of various locking devices | 1 | 1,000 |
| 8. | Model of various joints | 1 | 1,000 |
| 9. | Cut section Model of various couplings | 1 | 3,000 |
| 10. | Miscellaneous | LS | 5,000 |
| **ELECTRICAL ENGINEERING LABORTORY** | | | |
| 1. | Voltmeter | 5 | 7,500 |
| 2. | Ammeter | 5 | 10,000 |
| 3. | CRO | 1 | 15,000 |
| 4. | Wattmeter | 5 | 10,000 |
| 5. | Multimeter | 1 | 4,000 |
| 6. | Resistive load | 1 | 4,000 |
| 7. | Regulated supply | 1 | 8,000 |
| 8. | Signal generator | 1 | 5,000 |
| 9. | Rheostat | 2 | 2,500 |
| 10. | Lead acid battery | 1 | 4,000 |
| 11. | Cables, Coils, Lamp (as per requirements) | LS | 1,500 |
| 12. | Resistance, Inductor, Capacitor (as per requirements) | LS | 1,500 |
| 13. | Miscellaneous | LS | 1,500 |

| CARPENTRY SHOP | | | |
|---|---|---|---|
| **Sr. No.** | **Description** | **Qty** | **Total Price (Rs)** |
| 1 | Work benches fitted with carpenter vices | 5 | 20,000 |
| 2. | Circular saw grinder | 1 | 6,000 |
| 3. | Wood cutting band saw-vertical | 1 | 10,000 |
| 4. | Bench grinder | 1 | 5,000 |
| 5. | Drilling machine | 1 | 8,000 |
| 6. | Wood turning lathe | 1 | 40,000 |
| 7. | Wood Planner | 1 | 20,000 |
| 8. | Tool accessories measuring and marking Instruments | 25 | 25,000 |
| 9. | Band saw blade brazing unit | 1 | 10,000 |
| 10. | Miscellaneous | LS | 1,500 |
| **PAINTING AND POLISHING SHOP** | | | |
| 1. | Spray gun with hose pipe | 1 | 1,000 |
| 2. | Paint brushes | 20 | 2,000 |
| 3. | Paint/Varnish | LS | 2,000 |
| 4. | Air Compressor with 2 hp motor | 1 set | 10,000 |
| 5. | Miscellaneous | LS | 2,000 |
| **FITTING AND PLUMBING SHOP** | | | |
| 1. | Work benches with vices (4 vices on each bench) | 5 | 30,000 |
| 2. | Marking tables with scribers | 4 | 24,000 |
| 3. | Surface plates | 5 | 20,000 |
| 4. | Accessories like calipers, V blocks, height, gauges steel rules and scribers | 25 | 50,000 |
| 5. | Tool kits – taps, dies, drills | 25 | 40,000 |
| 6. | Tool kits – chiesels, hammers, files, hacksaw | 25 | 25,000 |
| 7. | Drilling machine | 2 | 12,000 |
| 8. | Pipe vice | 4 | 1,000 |
| 9. | Chain wrenches | 5 | 1,250 |
| 10. | Ring spanner set | 5 | 600 |
| 11. | Pipe die set 2” | 2 set | 1,000 |
| 12. | Pipe bending device | 1 | 5,000 |
| 13. | Various plumbing fittings | LS | 2,000 |
| 14. | Miscellaneous | LS | 1,500 |
| **SHEET METAL** | | | |
| 1. | Hammers | 8 | 3,000 |
| 2. | Mallets (Hard & Soft) | 5 | 2,000 |
| 3. | Sheet and wire Ganges | LS | 8,00 |
| 4. | Shearing Machine | 1 | 20,000 |
| **Sr. No.** | **Description** | **Qty** | **Total Price (Rs)** |
| 5. | Bar folding Machine | 1 | 20,000 |
| 6. | Burring machine | 1 | 10,000 |
| 7. | Various sheet (black plain, galvanized iron, corrugated, Aluminium) | 1 Each | 1,000 |

| | | | |
|---|---|---|---|
| 8. | Hand Shears/Snippers | 4 | 2,000 |
| 9. | Nuts, Bolts, Rivets, Screw | LS | 5,00 |
| 10. | Miscellaneous | LS | 1,000 |
| **PROGRAMMING LAB** | | | |
| 1. | Computer Server (Quad core, intel processor 32 GB RAM) | 1 | 5,00,000/- |
| 2. | Computer Desktop (i7,8th Generation, 1TB Hard disk, 8Gb RAM, Pre loaded window with 5 year warranty) | 60 | 48,00,000/- |
| 3. | Switch with 24 port speed 10/100/1000 (Manageable) | 3 | 1,50,000/- |
| 4. | Multifunctional Laser/Ink tank Printer | 3 | 90,000/- |
| 5. | Multifunctional Printer, A3 size | 1 | 40,000/- |
| 6. | Plotter | 1 | 80,000/- |
| 7. | Scanner | 1 | 65,000/- |
| 8. | Laptop | 1 | 75,000/- |
| 9. | Online UPS, 6KVA | 2 | 2,00,000/- |
| 10. | Digital Camera, HD quality | 1 | 30,000/- |
| 11. | Handy Cam | 1 | 25,000/- |
| 12. | Internet Connectivity | 60 Nodes | 3,00,000/- |
| 13. | LCD/DLP Projector with Screen | 1 | 25,000/- |
| 14. | Linux Operating System (Open Source) | - | - |
| 15. | Visual Studio Community Edition (Freeware, Open Source) | - | - |
| 16. | Visual Studio Code (Open Source) | - | - |
| 17. | Multimedia Tools – Software<br>- Blender (Freeware)<br>- Gimp Animation Tool (Freeware) | - | - |
| 18. | Mongo DB (Freeware) | - | - |
| 19. | Python IDE (PyCharm/Eclipse with PyDev/VS Code etc) – Freeware | - | - |
| 20. | HTML & CSS, Java Script, Ajax (Open Source) | - | - |
| 21. | PHP IDE XAMPP/WAMPP/VS Code (Freeware) | - | - |
| 22. | Word press (Open Source) | - | - |
| 23. | Oracle XE (Freeware)/MySql (Open Source) | - | - |
| 24. | Corel Draw latest version or equivalent FOSS | 10 User | 2,00,000/- |
| **Sr. No.** | **Description** | **Qty** | **Total Price (Rs)** |
| 25. | Adobe Creative Suite | 10 User | 2,50,000/- Per year |
| 26. | Rstudio (Open Source) | - | - |
| 27. | Macromedia Director latest version or equivalent FOSS | 4 User | 2,00,000/- |
| 28. | Multimedia authoring Tools | LS | 1,00,000/- Per year |

| | | | |
|---|---|---|---|
| 29. | Java for Internet Environment (latest version) – software | - | - |
| 30. | MS Office latest or equivalent FOSS<br>- Libre Office/Open Office (Freeware) | 1<br>- | 20,000/- Per year<br>- |
| 31. | Compiler Turbo C, C++ or equivalent FOSS | 1 | 10,000/- |
| 32. | Web camera, Mike and speakers | LS | 20,000/- |
| 33. | Air Conditioner 2 ton | 2 | 70,000/- |
| 34. | STARUML (Open Source) | - | - |
| 35. | J-Meter (Performance Testing)- Open Source | - | - |
| 36. | Lucid Chart (Developing DFD Model)- Open Source | - | - |
| 37. | Selenium (functional Testing and Web Application)- Open Source | - | - |
| 38. | J Unit (Java Testing) Open Source | - | - |
| 39. | Cross browser Testing (Compatibility Testing) - Open Source | - | - |
| 40. | Gantt Project (Project Plan)- Open Source | - | - |
| 41. | Video Editing Tools (Open Source) | - | - |
| 42. | - Eclipse IDE for Java programming/JDK (Open Source)<br>- Apache Tomcat Web Server for Advanced Java Web Applications | -<br>- | -<br>- |
| 43. | Antivirus Software | 5 Users | 10,000/- |
| 44. | Miscellaneous- cables and connectors, computer stationery, printer consumables (inks), toner etc. | LS | 30,000/- |
| **HARDWARE AND NETWORKING LAB** | | | |
| 1. | Computer Server (Quad core, intel processor 32 GB RAM) | 1 | 5,00,000/- |
| 2. | Computer Desktop (i7,8th Generation, 1TB Hard disk, 8Gb RAM, Pre loaded window with 5 year warranty) | 21 | 16,00,000/- |
| 3. | Online UPS, 6KVA | 1 | 1,00,000/- |
| 4. | Switch with 24 port speed 10/100/1000 (Manageable) | 1 | 50,000/- |
| 5. | Connectors (RJ-45, RJ-11, BNC, SC, ST) | LS | 10,000/- |

| **Sr. No.** | **Description** | **Qty** | **Total Price (Rs)** |
|---|---|---|---|
| 6. | Cables: (UTP,STP,OFC) - 25 m each | LS | 10,000/- |
| 7. | Multifunctional Laser/Ink tank Printer | 1 | 30,000/- |
| 8. | Router | 1 | 40,000/- |
| 9. | Modem cum Router | 2 | 10,000/- |
| 10. | Compact Disk/DVD R/W | 100 | 2000/- |
| 11. | Hardware kit (for computer Assembling/de-assembling) | 8 | 1,50,000/- |
| 12. | External Hard Disk | 4 | 30,000/- |

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|---|---|---|---|
| 13. | Networking Printer | 1 | 1,25,000/- |
| 14. | Internet Connectivity | 21 Nodes | 1,00,000/- |
| 15. | Computer System Demonstration Kit | 1 | 1,50,000/- |
| 16. | Printer Demonstration Kit | 1 | 1,00,000/- |
| 17. | SMPS Demonstration Kit | 1 | 20,000/- |
| 18. | LAN Trainer | 4 | 10.000/- |
| 19. | Antivirus Software | 5 Users | 10,000/- |
| 20. | Unmanaged Switch | 4 | 60,000/- |
| 21. | Hub | 2 | 20,000/- |
| 22. | Air Conditioner 2 ton | 2 | 70,000/- |
| 23. | Miscellaneous- cables and connectors, computer stationery, printer consumables (inks), toner etc. | LS | 30,000/- |
| **INTERNET OF THINGS (IoT) LAB (For IoT, Android and Major/Minor Project)** | | | |
| 1. | Computer Desktop (i7,8th Generation, 1TB Hard disk, 8Gb RAM, Pre loaded window with 5 year warranty) | 60 | 48,00,000/- |
| 2. | Switch with 24 port speed 10/100/1000 (Manageable) | 1 | 50,000/- |
| 3. | Multifunctional Laser/Ink tank Printer | 1 | 30,000/- |
| 4. | Online UPS, 6KVA | 2 | 2,00,000/- |
| 5. | Touch screen, 60 inch | 1 | 5,00,000/- |
| 6. | Laptop | 1 | 75,000/- |
| 7. | Internet Connectivity | 60 Nodes | 3,00,000/- |
| 8. | Photocopier Compatible with Computer System: Colour/Mono Photo-copier | 1 | 1,50,000/- |
| 9. | LCD/DLP Projector with Screen | 1 | 25,000/- |
| 10. | Video Conferencing System | 1 | 2,00,000/- |
| 11. | Android Studio (Open Source) | - | - |
| 12. | Antivirus Software | 5 Users | 10,000/- |

| **Sr. No.** | **Description** | **Qty** | **Total Price (Rs)** |
|---|---|---|---|
| 13. | Windows Latest or equivalent FOSS | 1 | 10,000/- |
| 14. | SciLab (Open Source) | - | - |
| 15. | Microsoft Azure/AWS/EC2 (Open Source) | - | - |
| 16. | Own Cloud (Open Source) | - | - |
| 17. | CloudSim (Open Source) | - | - |
| 18. | Digital Board | 1 | 30,000/- |
| 19. | Air Conditioner 2 ton | 2 | 70,000/- |
| 20. | Arduino Uno IDE with built in Wifi | 20 | 20,000/- |
| 21. | Raspberry pi | 2 | 6,000/- |
| 22. | Sensor Kits (e.g. MQ135, DHT11 etc.) | 10 | 1,00,000/- |

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|---|---|---|---|
| 23. | Bluetooth module HC05 | 10 | 3,500/- |
| 24. | Display Screen | 5 | 1,000/- |
| 25. | Relay Module | 5 | 5,000/- |
| 26. | Miscellaneous- cables and connectors, computer stationery, printer consumables (inks), toner etc. | LS | 30,000/- |
| **ENVIRONMENT ENGINEERING LABORATORY** | | | |
| 1. | pH Meter | 01 | 500 |
| 2. | Turbidity Meter | 01 | 5000 |
| 3. | Oven with Temperature Controller and Forced Air Circulation Type | 01 | 20000 |
| 4. | B.O.D. Incubator | 01 | 25000 |
| 5. | Water Analysis Kit | 01 | 5000 |
| 6. | High Volume Sampler | 01 | 40000 |
| 7. | Electrical Balance for weighing upto 1/10 of milligram (capacity) | 01 | 1000 |
| **ENERGY CONSERVATION LABORATORY** | | | |
| 1 | Clamp meter | 02 | 5000 |
| 2 | Multimeter | 02 | 2000 |
| 3 | Power Analyser | 01 | 20000 |
| 4 | Different types of lamps (LS)<br>– 60 W lamp, 230 V , 100 V<br>– 200 W lamp<br>– 500 W lamp<br>– 100 W lamp, 110 V, 150 V | 10 | 500 |
| 5 | Lux meter | 02 | 5000 |
| 6 | Centrifugal pump, 1 kW | 1 | 15,000 |
| 7 | Standard window A.C. | 01 | 20000 |
| 8 | Anemometer | 02 | 5000 |
| 9 | Thermometer | 03 | 2000 |
| 10 | Flow meter | 02 | 10000 |
| 11 | Pumping set with at least two pumps of different capacity. | 1 set | 10000 |
| 12 | Pressure gauge fitted on discharge lines | 1 set | 2000 |
| 13 | Variable Frequency Drive | 02 | 50000 |

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|---|---|---|---|
| 14 | A small compressor with a small network of pipe line fitted with suitable pipeline, pressure gauge, safety valve and loading / unloading pressure switch. | 1 | 3000 |
| 15 | Stop watch | 2 | 1000 |
| 16 | Small blower (1.5 kW motor) with inlet and outlet ducts of approximately one meter length on both sides | 1 | 10000 |
| 17 | Black Box (for checking lamp efficacy including stand and luxmeter) | 1 | 25000 |
| **Electronic Devices and Circuit Lab** | | | |
| 1 | CRO | 2 | 40000 |
| 2 | Zener Diode Kit | 2 | 8000 |
| 3 | Digital Multimeter | 3 | 6900 |
| 4 | Function Generator | 2 | 28000 |
| 5 | Set of Resistors (Multiple Values) | 2 set | 500 |
| 6 | Set of Capacitor (Multiple Values) | 2set | 600 |
| 7 | Set of Inductor | 1 set | 300 |
| 8 | Set of Diode (PN , Zener) | 2 set | 600 |
| 9 | Set of BJT (BC107 , SL100) | 2 set | 500 |
| 10 | Set of JFET (2N547 ,MPF102) | 1 set | 250 |
| 11 | Set of MOS (IRF540 , AO4620) | 10 pc | 500 |
| 12 | OP-AMP (741 IC) | 8 pc | 400 |
| 13 | 555 Timer IC | 10pc | 500 |

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| 14 | Breadboard | 6 | 1800 |
| 15 | Operational Amplifier as Adder and Subtractor kit | 5 | 20000 |
| 16 | Pushpull amplifier kit | 2 | 8000 |
| 17 | Wein bridge oscillator and phase shift oscillator | 2 | 10000 |
| 18 | Hartley and colpitts oscillator | 2 | 8000 |
| 19 | Clipper clamper kit | 3 | 15000 |
| 20 | Logic Gate IC(AND,OR,NOR.NAND,EXOR,EXNOR) | 10 EACH | 500 |
| 21 | Logic gate kit | 1 | 4000 |
| 23 | Flip Flop kit | 2 | 8000 |
| 24 | MUX-DEMUX kit | 1 | 5000 |
| 25 | Encoder and Decoder kit | 1 | 4800 |
| 26 | CMOS and TTL transfer characteristics kit | 1 | 4900 |
| 27 | Breadboard | 6 | 1800 |
| **Electronic Instruments and Measurement Lab** | | | |
| 1 | DSO | 1 | 35000 |
| 2 | CRO | 2 | 40000 |
| 3 | Wheat stone bridge | 2 | 7000 |
| 4 | RLC bridge | 1 | 6000 |
| 5 | Maxwell bridge | 1 | 4500 |
| **Electronic Communication Lab** | | | |
| 1 | CRO | 2 | 40000 |
| 2 | AM MODULATOR | 1 | 4500 |
| 3 | FM MODULATOR | 1 | 5500 |
| 4 | Sampling and reconstruction kit | 1 | 4400 |
| 5 | PPM &PWM KIT | 1 | 5500 |
| 6 | ASK,FSK,DPSK KIT | 1 | 6000 |
| 7 | PSPICE SOFTWARE | | |

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|---|---|---|---|
| 8 | GSM TRAINER KIT WITH GSM MOBILE | 1 | 20000 |
| 9 | Transmitting antenna measurement kit | 1 | 5000 |
| **Microprocessor Lab** | | | |
| 1 | 8085 MP kit | 8 | 80000 |
| 2 | 8086 mp kit | 2 | 20000 |

**NOTE**

In addition to above laboratories, computer centre will be required for effective implementation of the course.

### *10.1.3* Furniture Requirement

Norms and standards laid down by AICTE be followed for working out furniture requirement for this course.

- Furniture for laboratories/Computer Centre 15 lacs

## 10.2 Human Resources

Weekly work schedule, annual work schedule, student teacher ratio for various group and class size, staffing pattern, work load norms, qualifications, experience and job description of teaching staff workshop staff and other administrative and supporting staff be worked out as per norms and standards laid down by the AICTE. The website www.aicte.ernet.in may be referred for downloading current norms and standards pertaining to technician courses.

## 11. EVALUATION STRATEGY

### 11.1 INTRODUCTION

Evaluation plays an important role in the teaching-learning process. The major objective of any teaching-learning endeavor is to ensure the quality of the product which can be accessed through learner's evaluation.

The purpose of student evaluation is to determine the extent to which the general and the specific objectives of curriculum have been achieved. Student evaluation is also important from the point of view of ascertaining the quality of instructional processes and to get feedback for curriculum improvement. It helps the teachers in determining the level of appropriateness of teaching experiences provided to learners to meet their individual and professional needs. Evaluation also helps in diagnosing learning difficulties of the students. Evaluation is of two types: Formative and Summative (Internal and External Evaluation)

**Formative Evaluation**

It is an on-going evaluation process. Its purpose is to provide continuous and comprehensive feedback to students and teachers concerning teaching-learning process. It provides corrective steps to be taken to account for curricular as well as co-curricular aspects.

**Summative Evaluation**

It is carried out at the end of a unit of instruction like topic, subject, semester or year. The main purpose of summative evaluation is to measure achievement for assigning course grades, certification of students and ascertaining accountability of instructional process. The student evaluation has to be done in a comprehensive and systematic manner since any mistake or lacuna is likely to affect the future of students.

In the present educational scenario in India, where summative evaluation plays an important role in educational process, there is a need to improve the standard of summative evaluation with a view to bring validity and reliability in the end-term examination system for achieving objectivity and efficiency in evaluation.

### 11.2 STUDENTS' EVALUATION AREAS

The student evaluation is carried out for the following areas:

- Theory
- Practical Work (Laboratory, Workshop, Field Exercises)
- Project Work
- Professional Industrial Training

**A. Theory**

Evaluation in theory aims at assessing students' understanding of concepts, principles and procedures related to a course/subject, and their ability to apply learnt principles and solve problems. The formative evaluation for theory subjects may be caused through sessional /class-tests, home-assignments, tutorial-work, seminars, and group discussions etc. For end-term evaluation of theory, the question paper may comprise of three sections.

**Section-I**

It should contain objective type items e.g. multiple choice, matching and completion type. Total weightage to Section-1 should be of the order of 20 percent of the total marks and no choice should be given in this section. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

**Section-II**

It should contain short answer/completion items. The weightage to this section should be of the order of 40 percent of the total marks. Again, no choice should be given in section-II

**Section-III**

It may contain two to three essay type questions. Total weightage to this section should be of the order of 40 percent of the total marks. Some built-in, internal choice of about 50 percent of the questions set, can be given in this section

**Table II : Suggested Weightage to be given to different ability levels**

| Abilities | Weightage to be assigned |
|---|---|
| Knowledge | 10-30 percent |
| Comprehension | 40-60 percent |
| Application | 20-30 percent |
| Higher than application i.e. Analysis, Synthesis and Evaluation | Upto 10 percent |

**B. Practical Work**

Evaluation of students performance in practical work (Laboratory experiments, Workshop practicals/field exercises) aims at assessing students ability to apply or practice learnt concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work related attitudes. Formative and summative evaluation may comprise of weightages to performance on task, quality of product, general behaviour and it should be followed by viva-voce.

**C. Project Work**

The purpose of evaluation of project work is to assess students ability to apply, in an integrated manner, learnt knowledge and skills in solving real life problems, manipulative skills, ability to observe, record, creativity and communication skills. The formative and summative evaluation may comprise of weightage to nature of project, quality of product, quality of report and quality of presentation followed by viva-voce.

**D. Professional Industrial Training**

Evaluation of professional industrial training report and viva-voce/ presentation aims at assessing students' understanding of materials, industrial processes, practices in the industry/field and their ability to engage in activities related to problem-solving in

industrial setting as well as understanding of application of learnt knowledge and skills in real life situation. The formative and summative evaluation may comprise of weightages to performance in testing, general behaviour, quality of report and presentation during viva-voce.

## 11.3 ASPECTS OF QUESTION PAPER SETTING

Validity and reliability are the most important considerations in the selection and construction of evaluation procedures. First and foremost are the evaluation tools to measure the specific outcomes for which they are intended to measure. Next in importance is reliability, and following that is a host of practical features that can be classified under the heading of usability.

For weightage of marks assigned to formative (internal) and summative (external) evaluation and duration of evaluation has been given in the study and evaluation scheme of the curriculum document. Teachers/Paper-setters/Examiners may use Manual for Students' Evaluation developed by IRDT Kanpur to bring objectivity in the evaluation system. The working group found it very difficult to detail out precisely the contents of subject on **languages** and therefore teachers may send guidelines to respective examiners for paper setting to maintain objectivity in evaluation.

## 12. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION

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

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

### (A) Broad Suggestions:

1. Curriculum implementation takes place at programme, course and class-room level respectively and synchronization among them is required for its success. The first step towards achieving synchronization is to read curriculum document holistically and understand its rationale and philosophy.

2. Punjab State Board of Technical Education (PSBTE) may make the academic plan available to all polytechnics well in advance. The Principals have a great role to play in its dissemination and, percolation upto grass-root level. Polytechnics in turn are supposed to prepare institutional academic plan by referring state level PSBTE plan.

3. HOD of every Programme Department along with HODs and incharges of other departments viz. English, Maths, Physics, Chemistry etc. are required to prepare academic plan at department level referring institutional academic plan.

4. All lecturers/Senior lecturers are required to prepare course level and class level lesson plans referring departmental academic plan.

### (B) Course Level Suggestions

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

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

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

1. Teachers are required to prepare a course plan, taking into account departmental academic plan, number of weeks available, course to be taught, different learning experiences required to be developed etc.

2. Teachers are required to prepare lesson plan for every theory class. This plan may comprise of content to be covered, learning material (transparencies, VCDs, Models etc.) for execution of a lesson plan. They may follow steps for preparing lesson plan e.g. drawing attention, state instructional objectives, help in recalling pre-requisite knowledge, deliver planned subject content, check desired learning outcome and reinforce learning etc.

3. Teachers are required to plan for expert lectures from field/industry. Necessary steps are to plan in advance, identify field experts, make correspondence to invite them, take necessary budgetary approval etc.

4. Teachers are required to plan for guided library exercises by identification of course specific experience requirement, setting time, assessment, etc. The tutorial, assignment and seminar can be thought of as terminal outcome of library experiences.

5. Concept and content based field visits with appropriate releases (day-block) may be planned and executed for such content of course which otherwise is abstract in nature and no other requisite resources are readily available in institute to impart them effectively.

6. There is a dire need for planning practical experiences in right perspective. These slots in a course are the avenues to use problem based learning/activity learning/ experiential learning approach effectively. The development of lab instruction sheets for the course is a good beginning to provide lab experiences effectively.

7. Planning of progressive assessment encompasses periodical assessment in semester, preparation of proper quality question paper, assessment of answer sheets immediately and giving constructive explicit feed back to every student. It has to be planned properly; otherwise very purpose of the same is lost.

8. The co-curricular activities like camp, social gathering, study tour, hobby club etc. may be used to develop generic skills like task management, problem solving, managing self, collaborating with others etc.

9. Where ever possible, it is essential to use activity based learning rather than relying on delivery based conventional teaching all the time.

10. While imparting instructions, emphasis may be laid on the development of cognitive, psychomotor, reactive and interactive skills in the students.

11. Teachers may take working drawings from the industry/field and provide practices in reading these drawings.

12. Considerable emphasis should be laid in discipline specific contracting and repair and maintenance of machines, tools and installations.

13. Teachers may take initiative in establishing liaison with industries and field organizations for imparting field experiences to their students.

14. Case studies and assignments may be given to students for understanding of Enterprise Resource Management (ERM).

15. Students be made aware about issues related to ecology and environment, safety, concern for wastage of energy and other resources etc.

16. Students may be given relevant and well thought out minor and major project assignments, which are purposeful and develop practical skills. This will help students in developing creativity and confidence for their gainful employment (wage and self).

17. A Project bank may be developed by the concerned department of the polytechnics in consultation with related Industry, Research Institutes and other relevant field organizations in the state.

## 13. LIST OF PARTICIPANTS

**The following experts have participated in workshop for Developing the Curricula Structure and Contents of Diploma in Communication and Computer Networking for UP State on 6th August, 20212 at IRDT U.P. Kanpur:**

1. Sh. Ashok Kushwaha, Principal, Government Polytechnic, Risia Nanpara bahraich

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3. Saurabh Sachan, Lecturer Computer, Government Polytechnic, Deeh Unnao

4. Santosh Kumar, Lecturer Eelctronics, Government Polytechnic, Kanpur

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