

**NEP-2020 Aligned Curriculum for**  
**Three Year (Six Semesters) Diploma Programme**  
**in**  
**COMPUTER SCIENCE AND ENGINEERING**

For the State of Uttar Pradesh

(5<sup>th</sup> to 6<sup>th</sup> Semester)

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Semester System

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Prepared By:

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### SIXTH SEMESTER

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## 1 . SALIENT FEATURES

- 1) Name of the Programme : Diploma Programme in Computer Science and Engineering
- 2) Duration of the Programme : Three years (Six Semesters)
- 3) Entry Qualification : Matriculation or equivalent NEP-2020/NSQF Level-4 as Prescribed by State Board of Technical Education, U.P.
- 4) Pattern of the Programme : Semester Pattern
- 5) NSQF Level : Level - 5
- 6) Ratio between Theory and Practical : 40: 60 (Approx.)

### 7) **Industrial Training**

Four and six weeks of industrial training is made mandatory after the II and IV semesters during summer vacation. Total marks allotted to industrial training will be respectively 50 & 100.

In the last (6<sup>th</sup> Semester) we have made the one semester Industrial training/Internship as optional along with usual classroom training.

### 8) **Ecology and Environment**

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

### 9) **Entrepreneurship and Start-ups**

A full subject Entrepreneurship & Start-ups has been incorporated in the curriculum.

### 10) **Student Centred Activities**

A provision of 2-4 hrs per week has been made for organizing Student Centered 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, library and other cultural activities.

### 11) **Project work**

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

## 2- PROGRAM OUTCOMES (POs)

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### **PO1: Basics and Discipline specific Knowledge**

Assimilate knowledge of basic mathematics, science, engineering fundamentals.

### **PO2: Problem's Analysis and solution**

Identify, analyse and solve problems using standard methods and established techniques.

### **PO3: Design and Development**

Design solutions for technical problems.

Assist in designing components, systems, or processes to meet specific requirements.

### **PO4: Engineering Tools, Experimentation, and Testing**

Use modern engineering tools and appropriate techniques to conduct experiments as per BIS standard.

### **PO5: Socio/ Economic /Environmental impact assessment/remedy.**

Apply relevant technologies while considering societal needs, environmental impact keeping in view sustainable and ethical responsibilities.

### **PO6: Project Management and Communication**

Apply engineering management principles, work effectively as an individual or in a team, and communicate clearly on activities.

### **PO7: Lifelong Learning**

Recognize the importance of continuous learning and actively pursue self-improvement to keep pace with technological developments.

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

**NOTE: I & II Sem. is common to all engineering & technology branches and implemented from the session 2024-2025**

### FIFTH SEMESTER (COMPUTER SCIENCE AND ENGINEERING)

| Sr. No.                           | SUBJECTS                               | Category & Course Type    | STUDY SCHEME |   |    | Credits(C)<br><br>(L+T)+P = C | MARKS IN EVALUATION SCHEME |     |     |                     |    |     |    |     |     |  | Total Marks of Internal & External |
|-----------------------------------|----------------------------------------|---------------------------|--------------|---|----|-------------------------------|----------------------------|-----|-----|---------------------|----|-----|----|-----|-----|--|------------------------------------|
|                                   |                                        |                           | Periods/Week |   |    |                               | INTERNAL ASSESSMENT        |     |     | EXTERNAL ASSESSMENT |    |     |    |     |     |  |                                    |
|                                   |                                        |                           | L            | T | P  |                               |                            | Th  | Pr  | Tot                 | Th | Hrs | Pr | Hrs | Tot |  |                                    |
| 5.1                               | Object oriented programming using Java | Prog Core (Practicum)     | 1            | - | 4  | 1+2=3                         | -                          | 60  | 60  | -                   | -  | 40  | 03 | 40  | 100 |  |                                    |
| 5.2                               | Fundamentals of Internet of Things     | Prog Core (Practicum)     | 1            | - | 4  | 1+2=3                         | -                          | 60  | 60  | -                   | -  | 40  | 03 | 40  | 100 |  |                                    |
| 5.3                               | Program Elective -2                    | Prog Elective (Practicum) | 3            | - | 4  | 3+2=5                         | 40                         | -   | 40  | 60                  | 03 | -   | 03 | 60  | 100 |  |                                    |
| 5.4                               | Program Elective -3                    | Prog Elective (Practicum) | 3            | - | 4  | 3+2=5                         | 40                         | -   | 40  | 60                  | 03 | -   | 03 | 60  | 100 |  |                                    |
| 5.5                               | (Q) Open Elective-2 OR                 | Open Elective (Theory)    | 2            | - | -  | 2                             | 50*                        | -   | 50* | -                   | -  | -   | -  | -   | -   |  |                                    |
|                                   | *Advance Skill Development             | Certification Course      | -            | - | -  |                               | -                          | -   | -   | -                   | -  | -   | -  | -   | -   |  |                                    |
| 5.6                               | Summer Internship -II (6 Weeks         |                           | -            | - | -  | 2                             | -                          | 60  | 60  | -                   | -  | 40  | 03 | 40  | 100 |  |                                    |
| 5.7                               | (Q) Indian Constitutions               | Audit Courses             | 2            | - | -  | -                             | 50*                        | -   | 50* | -                   | -  | -   | -  | -   | -   |  |                                    |
| Student Centered Activities (SCA) |                                        |                           | -            | - | 8  | -                             | -                          | 50  | 50  | -                   | -  | -   | -  | -   | 50  |  |                                    |
| Total                             |                                        |                           | 12           |   | 24 | 20                            | 80                         | 230 | 310 | 120                 |    | 120 |    | 240 | 550 |  |                                    |

(Q) It is compulsory to appear and to pass the examination, but marks will not be included for percentage and division of obtained marks

\* Students will submit the certificate. Students will present a seminar/viva on their summer internship/ ADVANCE SKILL CERTIFICATION along with certificate, project and report.

# Student Centered 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, library, Cultural Activities and self-study etc. The periods allotted to SCA can also be utilized to complete the syllabus for other subjects.

## SIXTH SEMESTER (COMPUTER SCIENCE AND ENGINEERING)

### NORMAL PATHWAY

| Sr. No.                           | SUBJECTS                       | Category & Course Type               | STUDY SCHEME |   |    | Credits(C)<br><br>(L+T)+P = C | MARKS IN EVALUATION SCHEME |     |     |                     |     |     |     |     |     | Total Marks of Internal & External |
|-----------------------------------|--------------------------------|--------------------------------------|--------------|---|----|-------------------------------|----------------------------|-----|-----|---------------------|-----|-----|-----|-----|-----|------------------------------------|
|                                   |                                |                                      | Periods/Week |   |    |                               | INTERNAL ASSESSMENT        |     |     | EXTERNAL ASSESSMENT |     |     |     |     |     |                                    |
|                                   |                                |                                      | L            | T | P  |                               | Th                         | Pr  | Tot | Th                  | Hrs | Pr  | Hrs | Tot |     |                                    |
| 6.1                               | Program Elective-4             | Program Elective-4                   | 4            | - | -  | 4+0=4                         | 40                         | -   | 40  | 60                  | 03  | -   | -   | 60  | 100 |                                    |
| 6.2                               | Entrepreneurship and Start-ups | Humanities (Theory)                  | 2            | - | -  | 2+0=2                         | 40                         | -   | 40  | 60                  | 03  | -   | -   | 60  | 100 |                                    |
| 6.3                               | In House Project               | Project                              | 4            | - | 16 | 12                            | -                          | 240 | 240 | -                   | -   | 160 | -   | 160 | 400 |                                    |
| 6.4                               | (Q) Open Elective-3 OR         | Open Elective (Theory)*              | 2            | - | -  | 2                             | 50                         | -   | 50  | -                   | -   | -   | -   | -   | -   |                                    |
|                                   | Advance Skill Development      | Open Elective (certification Course) |              |   |    |                               | -                          | -   | -   | -                   | -   | -   | -   | -   | -   |                                    |
| Student Centered Activities (SCA) |                                |                                      | -            | - | 8  | -                             | -                          | 50  | 50  | -                   | -   | -   | -   | -   | 50  |                                    |
| Total                             |                                |                                      | 12           | - | 24 | 20                            | 80                         | 290 | 370 | 120                 | -   | 160 | -   | 280 | 650 |                                    |

#### NOTE: -

(Q) It is compulsory to appear and to pass the examination, but marks will not be included for percentage and division of obtained marks.

Advance skill development mention at 6.4 in the table provides the scope of selecting the course as per choice from the elective list provided in the syllabus conducted by various agencies of repute of duration not less than 20 Hrs. (Offline/Online).

The above scheme can be customized as per the specific requirements of the respective courses.

# Student Centered 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, library, Cultural Activities and self-study etc. The periods allotted to SCA can also be utilized to complete the syllabus for other subjects.

OR

## INDUSTRIAL PATHWAY

| Sr. No. | SUBJECTS                                     | Category & Course Type               | STUDY SCHEME |   |   | Credits(C)<br>(L+T)+P=C | MARKS IN EVALUATION SCHEME |     |     |                     |     |    |     |     |     | Total Marks of Internal & External | Assessment |
|---------|----------------------------------------------|--------------------------------------|--------------|---|---|-------------------------|----------------------------|-----|-----|---------------------|-----|----|-----|-----|-----|------------------------------------|------------|
|         |                                              |                                      | Periods/Week |   |   |                         | INTERNAL ASSESSMENT        |     |     | EXTERNAL ASSESSMENT |     |    |     |     |     |                                    |            |
|         |                                              |                                      | L            | T | P |                         | Th                         | Pr  | Tot | Th                  | Hrs | Pr | Hrs | Tot |     |                                    |            |
| 6.1     | Entrepreneurship and Start-ups (ONLINE Mode) | Humanities & Social Science (Theory) | -            | - | - | 2                       | -                          | -   | -   | 100                 | 03  | -  | -   | 100 | 100 | Theory                             |            |
| 6.2     | Industrial Hands On Practice                 | Industrial Training                  | -            | - | - | 12                      |                            |     |     |                     |     |    |     |     | 350 |                                    |            |
| 6.3     | Industrial Project                           | Industrial Training                  | -            | - | - | 4                       |                            |     |     |                     |     |    |     |     | 100 |                                    |            |
| 6.4     | Seminar                                      | In House                             | -            | - | - | 2                       | -                          | 100 | 100 | -                   | -   | -  | -   | -   | 100 |                                    |            |
| Total   |                                              |                                      | -            | - | - | 20                      | -                          |     |     |                     |     |    |     | -   | 650 |                                    |            |

### NOTE:

1. The Industrial training tenure should not be less than 4 months.
2. Industry must be registered with MSME / Directorate of industries/Limited Organization/ State/Central Government establishments.
3. Monthly progress reports of Intern/ Trainee should be attested and forwarded by industrial supervisor (allotted to Intern/Trainee) during industrial Internship/Training.
4. The Industrial unit/organisation must evaluate students using the format provided by polytechnic in the form of marks.
5. The Industrial Hands on Practice, Industrial Project and seminar must be evaluated on the basis of the BTE Internship / Training Policy -2025.
6. “*Entrepreneurship and Start-up*” course is also mandatory in Industrial internship/training mode. It will be conducted online mode by his/her polytechnic institute. After completing the online course, students must appear for exam conducted by the Board of Technical Education, Lucknow.

## **ANNEXURE 1**

### **LIST OF COURSES CONDUCTED BY TATA TECHNOLOGIES (OPEN ELECTIVE)**

1. Fundamentals of Innovation and Design Thinking
2. Product Design and Development
3. Product Verification and Analysis
4. Advanced Automobile
5. Electric Vehicle
6. Internet of Things
7. Advanced Manufacturing
8. Advanced Welding & Painting using Simulator
9. Industrial Automation and MES
10. Industrial Robotics
11. Inspection and Quality Control
12. Advanced Plumbing
13. AI and ML

**LIST OF PROGRAM ELECTIVE COURSES (PE-2)**

| <b>Sr No</b> | <b>Course Title</b>     | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|--------------|-------------------------|----------|----------|----------|----------|
| 1            | Mobile App Development  | 3        | -        | 4        | 5        |
| 2            | Multimedia Technologies | 3        | -        | 4        | 5        |

**LIST OF PROGRAM ELECTIVE COURSES (PE-3)**

| <b>Sr No</b> | <b>Course Title</b>       | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|--------------|---------------------------|----------|----------|----------|----------|
| 1            | Information Security      | 3        | -        | 4        | 5        |
| 2            | Advance Computer Networks | 3        | -        | 4        | 5        |

**LIST OF PROGRAM ELECTIVE COURSES (PE-4)**

| <b>Sr No</b> | <b>Course Title</b>                    | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|--------------|----------------------------------------|----------|----------|----------|----------|
| 1            | Fundamental of Artificial Intelligence | 4        | -        | -        | 4        |
| 2            | Data Science and Machine Learning      | 4        | -        | -        | 4        |

**LIST OF OPEN ELECTIVE COURSES (OE-2)**

| <b>Sr No</b> | <b>Course Title</b>                                 | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|--------------|-----------------------------------------------------|----------|----------|----------|----------|
| 1            | Product Design                                      | 2        | -        | -        | 2        |
| 2            | Engineering Economics & Accountancy                 | 2        | -        | -        | 2        |
| 3            | Artificial Intelligence and Machine Learning (TATA) | 2        | -        | -        | 2        |

**LIST OF OPEN ELECTIVE COURSES (OE-3)**

| <b>Sr No</b> | <b>Course Title</b>         | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|--------------|-----------------------------|----------|----------|----------|----------|
| 1            | Disaster Management         | 2        | -        | -        | 2        |
| 2            | Renewable Energy Technology | 2        | -        | -        | 2        |

**OPEN ELECTIVE's**

| <b>SR.NO.</b> | <b>ADVANCE SKILL DEVELOPMENT COURSES</b>                                                                                |
|---------------|-------------------------------------------------------------------------------------------------------------------------|
| 1.            | COURSES CONDUCTED BY CENTRE OF EXCELLENCE<br>(ESTABLISHED BY THIRD PARTY AS: - TATA TECHNOLOGIES. etc Refer Annexure 1) |
| 2.            | COURSES CONDUCTED BY INFOSYS SPRINGBOARD                                                                                |
| 3.            | COURSES CONDUCTED BY TCS ION                                                                                            |
| 4.            | COURSES CONDUCTED BY OTHER RELEVANT GOVERNMENT,<br>INTERNATIONAL/NATIONAL ORGANIZATION OR PLATFORMS OF REPUTE           |
| 5.            | COURSES CONDUCTED BY AICTE-ELIS AND CENTRALLY FUNDED TECHNICAL<br>INSTITUTES                                            |
| 6.            | COURSES CONDUCTED BY C-DAC                                                                                              |
| 7.            | COURSES CONDUCTED BY NEILIT                                                                                             |

## **DETAILED CONTENTS**

|                          |                                               |          |          |          |
|--------------------------|-----------------------------------------------|----------|----------|----------|
| <b>5.1<br/>Practicum</b> | <b>Object Oriented Programming Using Java</b> | <b>L</b> | <b>T</b> | <b>P</b> |
|                          |                                               | <b>1</b> | <b>-</b> | <b>4</b> |

## COURSE OBJECTIVES

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.

## COURSE OUTCOMES

After undergoing the subject, students will be able to:

CO 1: Install Java IDE, Compiler, Java virtual machines and understand basic concepts of Java

CO 2: Implement basic Java programs

CO 3: Explain and implement the concept of Object-oriented Programming

CO 4: Explain and implement Abstract class, Interface and Polymorphism using Java program.

CO 5: Understand Exceptions and develop multithreaded programs

## COURSE CONTENTS

### UNIT 1: Introduction and Features (2 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

### UNIT 2: Language Constructs (3 Periods)

variables, data types : Integer, floating point type, character, boolean operators, iteration and jump statement, conditional expressions, input using scanner class and output statement, loops, switch case, arrays, introduction to methods.

### UNIT 3: Classes and Objects: (3 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.

Inheritance :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 Public Vs Protected Vs Default)

### UNIT 4: Abstract Class, Interface and Polymorphism (3 Periods)

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

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

### UNIT 5: Exception Handling and Multithreading (3 Periods)

Definition of exception handling, implementation of keywords like try, catches, finally, throw & throws, built-in exceptions, difference between multi threading and multi tasking, thread life cycle, creating threads, thread priorities.

## 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.

## RECOMMENDED BOOKS

1. Programming with Java: A Primer;
2. E. Balagurusamy Head First Java,
3. O'REILLY, Kathy Sierra & Bert Bates.
4. OCA Java SE Programmer I Certification Guide ,
5. Wiley Publisher ,
6. Mala Gupta PROGRAMMER'S GUIDE TO JAVA SE 8 , Pearson , Khalid E Mughal

### SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted<br>(Periods) | Marks Allocation<br>(%) |
|-----------|----------------------------|-------------------------|
| 1.        | 02                         | 15                      |
| 2.        | 03                         | 15                      |
| 3.        | 03                         | 30                      |
| 4.        | 03                         | 20                      |
| 5.        | 03                         | 20                      |
| Total     | 14                         | 100                     |

|                          |                                          |          |          |          |
|--------------------------|------------------------------------------|----------|----------|----------|
| <b>5.2<br/>Practicum</b> | <b>FUNDAMENTAL OF INTERNET OF THINGS</b> | <b>L</b> | <b>T</b> | <b>P</b> |
|                          |                                          | <b>1</b> | <b>-</b> | <b>4</b> |

### Course Objectives

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.

#### 1. Introduction to 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, IoT Protocols, 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. Arduino

(12 Period)

Feature of arduino device ,Arduino device introduction Components of Arduino board )C Arduino Programming Language ,Understanding of basic of Arduino IDE, function ,control statement ,loops ,datatype ,variables

## **5. IoT and M2M**

(10 Peri-

ods)

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

### **LIST OF PRACTICALS**

Practical using Arduino-Interfacing Sensors :

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).

### 5.3 Program Elective-2

|                            |                               |          |          |          |
|----------------------------|-------------------------------|----------|----------|----------|
| <b>5.3.1<br/>Practicum</b> | <b>Mobile App Development</b> | <b>L</b> | <b>T</b> | <b>P</b> |
|                            |                               | <b>3</b> | <b>-</b> | <b>4</b> |

#### **COURSE OBJECTIVES:**

1. To facilitate students to understand android SDK
2. To help students to gain a basic understanding of Android application development
3. To inculcate working knowledge of Android Studio development tool

#### **COURSE OUTCOMES:**

At the end of this course, students will be able to: 1. Identify various concepts of mobile programming that make it unique from programming for other platforms, 2. Critique mobile applications on their design pros and cons, 3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces, 4. Program mobile applications for the Android operating system that use basic and advanced phone features, and 5. Deploy applications to the Android marketplace for distribution.

### **COURSE CONTENT**

#### **UNIT - I**

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building your First Android application, Understanding Anatomy of Android Application, Android Manifest file.

#### **UNIT - II**

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

#### **UNIT - III**

Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

#### **UNIT - IV**

Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

#### **UNIT - V**

Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

### **LIST OF PRACTICALS**

#### **Reference Books:**

1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd
3. Android Application Development All in one for Dummies by Barry Burd, Edition:

OR

| 5.3.2<br>Practicum | Multimedia Technologies | L | T | P |
|--------------------|-------------------------|---|---|---|
|                    |                         | 3 | - | 4 |

## COURSE OBJECTIVES

To introduce students to the domain of Multimedia Technologies, which explain the technologies underlying digital images, videos and audio contents, including various compression techniques and standards, and the issues to deliver multimedia content over the Internet.

## COURSE OUTCOMES

Student will understand various aspects of Multimedia and related standards. Student will be able to build multimedia content and applications and also multimedia enable Web applications and mobile applications.

## COURSE CONTENT

### UNIT 1: Introduction to Multimedia (10 Periods)

Multimedia Foundation and Concepts: Multimedia Hardware, Multimedia Software, Multimedia operating systems, Multimedia communication system

### UNIT 2: Basic Compression Techniques (12 Periods)

Video and Audio Data Compression Techniques – Lossy and Lossless.

Example algorithms/standards: Huffman, RLE, JPEG, MPEG, MP3, MP4, LZMA, FLAC, ALAC, ITU G.722, H.261, H.265

### UNIT 3: Content Development and Distribution (10 Periods)

Desktop publishing (Coral Draw, Photoshop, Page maker) Multimedia Animation & Special effects (2D/3D animation, Flash)

### UNIT 4: Introduction to Digital Imaging (10 Periods)

Basics of Graphic Design and use of Digital technology, Definition of Digital images, Digital imaging in multimedia

## LIST OF PRACTICALS

1. Installation of various multimedia software like Photoshop/GIMP, Blender, Flash, Director or any open source software
2. Installing and use of various multimedia devices Scanner Digital camera, web camera Mike and speakers Touch screen Plotter and printers DVD Audio CD and Video CD
3. Reading and writing of different format on CD/DVD
4. Transporting audio and video files
5. Using various features of Flash
6. Using various features of Photo-shop/GIMP
7. Using various features of Blender
8. Making multimedia presentations combining, Flash, Photo-shop/GIMP, such as department profile, lesson presentation, games and project presentations.

**Reference Books:**

1. An Introduction to Multimedia Authoring, A. Eliens
2. Fundamentals of Multimedia, Prentice Hall/Pearson, Ze-Nian Li & Mark S. Drew.
3. Multimedia and Animation, V.K. Jain, Khanna Publishing House, Edition 2018
4. Fundamentals of Multimedia, Ramesh Bangia, Khanna Book Publishing Co., N. Delhi (2007)

**SUGGESTED DISTRIBUTION OF MARKS**

| <b>Topic No.</b> | <b>Time Allotted (Periods)</b> | <b>Marks Allocation (%)</b> |
|------------------|--------------------------------|-----------------------------|
| 1.               | 10                             | 25                          |
| 2.               | 12                             | 25                          |
| 3.               | 10                             | 25                          |
| 4.               | 10                             | 25                          |
| Total            | 42                             | 100                         |

### 5.4 Program Elective-3

| 5.4.1<br>Practicum | Information Security | L | T | P |
|--------------------|----------------------|---|---|---|
|                    |                      | 3 | - | 4 |

#### COURSE OBJECTIVES

To learn how to evaluate and enhance information security of IT infrastructure and organizations

#### COURSE OUTCOMES

Understanding of security needs and issues of IT infrastructure. Have basic skills on security audit of networks, operating systems and application software.

#### COURSE CONTENT

##### UNIT 1: (8 Periods)

Introduction to Information Security, Various aspects of information security (PAIN), Security Features of Operating Systems – Authentication, Logs, Audit Features, File System Protection, User Privileges, RAID options, Anti-Virus Software, etc.

##### UNIT 2: (10 Periods)

Understanding security weaknesses in popular networking protocols – IP, TCP, UDP, RIP, OSPF, HTTP, SMTP, etc.; security weaknesses in common networking devices – Hub, switch, router, WiFi; Security solutions to mitigate security risk of networking protocols (IPSec, HTTPS, etc) and devices (VLAN, VPN, Ingress Filtering, etc)

##### UNIT 3: (8 Periods)

Basics of Cryptography, PKI, Security considerations while developing softwares

##### UNIT 4: (8 Periods)

Network Security Products – Firewall, IDS/IPS, VPN Concentrator, Content Screening Gateways, etc.

##### UNIT 5: (8 Periods)

Introduction to Security Standards – ISO 27001, Indian IT Act, IPR Laws; Security Audit procedures; Developing Security Policies; Disaster Recovery, Business Continuity Planning

#### REFERENCE BOOKS

1. Information Security and Cyber Laws, Sarika Gupta, Khanna Publishing House
2. RFCs of protocols listed in content (<https://www.ietf.org>)
3. Various Acts, Laws and Standards (IT Act, ISO27001 Standard, IPR and Copyright Laws, etc.)
4. Security Guideline documents of Operating Systems (OS Manual, Man Pages, etc)
5. <https://www.cert-in.org.in/>
6. <https://www.sans.org/>

#### LIST OF PRACTICALS

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) Encrypt and decrypt the message using 3 X 3 Hill Cipher (Cryptool)
7. Create Digital Signature document using (Cryptool)
8. Send and receive secret message using stenography techniques using steghide

#### SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted<br>(Periods) | Marks Allocation<br>(%) |
|-----------|----------------------------|-------------------------|
| 1.        | 08                         | 20                      |
| 2.        | 10                         | 22                      |
| 3.        | 08                         | 20                      |
| 4.        | 08                         | 20                      |
| 5.        | 08                         | 18                      |
| Total     | 42                         | 100                     |

|                            |                                   |          |          |          |
|----------------------------|-----------------------------------|----------|----------|----------|
| <b>5.4.2<br/>Practicum</b> | <b>Advanced Computer Networks</b> | <b>L</b> | <b>T</b> | <b>P</b> |
|                            |                                   | <b>3</b> | <b>-</b> | <b>4</b> |

## **COURSE OBJECTIVES**

An understanding of the overriding principles of computer networking, including protocol design, protocol layering, algorithm design, and performance evaluation.

### **UNIT 1: Review of Networking Basics** (10 Periods)

Advance Topics in IPv4 – Subnetting, Multicasting, Multicast Routing Protocols (IGMP, PIM, DVMRP); Advance Topics in TCP – flow management, congestion avoidance, protocol spoofing; IPv6

### **UNIT 2: Telecom Networks, Switching Techniques** (10 Periods)

Introduction to Frame Relay, ATM, MPLS; VSAT Communication – Star and Mesh architectures, bandwidth reservation; Wireless Networks – WiFi, WiMax, Cellular Phone Technologies – GSM, CDMA, 3G, 4G

### **UNIT 3: QoS** (6 Periods)

Network Redundancy, Load Balancers, Caching, Storage Networks; QoS; Network Monitoring – SNMP, RMON

### **UNIT 4: Introduction to Network Security** (8 Periods)

VLAN, VPN, Firewall, IPS, Proxy Servers

### **UNIT 5: Network Simulation** (8 Periods)

Network Simulation, Network design case studies and exercises, IP Addressing schema, Protocol Analysers (Wireshark, etc)

## **Reference Books:**

1. RFCs and Standards Documents ([www.ietf.org](http://www.ietf.org) and other standard body websites)
2. Communication Networking – An Analytical Approach, Anurag-Manjunath-Joy
3. TCP/IP Illustrated (Vol.1,2), Stevens
4. Data Networks, Bertsekas-Gallager
5. An Engineering Approach to Computer Networking, S. Keshav

## **LIST OF PRACTICALS**

1. Study different types of network cables and implement cross wired cables and straight through cables using clamping tools.
2. From given data find subnet, broadcast, range, subnet bits.

3. Study of various basic network commands and network configuration commands.
4. Performing an initial router configuration.
5. Interpreting Ping and trace-route output.
6. Connecting the computers in Local Area Network.
7. Perform logical Troubleshooting.
8. Observing Static and Dynamic Routing.
9. Configuring the Router as a DHCP Server.
10. Perform various networking operations using Packet Tracer.

#### SUGGESTED DISTRIBUTION OF MARKS

| SR No        | Topic Time Allotted<br>(periods) | Marks Allotted |
|--------------|----------------------------------|----------------|
| 1            | 10                               | 22             |
| 2            | 8                                | 20             |
| 3            | 6                                | 16             |
| 4            | 10                               | 22             |
| 5            | 8                                | 20             |
| <b>TOTAL</b> | <b>42</b>                        | <b>100</b>     |

**OPEN ELECTIVE-2**

| 5.5.1 | Product Design | L | T | P |
|-------|----------------|---|---|---|
|       |                | 2 | - | - |

**COURSE OBJECTIVES**

The objective of product design is to create a product with excellent functional utility and sales appeal at an acceptable cost within a reasonable time.

**UNIT-I: Definition of a product;****(5 Periods)**

Types of product; Levels of product; Product-market mix; New product development (NPD) process; Idea generation methods; Creativity; Creative attitude; Creative design process; Morphological analysis; Analysis of interconnected decision areas; Brain storming.

**Unit-II: Product life cycle;****(6 Periods)**

The challenges of Product development; Product analysis; Product characteristics; Economic considerations; Production and Marketing aspects; Characteristics of successful Product development; Phases of a generic product development process; Customer need identification; Product development practices and industry-product strategies.

**Unit-III: Product design;****(6 Periods)**

Design by evolution; Design by innovation; Design by imitation; Factors affecting product design; Standards of performance and environmental factors; Decision making and iteration; Morphology of design (different phases); Role of aesthetics in design.

**Unit-IV: Introduction to optimization in design;****(6 Periods)**

Economic factors in design; Design for safety and reliability; Role of computers in design; Modeling and Simulation; The role of models in engineering design; Mathematical modeling; Similitude and scale models; Concurrent design; Six sigma and design for six sigma; Introduction to optimization in design; Economic factors and financial feasibility in design; Design for manufacturing; Rapid Prototyping (RP); Application of RP in product design; Product Development versus Design.

**Unit-V: Design of simple products:****(5 Periods)**

Dealing with various aspects of product development; Design starting from need till the manufacture of the product, Open Elective Courses 448

**Reference Books:**

1. Product Design and Development, Karl T. Ulrich and Steven D. Eppinger, Tata McGraw–Hill edition.
2. Engineering Design –George E. Dieter.
3. An Introduction to Engineering Design methods Vijay Gupta.
4. Merie Crawford : New Product management, McGraw-Hill Irwin.
5. Chitale A K and Gupta R C, “Product Design and Manufacturing”, Prentice Hall of India, 2005.
6. Kevin Otto and Kristin Wood, Product Design, Techniques in Reverse Engineering and New Product Development, Pearson education.

### SUGGESTED DISTRIBUTION OF MARKS

| <b>To<br/>pic<br/>No.</b> | <b>Time Allotted<br/>(Periods)</b> | <b>Marks Allocation<br/>(%)</b> |
|---------------------------|------------------------------------|---------------------------------|
| 1.                        | 05                                 | 15                              |
| 2.                        | 06                                 | 25                              |
| 3.                        | 06                                 | 25                              |
| 4.                        | 06                                 | 20                              |
| 5.                        | 05                                 | 15                              |
| Total                     | 28                                 | 100                             |

**OR**  
**OPEN ELECTIVE-2**

|              |                                                |          |          |          |
|--------------|------------------------------------------------|----------|----------|----------|
| <b>5.5.2</b> | <b>ENGINEERING ECONOMICS &amp; ACCOUNTANCY</b> | <b>L</b> | <b>T</b> | <b>P</b> |
|              |                                                | <b>2</b> | <b>-</b> | <b>-</b> |

**COURSE OBJECTIVES**

Students will analyze the performance and functioning of government, markets and institutions in the context of social and economic problems. Students will think critically about economic models, evaluating their assumptions and implications.

**UNIT-I: Introduction:**

(5 Periods)

Managerial Economics; Relationship with other disciplines; Firms: Types, objectives and goals; Managerial decisions; Decision analysis.

**Unit-II: Demand & Supply Analysis:**

(6 Periods)

Demand; Types of demand; Determinants of demand; Demand function; Demand elasticity; Demand forecasting; Supply; Determinants of supply; Supply function; Supply elasticity.

**Unit-III: Production and Cost Analysis:**

(6 Periods)

Production function; Returns to scale; Production optimization; Least cost input; Isoquants; Managerial uses of production function; Cost Concepts; Cost function; Types of Cost; Determinants of cost; Short run and Long run cost curves; Cost Output Decision; Estimation of Cost.

**Unit-IV: Pricing:**

(6 Periods)

Determinants of Price; Pricing under different objectives and different market structures; Price discrimination; Pricing methods in practice; Role of Government in pricing control

**Unit-V: Elementary Accounting :**

(5 Periods)

Introduction to Accountancy, Cash flow analysis; Payback Period; Net Present Value;

**Reference Books:**

1. Premvir Kapoor, Sociology & Economics for Engineers, Khanna Publishing House, New Delhi, 2018
2. McGuigan, Moyer and Harris, 'Managerial Economics; Applications, Strategy and Tactics' Thomson South Western, 10th Edition, 2005.
3. Prasanna Chandra. 'Fundamentals of Financial Management', Tata Mcgraw Hill Publishing Ltd., 4th edition, 2005.
4. Samuelson. Paul A and Nordhaus W.D., 'Economics', Tata Mcgraw Hill Publishing Company Limited, New Delhi, 2004.
5. Paresh Shah, 'Basic Financial Accounting for Management', Oxford University Press, New Delhi, 2007.
6. Salvatore Dominick, 'Managerial Economics in a global economy'. Thomson South Western, 4th Edition, 2001.

**SUGGESTED DISTRIBUTION OF MARKS**

| <b>Topic No.</b> | <b>Time Allotted (Periods)</b> | <b>Marks Allocation (%)</b> |
|------------------|--------------------------------|-----------------------------|
| 1.               | 05                             | 20                          |
| 2.               | 06                             | 20                          |
| 3.               | 06                             | 20                          |
| 4.               | 06                             | 20                          |
| 5.               | 05                             | 20                          |
| Total            | 28                             | 100                         |

**OR**  
**OPEN ELECTIVE-2**

|              |                                                            |          |          |          |
|--------------|------------------------------------------------------------|----------|----------|----------|
| <b>5.5.3</b> | <b>ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (TATA)</b> | <b>L</b> | <b>T</b> | <b>P</b> |
|              |                                                            | <b>2</b> | <b>-</b> | <b>-</b> |

### **1.1 COURSE OVERVIEW**

This course is designed to equip students with essential theoretical and practical skills need for understanding the requirements, collection of data, preprocessing of data, building and deploying machine learning and artificial intelligence solutions to real world applications. Participants will gain hands-on experience with the latest software, enabling them to adopt latest technologies in line with industry requirements and building competency in the Machine Learning and Artificial Intelligence field.

### **1.2 TABLE OF CONTENTS**

| <b>Sr No</b> | <b>Course contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1            | <b>Industrial Safety Practices</b> <ul style="list-style-type: none"> <li>• Fire Extinguishers &amp; its Types</li> <li>• Safely handling Tools &amp; Equipment</li> <li>• Use of proper Tools &amp; Equipment &amp; its maintenance</li> <li>• OSH &amp; practices to be observed as a precaution</li> </ul>                                                                                                                                                                                                                                                                                 |
| 2            | <b>Fundamentals required for AI and ML</b> <ul style="list-style-type: none"> <li>• Introduction to Artificial Intelligence and Machine Learning</li> <li>• Need of AI and ML</li> <li>• Basic Mathematical concepts related to AI and ML</li> <li>• Data Collection, Data Processing and Cleaning</li> <li>• Types of Data Sources <ul style="list-style-type: none"> <li>○ Structured Data</li> <li>○ Unstructured Data</li> <li>○ Semi Structured</li> <li>○ Realtime Data</li> <li>○ Open Data Set</li> <li>○ Data Scraping</li> </ul> </li> <li>• Data Acquisition Techniques</li> </ul> |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <ul style="list-style-type: none"> <li>○ APIs (Application Programming Interfaces): Collection of from External Sources)</li> <li>○ Web Scrapping</li> <li>○ Surveys and Forms</li> <li>○ Sensor Data</li> <li>○ Database and Data Warehouse</li> <li>● Data Integration</li> <li>○ Combining Data from Multiple Sources</li> <li>○ Data Merging (Combing Data from different Tables)</li> <li>○ Data Aggregation</li> <li>● Data Pre-Processing</li> <li>○ Data Cleaning</li> <li>○ Outlier Detection and Removal</li> <li>○ Duplicate Data</li> </ul> |
| 3 | <b>Programming concepts for AI and ML</b> <ul style="list-style-type: none"> <li>○ Python Basics</li> <li>○ Python Structure</li> <li>○ NumPy</li> <li>○ Pandas</li> <li>○ Matplotlib and Seaborn</li> <li>○ Scikit-learn</li> </ul>                                                                                                                                                                                                                                                                                                                    |
| 4 | <b>Introduction to Supervised Machine Learning</b><br>Types of Machine Learning Techniques (Supervised, Unsupervised and Reinforcement Learning) <ul style="list-style-type: none"> <li>● Supervised Learning</li> <li>○ Regression</li> <li>○ Classification</li> <li>○ Logistic Regression</li> <li>○ Support Vector Machines</li> <li>○ Decision Tree</li> <li>○ Random Forest</li> <li>○ K – Nearest Neighbors (KNN)</li> <li>○ Use cases of Regression and Classification</li> </ul>                                                               |
|   | <b>Introduction to Unsupervised Learning</b> <ul style="list-style-type: none"> <li>● Clustering</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                             |

|   |                                                                                                                                                                                                                                                                                                                                                                                                |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <ul style="list-style-type: none"> <li>○ K – Means Clustering</li> <li>○ Hierarchical Clustering</li> <li>○ DBSCAN</li> <li>● Dimensionality Reduction</li> <li>● Anomaly Detection</li> <li>● Use cases of clustering and Dimensional Reduction</li> <li>● Building Machine Learning Model</li> <li>● Model Evaluation and Validation</li> <li>● Machine Learning Model Deployment</li> </ul> |
| 5 | <b>Deep Learning, Reinforcement Learning and Natural Language Processing</b> <ul style="list-style-type: none"> <li>○ Fundamentals of Deep Learning</li> <li>○ Convolutional Neural Networks (CNNs)</li> <li>○ Recurrent Neural Networks (RNNs)</li> <li>○ Natural Language Processing</li> <li>○ Reinforcement Learning</li> <li>○ TensorFlow and Kera</li> </ul>                             |
|   | <b>Generative AI</b> <ul style="list-style-type: none"> <li>○ Understanding of Gen AI</li> <li>○ Applications of Gen AI</li> <li>○ Development of Gen AI model</li> <li>○ Integration of Gen AI in Mobile App.</li> <li>○ Deployment</li> </ul>                                                                                                                                                |
| 6 | <b>Deep Learning Applications</b> <ul style="list-style-type: none"> <li>○ Computer Vision</li> <li>○ Natural Language Processing</li> <li>○ Speech Recognition</li> <li>○ Model Deployment</li> </ul>                                                                                                                                                                                         |
| 7 | <b>Ethics and Responsibility in AI and Machine Learning</b> <ul style="list-style-type: none"> <li>○ Ethics in AI and ML</li> <li>○ Accountability and Responsibility</li> </ul>                                                                                                                                                                                                               |

|  |                                                                                                                                              |
|--|----------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"> <li>○ Privacy and Data Protection</li> <li>○ Social Impact of AI</li> <li>○ Ethical Guidelines</li> </ul> |
|--|----------------------------------------------------------------------------------------------------------------------------------------------|

## 1. COURSE PRACTICALS

Please conduct practical's as per lesson plan

1. Load a Dataset and perform basic preprocessing
2. Splitting of Dataset into Training and Testing Set
3. Explore Python Libraries Pandas, NumPy, Matplotlib etc.
4. Build Machine Learning Model for Linear Regression Analysis for predict.
5. Implement K – Means clustering to segment customer based on purchasing behaviour.
6. Build a Machine Learning Model – Decision Tree
7. Build a Machine Learning Model – Random Forest
8. Build a Machine Learning Model for Anomaly Detection
9. Build SVM model and evaluate performance (Precision, Recall, F-Score and Confusion Matrix)
10. Build a Neural Network using Keras or TensorFlow to classify the handwriting digits.
11. Implement a Convolutional Neural Network to classify images using given dataset.
12. Build a Recurrent Neural Network (RNN) for Sentiment Analysis.
13. Implement a Chatbot using RNN.
14. Compare two different Gen AI models
15. Integrate a Trained Machine Learning Model in Mobile APP for Prediction.
16. Case Studies
17. Mini Project

## 2. COURSE OUTCOME

1. Understand the fundamentals of Machine Learning and AI and their practical applications.
2. Understanding of Basic Mathematical Concepts used in AI and ML.
3. Understand Data Collection and Data Pre-Processing.
4. Understand Basics of AI and Machine Learning
5. Develop python programming skills for Machine Learning and AI.
6. Understand the role of Supervised, Unsupervised and Deep Learning in real world applications.
7. Select appropriate Machine Learning Algorithm for specific applications.
8. Implementation of Regression Analysis for Prediction.
9. Train a logistic regression model for binary classification.
10. Train and Evaluate SVM for classification.
11. Implementation of Decision Tree Machine Learning Model.
12. Implement K – Means clustering.
13. Build Supervised Machine Learning Model.
14. Build Unsupervised Machine Learning.
15. Build Reinforcement Machine Learning Model.
16. Train a convolutional network (CNN) for image classification task.
17. Evaluate Machine Learning Model.
18. Deployment of Machine Learning Model.
19. Understand Ethical challenges in AI and ML
20. Understand importance of Data Protection.
21. Understand social impact of AI.
22. Evaluate the responsibility and accountability of AI systems.
23. Familiarize with key ethical frameworks and guidelines governing AI deployment.

## **5.6 SUMMER INTERNSHIP II (6 WEEKS AFTER 4th SEM)**

It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. It is Summer Internship, 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 Summer Internship of 4 weeks duration to be organized during the semester break starting after second year i.e. after 4th semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that an internship schedule may be drawn for each student before starting of the internship in consultation with the internship 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 internship 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 3rd Semester. Evaluation of professional Summer Internship 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 5th 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%

|                                   |                            |          |          |          |
|-----------------------------------|----------------------------|----------|----------|----------|
| <b>5.7</b><br><b>Audit Course</b> | <b>INDIAN CONSTITUTION</b> | <b>L</b> | <b>T</b> | <b>P</b> |
|                                   |                            | <b>2</b> | <b>-</b> | <b>-</b> |

### **Unit 1 – The Constitution - Introduction**

- The History of the Making of the Indian Constitution
- Preamble and the Basic Structure, and its interpretation
- Fundamental Rights and Duties and their interpretation
- State Policy Principles

### **Unit 2 – Union Government**

- Structure of the Indian Union
- President – Role and Power
- Prime Minister and Council of Ministers
- Lok Sabha and Rajya Sabha

### **Unit 3 – State Government**

- Governor – Role and Power
- Chief Minister and Council of Ministers
- State Secretariat

### **Unit 4 – Local Administration**

- District Administration
- Municipal Corporation
- Zila Panchayat

### **Unit 5 – Election Commission**

- Role and Functioning
- Chief Election Commissioner
- State Election Commission

Suggested Learning Resources:

| S. No. | Title of Book                                  | Author          | Publication                              |
|--------|------------------------------------------------|-----------------|------------------------------------------|
| 1.     | Ethics and Politics of the Indian Constitution | Rajeev Bhargava | Oxford University Press, New Delhi, 2008 |
| 2.     | The Constitution of India                      | B.L. Fadia      | Sahitya Bhawan; New edition (2017)       |
| 3.     | Introduction to the Constitution of India      | DD Basu         | Lexis Nexis; Twenty-Third 2018 edition   |

Suggested Software/Learning Websites:

- a. <https://www.constitution.org/cons/india/const.html>
- b. <http://www.legislative.gov.in/constitution-of-india>
- c. <https://www.sci.gov.in/constitution>
- d. <https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/>

## **SIXTH SEMESTER**

#### PROGRAM ELECTIVE -4

|               |                                                 |          |          |          |
|---------------|-------------------------------------------------|----------|----------|----------|
| <b>6.1</b>    | <b>FOUNDAMENTALS OF ARTIFICIAL INTELLIGENCE</b> | <b>L</b> | <b>T</b> | <b>P</b> |
| <b>Theory</b> |                                                 | <b>4</b> | <b>-</b> | <b>-</b> |

#### COURSE OBJECTIVES

The main learning objectives of the course are to: Identify problems where artificial intelligence techniques are applicable. Apply selected basic AI techniques; judge applicability of more advanced techniques. Participate in the design of systems that act intelligently and learn from experience.

##### UNIT 1: Introduction

(8 Periods)

Overview and Historical Perspective, Turing test, Physical Symbol Systems and the scope of Symbolic AI, Agents.

##### UNIT 2: Searching

(8 Periods)

Heuristic Search: Best First Search, Hill Climbing, Beam Search, Tabu Search Randomized Search: Simulated Annealing, Genetic Algorithms, Ant Colony Optimization.

##### UNIT 3:

(10 Periods)

**Finding Optimal Paths:** Branch and Bound, A\*, IDA\*, Divide and Conquer approaches, Beam Stack Search, Problem Decomposition: Goal Trees, AO\*, Rule Based Systems, Rete Net. Game Playing: Minimax Algorithm, AlphaBeta Algorithm, SSS\*.

##### UNIT 4:

(8 Periods)

**Planning and Constraint Satisfaction:** Domains, Forward and Backward Search, Goal Stack Planning, Plan Space Planning, Graphplan, Constraint Propagation.

##### UNIT 5:

(8 Periods)

**Logic and Inferences:** Propositional Logic, First Order Logic, Soundness and Completeness, Forward and Backward chaining.

#### REFERENCE BOOKS

1. Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India)
2. <https://nptel.ac.in/courses/106106126/>
3. Stefan Edelkamp and Stefan Schroedl. Heuristic Search, Morgan Kaufmann.
4. Pamela McCorduck, Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence, A K Peters/CRC Press
5. Elaine Rich and Kevin Knight. Artificial Intelligence, Tata McGraw Hill.
6. Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, Prentice Hall
7. M.C. Trivedi, A classical approach to Artificial Intelligence, Khanna Publishing House

### SUGGESTED DISTRIBUTION OF MARKS

| <b>Topic No.</b> | <b>Time Allotted (Periods)</b> | <b>Marks Allocation (%)</b> |
|------------------|--------------------------------|-----------------------------|
| 1.               | 08                             | 20                          |
| 2.               | 08                             | 20                          |
| 3.               | 10                             | 20                          |
| 4.               | 08                             | 20                          |
| 5.               | 08                             | 20                          |
| Total            | 42                             | 100                         |

OR

**Program Elective**

|               |                                                |          |          |          |
|---------------|------------------------------------------------|----------|----------|----------|
| <b>6.1</b>    | <b>6.1.2 Data Science and Machine Learning</b> | <b>L</b> | <b>T</b> | <b>P</b> |
| <b>Theory</b> |                                                | <b>4</b> | <b>-</b> | <b>-</b> |

**COURSE OBJECTIVES**

This course will introduce the concepts of data ware house and data mining, which gives a complete description about the principles, used, architectures, applications, design and implementation of data mining and data ware housing concepts.

**UNIT 1: Introduction of data Science and Machine Learning:** (10 Periods)  
Fundamentals of Artificial Intelligence, need and applications of Data Science, Data Mining, data preparation, Machine Learning , Types and Applications of Machine learning

**UNIT 2: Data Preprocessing, Analysis and Visualization:** (6 Periods)  
Data Pre-processing: Pre-processing Techniques- Mean Removal, Scaling, Normalization, Binarization, One Hot Encoding, Label encoding, Data Analyses: Loading and summarizing the dataset, Data Visualization: Univariate Plots, Multivariate Plots, Training Data, Test Data, Performance Measures

**UNIT 3: Statistical Inference & Exploratory Data Analysis and the Data Science Process** (10 Periods)  
Populations and samples, Types of Statistical modelling, Types of probability distributions. Parametric and Non-Parametric Methods, Distance Metrics.  
Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process.

**UNIT 4: Machine Learning Algorithms** (8 Periods)  
Introduction to Supervised Learning Algorithms –Decision Tree, Linear Regression, k Nearest Neighbours (k-NN), SVM and Introduction to Unsupervised Learning Algorithms - K-means Clustering, Mean Shift Algorithm, Dimensionality Reduction Techniques, Introduction to Neural Networks.

**UNIT 5: Mining Social-Network Graphs, Data Science and Ethical Issues** (8 Periods)  
Social networks as graphs, Clustering of graphs, Direct discovery of communities in graphs, Partitioning of graphs, Neighbourhood properties in graphs, Discussions on privacy, security, ethics, A look back at Data Science, Next-generation data scientists.

**Reference Books:**

1. Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, Elsevier
2. Margaret H Dunham, Data Mining Introductory and Advanced Topics, Pearson Education
3. Amitesh Sinha, Data Warehousing, Thomson Learning, India.
4. Xingdong Wu, Vipin Kumar, the Top Ten Algorithms in Data Mining, CRC Press, UK.

**SUGGESTED DISTRIBUTION OF MARKS**

| <b>SR No</b>  | <b>Topic Time Allotted (periods)</b> | <b>Marks Allotted</b> |
|---------------|--------------------------------------|-----------------------|
| 1             | 10                                   | 22                    |
| 2             | 6                                    | 16                    |
| 3             | 10                                   | 22                    |
| 4             | 8                                    | 20                    |
| 5             | 8                                    | 20                    |
| <b>TO-TAL</b> | <b>42</b>                            | <b>100</b>            |

|                                 |                                       |          |          |          |
|---------------------------------|---------------------------------------|----------|----------|----------|
| <b>6.2</b><br><b>HUMANITIES</b> | <b>ENTREPRENEURSHIP AND START-UPS</b> | <b>L</b> | <b>T</b> | <b>P</b> |
|                                 |                                       | <b>2</b> | <b>-</b> | <b>-</b> |

## **COURSE OBJECTIVES**

Explore the Objectives of Entrepreneurship, including innovation, wealth creation, and societal impact, and learn how Entrepreneurs foster economic growth. Entrepreneurship drives the economy and is the very fundamental to all innovation and development.

## **COURSE OUTCOMES**

CO 1: Understand the basic of Entrepreneurship and Business Structures

CO 2: Planning and implementation of Business ideas

CO 3: Understanding Strategical Market Analysis

CO 4: Manage Organizational roles

CO 5: Understanding various Financial schemes

## **COURSE CONTENT**

### **Unit 1 - Introduction to Entrepreneurship and Start – Ups (02 Periods)**

- Definitions, Classification of Entrepreneur
- Traits of an Entrepreneur, Intrapreneurship, Motivation
- Types of Business Structures- On the Basis of size and On the basis of ownership
- Similarities/differences between entrepreneurs and managers

### **Unit 2 – Business Ideas and their implementation (06 Periods)**

- Discovering ideas and visualizing the business
- Activity map
- Business Plan (Case Study )

### **Unit 3 – Ideas to Start-up (06 Periods)**

- Marketing and Accounting- Definition and Importance.
- Market Analysis – STP (Segmentation, Targeting, Positioning)
- Competition evaluation and Strategy Development – Vision, Mission, Goal, Objectives.
- Risk analysis- SWOT Analysis.

### **Unit 4 – Management (04 Periods)**

- Definition Concept and Functions of Management
- Company's Organization Structure- Concept and Classification
- Recruitment and Selection- Definition,
- Training and Development- Importance.

### **Unit 5 - Financing and Protection of Ideas (06 Periods)**

- Financing methods available for Entrepreneurship/ Startups in India (Government Scheme, Banking, NBFCs, SHG and Micro Financing).
- Intellectual Property Rights- Overview of - Copyrights, Trademark, Geographical Indicators, Patenting and Licenses
- Communication of Ideas to potential investors – Investor Pitch.

#### **Unit 6: Succession, Dissolution and Harvesting strategy**

**(04 Periods)**

- Ways of succession
- Types of Dissolution

#### **SUGGESTED LEARNING RESOURCES:**

| <b>S. No.</b> | <b>Title of Book</b>                                                                                            | <b>Author</b>                       | <b>Publication</b>                                |
|---------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------|
| 1.            | The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company                                 | Steve Blank and Bob Dorf            | K & S Ranch<br>ISBN – 978-0984999392              |
| 2.            | Entrepreneurship Development (A new Venture creation)                                                           | Vasant Desai                        | Himalya Publication                               |
| 3.            | Entrepreneurship Development                                                                                    | Khanka S.S.                         | S Chand & Company Limited<br>New Delhi            |
| 4.            | Entrepreneurship Development                                                                                    | Gupta and Srinivasan                | S Chand & Company<br>Limited New Delhi            |
| 5             | Demand: Creating What People Love Before They Know They Want It                                                 | Adrian J. Slywotzky with Karl Weber | Headline Book Publishing<br>ISBN – 978-0755388974 |
| 6             | The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses | Eric Ries                           | Penguin UK<br>ISBN – 978-0670921607               |
| 7             | The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business                        | Clayton M. Christensen              | Harvard<br>business<br>ISBN: 978-142219602        |

#### **SUGGESTED SOFTWARE/LEARNING WEBSITES:**

- <https://www.fundable.com/learn/resources/guides/startup>
- <https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate-structure/>
- <https://www.finder.com/small-business-finance-tips>
- <https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/>
- NPTEL Course on Entrepreneurship [https://onlinecourses.nptel.ac.in/noc23\\_mg74/preview](https://onlinecourses.nptel.ac.in/noc23_mg74/preview)
- National Geographic Channel you tube Video on “GI Tag Crafts of Bharat”

### SUGGESTED DISTRIBUTION OF MARKS

| <b>Topic No.</b> | <b>Time Allotted<br/>(Periods)</b> | <b>Marks Allotted<br/>(%)</b> |
|------------------|------------------------------------|-------------------------------|
| 1                | 2                                  | 17                            |
| 2                | 6                                  | 14                            |
| 3                | 6                                  | 20                            |
| 4                | 4                                  | 17                            |
| 5                | 6                                  | 21                            |
| 6                | 4                                  | 11                            |
| <b>Total</b>     | <b>28</b>                          | <b>100</b>                    |

### **6.3 PROJECT**

In House 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:

- Programming customer based applications
- Web page designing (Only dynamic)
- Database applications
- Software Development

### **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 sustainment critical investigation.
- Develop, leadership abilities.
- Apply fundamental and disciplinary concepts and methods in ways appropriate to their areas of study.

### 6.4 Open Elective-3

|                        |                     |          |          |          |
|------------------------|---------------------|----------|----------|----------|
| 6.4.1<br><i>THEORY</i> | Disaster Management | <b>L</b> | <b>T</b> | <b>P</b> |
|                        |                     | <b>2</b> | <b>-</b> | <b>-</b> |

#### COURSE OBJECTIVES

Disaster management aims to reduce, or avoid the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery.

#### Unit – I: Understanding Disaster

(6 Periods)

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity Disaster and Development, and disaster management.

#### Unit – II: Types, Trends, Causes, Consequences and Control of Disasters

(10 Periods)

Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire);

Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.

### **Unit- III: Disaster Management Cycle and Framework**

(10 Periods)

Disaster Management Cycle – Paradigm Shift in Disaster Management.

Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Micro zonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness.

During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation –

Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action.

### **Unit– IV: Disaster Management in India**

(10 Periods)

Disaster Profile of India – Mega Disasters of India and Lessons Learnt.

Disaster Management Act 2005 – Institutional and Financial Mechanism,

National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter Governmental Agencies

### **Unit- V: Applications of Science and Technology for Disaster Management**

(6 Periods)

Geo-informatics in Disaster Management (RS, GIS, GPS and RS).

Disaster Communication System (Early Warning and Its Dissemination).

Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non-Structural Mitigation of Disasters S&T Institutions for Disaster Management in India

### **References**

1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
2. Bhandani, R. K., An overview on natural & man-made disasters and their reduction, CSIR, New Delhi
3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing countries, Daya Publishers, Delhi
4. Alexander, David, Natural Disasters, Kluwer Academic London
5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation
6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

### **SUGGESTED DISTRIBUTION OF MARKS**

| SR No        | Topic Time Allotted (periods) | Marks Allotted |
|--------------|-------------------------------|----------------|
| 1            | 6                             | 17             |
| 2            | 10                            | 22             |
| 3            | 10                            | 22             |
| 4            | 10                            | 22             |
| 5            | 6                             | 17             |
| <b>TOTAL</b> | <b>42</b>                     | <b>100</b>     |

### 6.4 Open Elective-3

|                 |                               |   |   |   |
|-----------------|-------------------------------|---|---|---|
| 6.4.2<br>THEORY | RENEWABLE ENERGY TECHNOLOGIES | L | T | P |
|                 |                               | 2 | - | - |

#### UNIT-I: Introduction

World Energy Use; Reserves of Energy Resources; Environmental Aspects of Energy Utilisation; Renewable Energy Scenario in India and around the World; Potentials; Achievements / Applications; Economics of renewable energy systems.

#### Unit-II: Solar energy

Solar Radiation; Measurements of Solar Radiation; Flat Plate and Concentrating Collectors; Solar direct Thermal Applications; Solar thermal Power Generation Fundamentals of Solar Photo Voltaic Conversion; Solar Cells; Solar PV Power Generation; Solar PV Applications.

#### Unit-III: Wind Energy

Wind Data and Energy Estimation; Types of Wind Energy Systems; Performance; Site Selection; Details of Wind Turbine Generator; Safety and Environmental Aspects.

#### Unit-IV: Bio-Energy

Biomass direct combustion; Biomass gasifiers; Biogas plants; Digesters; Ethanol production; Biodiesel; Cogeneration; Biomass Applications.

### **Unit-V: Other Renewable Energy Sources**

Tidal energy; Wave Energy; Open and Closed OTEC Cycles; Small Hydro-Geothermal Energy; Hydrogen and Storage; Fuel Cell Systems; Hybrid Systems.

### **Reference Books:**

1. O.P. Gupta, Energy Technology, Khanna Publishing House, Delhi (ed. 2018)
2. Renewable Energy Sources, Twidell, J.W. & Weir, A., EFN Spon Ltd., UK, 2006.
3. Solar Energy, Sukhatme. S.P., Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
4. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K., 1996.
5. Fundamental of Renewable Energy Sources, GN Tiwari and MK Ghoshal, Narosa, New Delhi, 2007.
6. Renewable Energy and Environment-A Policy Analysis for India, NH Ravindranath, UK Rao, B Natarajan, P Monga, Tata McGraw Hill.
7. Energy and The Environment, RA Ristinen and J J Kraushaar, Second Edition, John Willey & Sons, New York, 2006.
8. Renewable Energy Resources, JW Twidell and AD Weir, ELBS, 2006.

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

It was discussed and decided that the maximum marks for SCA should be 50 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows-

15 Marks for general behaviour and discipline

(by HODs in consultation with all the teachers of the department)

10 Marks for attendance as per following:

(by HODs in consultation with all the teachers of the department)

- |    |           |          |
|----|-----------|----------|
| a) | 75 - 80%  | 06 Marks |
| b) | 80 - 85%  | 08 Marks |
| c) | Above 85% | 10 Marks |

25 Marks maximum for Sports/NCC/Cultural/Co-curricular/NSS activities as per following:

(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)

- |    |    |   |                                    |
|----|----|---|------------------------------------|
| a) | 25 | - | State/National Level participation |
|----|----|---|------------------------------------|

- b) 20 - Participation in two of above activities
- c) 15 - Inter-Polytechnic level participation

## **9- RESOURCE REQUIREMENT**

### **A : Laboratory**

#### **1. Computer Center**

| <b>S.No.</b> | <b>Description</b>                                                                                              | <b>QTY</b> | <b>Total Price</b> |
|--------------|-----------------------------------------------------------------------------------------------------------------|------------|--------------------|
| <b>A</b>     | <b>B</b>                                                                                                        | <b>C</b>   | <b>D</b>           |
| 1.           | Computer Desktop (i7,8th Generation, 1TB Hard disk/500 GB SSD, 8Gb RAM, Pre loaded window with 5 year warranty) | 60         | 48,00,000/-        |
| 2.           | Computer Table and Chair                                                                                        | 60         | 9,00,000/-         |
| 3.           | Working Bench with power Supply + 40 Stools                                                                     | 04         | 100000/-           |
| 4.           | Component Storage Rack                                                                                          | 05         | 100000/-           |
| 5.           | Online UPS, 6KVA                                                                                                | 2          | 2,00,000/-         |
| 6.           | Printer                                                                                                         | 1          | 25000/-            |
| 7.           | Switch with 24 port speed 10/100/1000 (Manageable)                                                              | 03         | 1,50,000/-         |
| 8.           | Smart Board interactive panel                                                                                   | 01         | 4,00,000/-         |
| 9.           | Network Forensic FOSS like The Sleuth Kit,                                                                      | LS         | -                  |

|     |                                                                                                                 |          |            |
|-----|-----------------------------------------------------------------------------------------------------------------|----------|------------|
|     | Autopsy, NetworkMiner, Wireshark, Volatility, Jhon the Ripper, Disk Drill, Cryptool, OpenPuff, MailTracker etc. |          |            |
| 10. | Android Studio or other FOSS like Xamarin                                                                       | LS       | -          |
| 11. | Multimedia authoring Tool or Similar FOSS                                                                       | LS       | 1,00,000/- |
| 12. | MS Office latest or equivalent FOSS Libre Office/Open Office (Freeware                                          | LS       | 20,000/-   |
| 13. | FOSS CASE tools like Jmeter, Selenium etc                                                                       | LS       | -          |
| 14. | Compiler Turbo C, C++ or equivalent FOSS like VS Code                                                           | LS       | 10,000/-   |
| 15. | Web camera, Mike and speakers                                                                                   | 01       | 20,000/-   |
| 16. | Air Conditioner 2 ton                                                                                           | 02       | 1,40,000/- |
| 17. | Antivirus Software                                                                                              | 05 user  | 10,000/-   |
| 18. | Internet connectivity                                                                                           | 60 Nodes | 3,00,000/- |

## 2. Programming lab

| S.No. | Description                                                                                                                                                | QTY      | Total Price |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|
| A     | B                                                                                                                                                          | C        | D           |
| 1.    | Computer Desktop (i7,8th Generation, 1TB Hard disk/500 GB SSD, 8Gb RAM, Pre loaded window with 5 year warranty)                                            | 60       | 48,00,000/- |
| 2.    | Computer Table and Chair                                                                                                                                   | 60       | 9,00,000/-  |
| 3.    | Working Bench with power Supply + 40 Stools                                                                                                                | 04       | 100000/-    |
| 4.    | Component Storage Rack                                                                                                                                     | 05       | 100000/-    |
| 5.    | Online UPS, 6KVA                                                                                                                                           | 2        | 2,00,000/-  |
| 6.    | Switch with 24 port speed 10/100/1000 (Manageable)                                                                                                         | 03       | 1,50,000/-  |
| 7.    | Printer                                                                                                                                                    | 1        | 25000/-     |
| 8.    | scanner                                                                                                                                                    | 01       | 65,000/-    |
| 9.    | Laptop                                                                                                                                                     | 01       | 70,000/-    |
| 10.   | Digital camera                                                                                                                                             | 01       | 30,000/-    |
| 11.   | Handy Cam                                                                                                                                                  | 01       | 25,000/-    |
| 12.   | Smart Board interactive panel                                                                                                                              | 01       | 4,00,000/-  |
| 13.   | Network Forensic FOSS like The Sleuth Kit, Autopsy, NetworkMiner, Wireshark, Volatility, Jhon the Ripper, Disk Drill, Cryptool, OpenPuff, MailTracker etc. | LS       | -           |
| 14.   | Android Studio or other FOSS like Xamarin                                                                                                                  | LS       | -           |
| 15.   | MS Office latest or equivalent FOSS Libre Office/Open Office (Freeware)                                                                                    | LS       | 20,000/-    |
| 16.   | FOSS CASE tools like Jmeter, Selenium etc                                                                                                                  | LS       | -           |
| 17.   | Compiler Turbo C, C++ or equivalent FOSS like VS Code                                                                                                      | LS       | 10,000/-    |
| 18.   | Web camera, Mike and speakers                                                                                                                              | 01       | 20,000/-    |
| 19.   | Air Conditioner 2 ton                                                                                                                                      | 02       | 1,40,000/-  |
| 20.   | Antivirus Software                                                                                                                                         | 05 user  | 10,000/-    |
| 21.   | Internet connectivity                                                                                                                                      | 60 Nodes | 3,00,000/-  |

### 3. Networking lab/ IoT Lab/Project Lab

| S.No. | Description                                                                                                       | QTY      | Total Price |
|-------|-------------------------------------------------------------------------------------------------------------------|----------|-------------|
| A     | B                                                                                                                 | C        | D           |
| 1.    | Computer Server (Quad core, intel processor 32 GB RAM)                                                            | 1        | 5,00,000/-  |
| 2.    | Computer Desktop (i7,8th Generation, 1TB Hard disk / 500 GB SSD, 8Gb RAM, Pre loaded window with 5 year warranty) | 20       | 16,00,000/- |
| 3.    | Computer Table and Chair                                                                                          | 20       | 3,00,000/-  |
| 4.    | Working Bench with power Supply + 40 Stools                                                                       | 04       | 100000/-    |
| 5.    | Component Storage Rack                                                                                            | 05       | 100000/-    |
| 6.    | Online UPS, 6KVA                                                                                                  | 1        | 1,00,000/-  |
| 7.    | Smart Board interactive panel                                                                                     | 01       | 4,00,000/-  |
| 8.    | Printer                                                                                                           | 1        | 25000/-     |
| 9.    | Switch with 24 port speed 10/100/1000 (Manageable)                                                                | 1        | 50,000/-    |
| 10.   | Connectors (RJ-45, RJ-11, BNC, SC, ST)                                                                            | LS       | 10,000/-    |
| 11.   | Cables: (UTP,STP,OFC) - 25 m each                                                                                 | LS       | 10,000/-    |
| 12.   | Router                                                                                                            | 1        | 40,000/-    |
| 13.   | Modem cum Router                                                                                                  | 2        | 10,000/-    |
| 14.   | Networking Printer                                                                                                | 1        | 1,00,000/-  |
| 15.   | Internet Connectivity                                                                                             | 20 Nodes | 1,00,000/-  |
| 16.   | LAN Trainer                                                                                                       | 4        | 60,000/-    |
| 17.   | Antivirus Software                                                                                                | LS       | 10,000/-    |
| 18.   | Unmanaged Switch                                                                                                  | 4        | 60,000/-    |
| 19.   | Hub                                                                                                               | 2        | 20,000/-    |
| 20.   | Air Conditioner 2 ton                                                                                             | 2        | 1,40,000/-  |
| 21.   | Miscellaneous- cables and connectors, computer stationery, printer consumables (inks), toner etc.                 | LS       | 30,000/-    |
| 22.   | Arduino Uno IDE with built in Wifi                                                                                | 20       | 20,000/-    |
| 23.   | Raspberry pi                                                                                                      | 2        | 6000/-      |
| 24.   | Sensor Kits (e.g. MQ135, DHT11 etc.)                                                                              | 20       | 100000/-    |
| 25.   | Bluetooth module HC05                                                                                             | 20       | 5000/-      |
| 26.   | Display Screen                                                                                                    | 20       | 5000/-      |
| 27.   | Relay Module                                                                                                      | 20       | 5000/-      |
| 28.   | Miscellaneous- cables and connectors, computer stationery, printer consumables (inks), toner etc.                 | LS       | 30000/-     |

**B - Furniture Requirement**

Norms and standards laid down by AICTE -APH (latest) be followed for working out furniture requirement for diploma courses

**C- 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.

## **10 - List of Participants / Experts**

The following experts participated in various workshop for Developing the Curriculum's Structure and Contents of **Computer Science and Engineering** at I.R.D.T. Kanpur.

- 1- Shri Madan Mishra, HOD Computer, MMIT Santkabir Nagar .
- 2- Dr. Jokhu Lal, HOD Computer, Govt. Girls Poly. Lucknow.
- 3- Shri Janmeyjay Kumar, Lecturer Computer, Govt. Poly. Jansath Mujaffarnagar.
- 4- Smt. Rupali Singh, Lecturer Computer, Govt. Poly. Kanpur .
- 5- Shri Sunil Kumar, Lecturer Computer, Govt. Poly. Changipur Noorpur, Bijnor .
- 6- Dr. Vikas Yadav, Lecturer Computer, Govt. Poly. Bighapur Unnav .
- 7- Shri Shitanshu krishan, Lecturer Computer, Govt. Girls Poly. Amethi .