

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

For the State of Uttar Pradesh

(5th to 6th Semester)

Semester System



Prepared By:

INSTITUTE OF RESEARCH DEVELOPMENT & TRAINING, U.P., KANPUR

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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 (6th 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)

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 Periods/Week			Credits(C) (L+T)+P = C	MARKS IN EVALUATION SCHEME										Total Marks of Internal & External
							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 Periods/ Week			Credits(C) (L+T)+P = C	MARKS IN EVALUATION SCHEME									Total Marks of Internal & External
							INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
			L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot		
6.1	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

UPDATED AND APPROVED BY BOARD OF TECHNICAL EDUCATION U.P. LUCKNOW IN C.D.C MEETING HELD ON 16.07.2026

INDUSTRIAL PATHWAY

Sr. No.	SUBJECTS	Category & Course Type	STUDY SCHEME			Credits(C) (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	150*			200**					350			
6.3	Industrial Project	Industrial Training	-	-	-	4	50*			50**					100			
6.4	# Seminar	In House	-	-	-	2	-	100	100	-	-	-	-	-	100			
Total			-	-	-	20	-							-	650			

NOTE:

1. The Industrial training tenure should not be less than 14 Weeks.
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 AICTE Internship Policy: Guidelines and procedures (Chapter -9 Procedures / format for organizing internship)
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.
7. ***Evaluation by faculty mentor**
The institute will depute one faculty member for mentoring at least 20-30 students undertaking apprenticeship training. Such mentors will monitor, guide and provide counselling to the students as and when required. Faculty mentor of the institute(s) may make a surprise visit to the internship/apprenticeship site to check the student's presence physically. (The Proforma of the evaluation is attached as the Annexure -1)

8. **** Evaluation by industry** : The industry shall assess the candidates based on the following parameters attendance, discipline and punctuality, familiarity of tools and material, engineering skills, application of knowledge and problem-solving skills, comprehension and observation, professional ethics, safety and environmental consciousness, communication skills, supervisory skills and general conduct during the period (The Proforma of the evaluation is attached as the Annexure -2)
9. **# Evaluation through seminar presentation/Viva-Voce at the institute** : The student will give a seminar based on his training report, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria .

ANNEXURE -A

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)

Sr No	Course Title				
1	Mobile App Development				
2	Multimedia Technologies				

LIST OF PROGRAM ELECTIVE COURSES (PE-3)

Sr No	Course Title				
1	Information Security				
2	Advance Computer Networks				

LIST OF PROGRAM ELECTIVE COURSES (PE-4)

Sr No	Course Title				
1	Artificial Intelligence				
2	Data Science and Machine Learning				

LIST OF OPEN ELECTIVE COURSES (OE-2)

Sr No	Course Title				
1	Product Design				
2	Engineering Economics & Accountancy				
3	Artificial Intelligence and Machine Learning (TATA)				

LIST OF OPEN ELECTIVE COURSES (OE-3)

Sr No	Course Title	L	T	P	C
1	Disaster Management	2	-	-	2
2	Renewable Energy Technology	2	-	-	2

OPEN ELECTIVE's

SR.NO.	ADVANCE SKILL DEVELOPMENT COURSES
1.	COURSES CONDUCTED BY CENTRE OF EXCELLENCE (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, INTERNATIONAL/NATIONAL ORGANIZATION OR PLATFORMS OF REPUTE
5.	COURSES CONDUCTED BY AICTE-ELIS AND CENTRALLY FUNDED TECHNICAL INSTITUTES
6.	COURSES CONDUCTED BY C-DAC
7.	COURSES CONDUCTED BY NEILIT

DETAILED CONTENTS

5.1 Practicum	Object Oriented Programming Using Java	L	T	P
		1	-	4

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

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	1	-	2	-	-	2	*	*
CO2	2	2	2	3	-	1	2	*	*
CO3	3	3	3	2	-	1	2	*	*
CO4	3	3	3	2	-	1	2	*	*
CO5	3	3	3	3	-	2	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

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 in-

vocation, 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 (Periods)	Marks Allocation (%)
1.	02	15
2.	03	15
3.	03	30
4.	03	20
5.	03	20
Total	14	100

5.2 Practicum	FUNDAMENTAL OF INTERNET OF THINGS	L	T	P
		1	-	4

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.

COURSE OUTCOMES:

After successful completion of this course, the students should be able to

CO1: Basic understanding of IoT.

CO2: Familiarizing with different sensors.

CO3: Understanding Arduino programming.

CO4: Implementing IoT through Raspberry Pi.

CO5: Design IoT models using sensors and actuators.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	1	-	-	1	-	2	*	*
CO2	2	2	1	2	1	-	2	*	*
CO3	2	2	2	3	-	1	2	*	*
CO4	2	3	3	3	1	2	2	*	*
CO5	3	3	3	3	2	2	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

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 Periods)

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

LIST OF PRACTICALS

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

5.3.1 Practicum	Mobile App Development	L	T	P
		3	-	4

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

After completion of this course, the student will be able to:

CO1

Explain the Android platform, SDK, application architecture, and Manifest file to understand the structure of Android applications.

CO2

Design Android applications using Activities, Services, Intents, Broadcast Receivers, permissions, and intent **filters** for effective application flow and communication.

CO3

Create interactive Android user interfaces using layouts, UI components, and animations to enhance user experience.

CO4

Apply testing, publishing, preference handling, and resource management techniques for reliable and scalable Android applications.

CO5

Develop data-driven and network-enabled Android applications using SQLite, Content Providers, networking, web, and telephony APIs.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	1	-	2	-	-	2	*	*
CO2	3	2	3	2	-	1	2	*	*
CO3	2	1	3	2	-	-	2	*	*
CO4	2	2	2	3	-	2	2	*	*
CO5	3	2	3	3	1	2	3	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

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 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.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	-	-	-	-	-	-	*	*
CO2	3	3	-	2	-	-	-	*	*
CO3	3	2	-	3	-	-	-	*	*
CO4	3	3	3	-	-	-	-	*	*
CO5	3	1	-	-	-	-	-	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA

guidelines, formulating PSOs is optional.

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

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	10	25
2.	12	25
3.	10	25
4.	10	25
Total	42	100

5.4 Program Elective-3

5.4.1 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.

CO1:

Understand the fundamentals of information security, its various aspects, and security features of operating systems including authentication, access control, auditing, and malware protection.

CO2:

Analyze security weaknesses in networking protocols and devices, and apply appropriate security solutions such as VPNs, VLANs, IPSec, and HTTPS to mitigate risks.

CO3:

Explain the basics of cryptography and Public Key Infrastructure (PKI), and apply secure coding practices while developing software applications.

CO4:

Identify and evaluate network security products such as firewalls, IDS/IPS, VPN concentrators, and content screening gateways for securing enterprise networks.

CO5:

Understand security standards, legal frameworks, and compliance requirements including ISO 27001, Indian IT Act, IPR laws, and perform basic security audit procedures.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	2	2	2	1	2	*	*
CO2	3	3	3	3	1	2	2	*	*
CO3	3	2	3	2	1	2	3	*	*
CO4	3	3	3	3	1	2	2	*	*
CO5	3	2	2	2	3	2	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

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 steganography techniques using steghide

SUGGESTED DISTRIBUTION OF MARKS

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

5.4.2 Practicum	Advanced Computer Networks	L	T	P
		3	-	4

COURSE OBJECTIVES

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

CO1:

Explain advanced networking fundamentals including IPv4 subnetting, multicasting, TCP flow and congestion control, and IPv6 addressing mechanisms.

CO2:

Analyze telecom network architectures and switching techniques such as Frame Relay, ATM, MPLS, and VSAT communication systems.

CO3:

Compare and evaluate wireless and cellular communication technologies including WiFi, WiMax, GSM, CDMA, 3G, and 4G networks. Apply Quality of Service (QoS) concepts, network redundancy, load balancing, caching, and network monitoring techniques using SNMP and RMON.

CO4:

Describe and implement basic network security mechanisms including VLANs, VPNs, firewalls, IPS, and proxy servers.

CO5:

Design and simulate computer networks using appropriate IP addressing schemes and protocol analyzers such as Wireshark.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	-	-	-	-	1	*	*
CO2	3	2	2	-	-	-	1	*	*
CO3	3	3	2	1	1	-	1	*	*
CO4	2	2	3	2	1	-	1	*	*
CO5	2	2	3	3	-	1	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

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 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 (periods)	Marks Allotted
1	10	22
2	8	20
3	6	16
4	10	22
5	8	20
TOTAL	42	100

OPEN ELECTIVE-2

5.5.1	Product Design	L	T	P
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		2	-	-
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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.

COURSE OUTCOMES

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

CO1: Understand the characteristics and concepts used for product design

CO2: Assess the customer requirements in product design.

CO3: Apply structural approach for product design.

CO4: Develop optimized methods to minimize the cost.

CO5: Design simple products

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	1	1	-	1	-	1	*	*
CO2	2	3	2	1	3	2	1	*	*
CO3	3	2	3	3	1	1	1	*	*
CO4	2	3	3	3	3	2	1	*	*
CO5	2	3	3	3	2	2	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

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

To pic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	05	15
2.	06	25
3.	06	25
4.	06	20
5.	05	15
Total	28	100

OR

OPEN ELECTIVE-2

5.5.2	ENGINEERING ECONOMICS & ACCOUNTANCY	L	T	P
		2	-	-

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.

COURSE OUTCOMES

After undergoing the subject, students will be able to:

CO 1: Understand the concept of Managerial Economics

CO 2: Understand and Analyze Demand and Supply

CO 3: Analyze and Estimate Production Cost

CO 4: Apply Pricing methods in practice

CO 5: Understand concepts of Accounting

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	1	-	-	3	1	1	*	*
CO2	3	3	1	-	3	1	1	*	*
CO3	3	3	1	1	2	3	1	*	*
CO4	3	2	2	1	2	2	1	*	*
CO5	3	1	-	2	1	3	3	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

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

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	05	20
2.	06	20
3.	06	20
4.	06	20
5.	05	20
Total	28	100

OR

OPEN ELECTIVE-2

5.5.3	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (TATA)	L	T	P
		2	-	-

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.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	-	-	-	-	-	-	*	*

CO2	3	3	-	2	-	-	-	*	*
CO3	3	2	-	3	-	-	-	*	*
CO4	3	3	3	-	-	-	-	*	*
CO5	3	1	-	-	-	-	-	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

1.2 TABLE OF CONTENTS

Sr No	Course contents
1	Industrial Safety Practices • Fire Extinguishers & its Types • Safely handling Tools & Equipment • Use of proper Tools & Equipment & its maintenance • OSH & practices to be observed as a precaution
2	Fundamentals required for AI and ML • Introduction to Artificial Intelligence and Machine Learning • Need of AI and ML • Basic Mathematical concepts related to AI and ML • Data Collection, Data Processing and Cleaning • Types of Data Sources ○ Structured Data ○ Unstructured Data ○ Semi Structured ○ Realtime Data ○ Open Data Set ○ Data Scrapping • Data Acquisition Techniques ○ APIs (Application Programming Interfaces): Collection of from External Sources) ○ Web Scrapping ○ Surveys and Forms ○ Sensor Data ○ Database and Data Warehouse • Data Integration ○ Combining Data from Multiple Sources ○ Data Merging (Combing Data from different Tables) ○ Data Aggregation

	• Data Pre-Processing ○ Data Cleaning ○ Outlier Detection and Removal ○ Duplicate Data
3	Programming concepts for AI and ML ○ Python Basics ○ Python Structure ○ NumPy ○ Pandas ○ Matplotlib and Seaborn ○ Scikit-learn
4	Introduction to Supervised Machine Learning Types of Machine Learning Techniques (Supervised, Unsupervised and Reinforcement Learning) • Supervised Learning ○ Regression ○ Classification ○ Logistic Regression ○ Support Vector Machines ○ Decision Tree ○ Random Forest ○ K – Nearest Neighbors (KNN) ○ Use cases of Regression and Classification
	Introduction to Unsupervised Learning • Clustering ○ K – Means Clustering ○ Hierarchical Clustering ○ DBSCAN • Dimensionality Reduction • Anomaly Detection • Use cases of clustering and Dimensional Reduction • Building Machine Learning Model • Model Evaluation and Validation • Machine Learning Model Deployment
5	Deep Learning, Reinforcement Learning and Natural Language Processing ○ Fundamentals of Deep Learning

	○ Convolutional Neural Networks (CNNs) ○ Recurrent Neural Networks (RNNs) ○ Natural Language Processing ○ Reinforcement Learning ○ TensorFlow and Kera
	Generative AI ○ Understanding of Gen AI ○ Applications of Gen AI ○ Development of Gen AI model ○ Integration of Gen AI in Mobile App. ○ Deployment
6	Deep Learning Applications ○ Computer Vision ○ Natural Language Processing ○ Speech Recognition ○ Model Deployment
7	Ethics and Responsibility in AI and Machine Learning ○ Ethics in AI and ML ○ Accountability and Responsibility ○ Privacy and Data Protection ○ Social Impact of AI ○ Ethical Guidelines

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%

5.7 Audit Course	INDIAN CONSTITUTION	L	T	P
		2	-	-

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:

Course Outcomes (COs)

CO1: Understand the historical background, philosophy, and process involved in the making of the Indian Constitution.

CO2: Analyze the structure and functioning of the Union Government, including the roles, powers, and relationships of the President, Prime Minister, Council of Ministers, Lok Sabha, and Rajya Sabha.

CO3: Explain the organization and working of the State Government.

CO4: Evaluate the system of Local Administration in India by understanding the structure and functions of District Administration, Municipal Corporations, and Zila Panchayats.

CO5: Understand the role, powers, and significance of the Election Commission of India in ensuring free and fair elections in a democratic system.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	-	-	2	-	2	*	*
CO2	3	3	2	-	2	1	2	*	*
CO3	3	2	1	-	2	1	2	*	*
CO4	3	3	2	-	3	2	2	*	*
CO5	3	2	-	-	3	1	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

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:

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

SIXTH SEMESTER

PROGRAM ELECTIVE -4

6.1	ARTIFICIAL INTELLIGENCE	L	T	P
Theory		4	-	-

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.

COURSE OUTCOME

After successful completion of this course, the students should be able to

CO1: Understanding the basic concepts of Artificial Intelligence.

CO2: Describing different AI searching algorithms.

CO3: Applying various optimization techniques to real world problems.

CO4: Capable of implementing autonomous planning under constraints in simulated or real environment.

CO5: Applying different AI logics to solve various problems.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Engineering Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	-	-	-	-	1	*	*
CO2	3	3	2	1	-	-	1	*	*
CO3	2	3	3	2	1	-	1	*	*
CO4	2	3	3	3	2	1	2	*	*
CO5	2	3	2	2	1	-	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

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

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	08	20
2.	08	20
3.	10	20
4.	08	20
5.	08	20
Total	42	100

OR
Program Elective

6.1	6.1.2 Data Science and Machine Learning	L	T	P
Theory		4	-	-

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.

COURSE OUTCOMES

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

- CO 1: Understand the basics of Data Science
- CO 2: Visualize and Analyze Data
- CO 3: Understand concept of Exploratory Data Analysis
- CO 4: Understand and develop Machine Learning Algorithms.
- CO 5: Implement Mining Process on Social Network Graph

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	1	2	1	1	2	*	*
CO2	3	3	2	3	1	3	2	*	*
CO3	3	3	2	3	1	2	2	*	*
CO4	3	3	3	3	2	1	3	*	*
CO5	3	3	3	3	2	1	3	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

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

SR No	Topic Time Allotted (periods)	Marks Allotted
1	10	22
2	6	16
3	10	22
4	8	20
5	8	20
TOTAL	42	100

6.2 HUMANITIES	ENTREPRENEURSHIP AND START-UPS	L	T	P
		2	-	-

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

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	1	1	-	-	-	2	*	*
CO2	2	3	3	2	1	3	2	*	*
CO3	2	2	2	2	1	-	2	*	*
CO4	2	1	2	-	2	3	2	*	*
CO5	3	2	2	2	2	1	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

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:

S. No.	Title of Book	Author	Publication
1.	The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf	K & S Ranch ISBN – 978-0984999392
2.	Entrepreneurship Development (A new Venture creation)	Vasant Desai	Himalya Publication
3.	Entrepreneurship Development	Khanka S.S.	S Chand & Company Limited New Delhi
4.	Entrepreneurship Development	Gupta and Srinivsan	S Chand & Company Limited New Delhi
5	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber	Headline Book Publishing ISBN – 978-0755388974

6	The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN – 978-0670921607
7	The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business	Clayton M. Christensen	Harvard business s ISBN: 978-142219602

SUGGESTED SOFTWARE/LEARNING WEBSITES:

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

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	2	17
2	6	14
3	6	20
4	4	17
5	6	21
6	4	11
Total	28	100

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 THEORY	Disaster Management	L	T	P
		2	-	-

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.

COURSE OUTCOMES

- CO 1: Understanding disaster and hazards
- CO 2: Understanding types, consequences and control of disasters
- CO 3: Understanding Disaster Management Cycle
- CO 4: Understanding Disaster Management Acts in India
- CO 5: Understanding application of technology for Managing the disasters

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	1	-	3	1	2	*	*
CO2	3	3	2	1	3	2	2	*	*
CO3	3	2	2	1	3	3	2	*	*
CO4	2	1	-	-	3	2	2	*	*
CO5	2	2	2	3	2	2	3	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

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
TOTAL	42	100

6.4 Open Elective-3

6.4.2 THEORY	RENEWABLE ENERGY TECHNOLOGIES	L	T	P
		2	-	-

COURSE OUTCOMES

CO 1: Understanding basics of Renewable Energy

CO 2: Understanding Solar Energy

CO 3: Understanding Wind Energy

CO 4: Understanding Bio Energy

CO 5: Understanding Tidal, Wave, Hydro Thermal Energy

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	1	1	-	3	1	2	*	*
CO2	3	2	2	1	3	1	2	*	*
CO3	3	2	2	1	3	1	2	*	*
CO4	3	1	1	-	3	1	2	*	*
CO5	3	1	1	-	3	1	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

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-

1- 15 Marks for general behaviour and discipline

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

2- 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

3- * **Even Semester:**

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

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

a) State/National Level participation

b) Participation in two of above activities

c) Inter-Polytechnic level participation

****Odd Semester:**

25 Marks maximum

a) Language Lab Practices / foreign language practices

b) Group Discussion and Personality Development

c) Industrial Visits/Industrial Talks

d) Power Point Presentations and Resume Making

e) Development of Aptitude and Reasoning Skills

f) Participation in the technical Exhibitions, Symposiums, Seminars, Workshops at the Institute /District/State/National Level.

9- RESOURCE REQUIREMENT

A : Laboratory

1. Computer Center

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.	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, Autopsy, NetworkMiner, Wireshark, Volatility, Jhon the Ripper, Disk Drill, Cryptool, OpenPuff, MailTracker etc.	LS	-
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, Open Puff, 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 .

11 . EVALUATION SCHEME

a. For Theory Courses:

(The weightage of Internal assessment is 40% and for End Semester Exam is 60%) The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

b. For Practical Courses:

(The weightage of Internal assessment is 60% and for End Semester Exam is 40%) The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

c. For Summer Internship / Projects / Seminar etc.

Evaluation is based on work done, quality of report, performance in viva-voce, presentation etc.

Note: The internal assessment is based on the student's performance in mid semester tests (two best out of three), quizzes, assignments, class performance, attendance, viva-voce in practical, lab record etc.

12 -Evaluation Method

ANNEXURE- 1

1. EVALUATION METHOD for THEORY

	Internal Assessment (40 marks)				External Assessment (60 marks)
	IA 1	IA 2	IA 3	IA 4	
Mode	Written Test	Written Test	Attendance and Assignments	Pre – Semester Examination	End Semester Examination
Portion	2 units	2 units	Regularly	All units	All units
Duration1hr	1hr	1hr	-	3hrs	3hrs
Exam Marks	20	20	20	60	60
Converted to	10	10	15	15	60
Tentative Schedule	5 th Week	10 th Week	Regularly	12 th -13 th Week	

IA1 and IA2: A written assessment test worth 20 marks should be conducted for two units. The marks earned (20 marks) will be converted to 10 marks. The best of the two assessments will be evaluated for an internal 10-mark assessment.

IA3: Assignments given after the completion of each unit, along with attendance throughout the semester, will be assessed for a total of 15 marks.

IA4: The pre-semester examination should follow the end-semester examination question pattern. The marks should be adjusted to 15 for internal assessment.

2. EVALUATION METHOD for PRACTICAL

	Internal Assessment (60 marks)				External Assessment (40 marks)
	IA 1	IA 2	IA 3	IA 4	
Mode	Practical Test	Practical Test	Attendance and Practical Documentation	Practical Test and Quiz – Viva Voce	Practical Examination
Portion	50% Practical	50% practical	All practical	All practical	All practical
Duration	3hrs	3 hrs	Regularly	3 hrs	3hrs
Exam Marks	20	20	20	20	40
Tentative Schedule	5th Week	10th Week	Regularly	12th -13 th Week	

IA1 and IA2: Complete all exercises and experiments as outlined and retain them for the practical test. The test should be conducted in accordance with the evaluation scheme. The best of the two practical tests will be internally evaluated for a total of 20 marks.

IA3: Maintain a practical file for each exercise while ensuring attendance throughout the semester. Submit the required documents for the practical file, quiz, and practical test along with a valid certificate (Progress Card). This will be assessed for 20 marks.

IA4: The pre-semester practical examination, quiz, and viva-voce should follow the end-semester practical examination pattern, with marks adjusted to 20 for internal assessment.

SUGGESTED DISTRIBUTION OF MARKS FOR INTERNAL EVALUATION

Part	Description	Marks Allotted
A.	Objective	5
B.	Diagram	5
C.	Procedure	10
D.	Observation Table and Calculation	10
E.	Result and its Discussion, Conclusion	10
F.	Practical Test	20
	Total	60

SUGGESTED DISTRIBUTION OF MARKS FOR EXTERNAL EVALUATION

Part	Description	Marks Allotted
A.	Objective	5
B.	Diagram	5
C.	Procedure	5
D.	Observation Table and Calculation	5
E.	Result and its Discussion, Conclusion	10
F.	Viva-Voce	10
	Total	40

3. EVALUATION METHOD for PRACTICUM (End Exam-Practical)

	Internal Assessment (60 marks)				External Assessment (40 marks)
	IA 1	IA 2	IA 3	IA 4	
Mode	Practical Test	Practical Test	Attendance and Practical Documentation	Micro Project	Practical Examination
Portion	50% practical	50% practical	All practical	All practical	All practical
Duration	3hrs	3 hrs	Regularly	Regularly	3hrs
Exam Marks	20	20	20	20	40
Tentative Schedule	5th Week	10th Week	Regularly	12th -13 th Week	

- **IA1 and IA2:** Complete all exercises and experiments as instructed and retain them for the practical test. The test should be conducted according to the evaluation scheme. The best of the two practical tests will be internally assessed for a total of 20 marks.
- **IA3:** Maintain a practical file for each exercise, ensuring attendance throughout the semester. Submit the required documents for the practical file, quiz, practical test, and end-semester examination, along with a valid certificate (Progress Card). This will be evaluated by 20 marks.
- **IA4:** Submit a micro-project report along with a fabrication model or analysis report. The performance of each student in the group will be assessed by both the laboratory supervisor and an internal examiner. This evaluation will contribute 20 marks.

SUGGESTED DISTRIBUTION OF MARKS FOR INTERNAL EVALUATION

Part	Description	Marks Allotted
A.	Objective	5
B.	Diagram	5
C.	Procedure	10
D.	Observation Table and Calculation	10
E.	Result and its Discussion, Conclusion	10
F.	Mini Project	20
	Total	60

SUGGESTED DISTRIBUTION OF MARKS FOR EXTERNAL EVALUATION

Part	Description	Marks Allotted
A.	Objective	5
B.	Diagram	5
C.	Procedure	5
D.	Observation Table and Calculation	5
E.	Result and its Discussion, Conclusion	10
F.	Viva-Voce	10
	Total	40

4. EVALUATION METHOD for PRACTICUM (End Exam-Theory)

	Internal Assessment (40 marks)						External Assessment (60marks)
	IA 1		IA 2		IA 3	IA 4	
Mode	Written Test	Practical Test	Written Test	Practical Test	Attendance and Practical Documentation	Pre Semester Examination and Micro Project	End Semester Examination
Portion	2 units	Practical related to the units	2 units	Practical related to the units	All unit	All Practical	All unit
Duration	1hr	3hrs	1hr	3 hrs	3hrs	Regularly	3hrs
Exam Marks	10	20	10	20	60	60	60
	30		30				
Converted to	10		10		15	15	60
Tentative Schedule	5 th Week		10 th Week		Regularly	12 th -13 th Week	

IA1 and IA2: A written assessment test worth 10 marks should be conducted for two **UNITs**. Complete all exercises and experiments as outlined and retain them for the practical test worth 20 marks. The practical test should be conducted in accordance with the evaluation scheme. The total marks earned (30 marks) will be converted to 10 marks. The best of the two assessments will be internally evaluated for a total of 10 marks.

IA3: Attendance and the pre-semester examination should follow the end-semester examination question paper pattern. The marks should be adjusted to 15 for internal assessment.

IA4: Maintain a practical file for each exercise. Submit the required documents for the practical file, quiz/viva-voice, practical test, and end-semester examination, along with a valid certificate (Progress Card). This will be assessed for 40 marks. Additionally, submit a micro-project report along with a fabrication model or analysis report. The performance of each student in the group will be evaluated by both the laboratory supervisor and an internal examiner. The total of 60 marks will be converted to 15 marks.

PROCEDURES / FORMATS FOR ORGANIZING INTERNSHIPS.

STUDENT INTERNSHIP PROGRAM APPLICATION

Complete and submit to the TPO/ Internship Program Coordinator.

1. Student Name:		Enroll. No.:	
2. Campus Address:		Phone:	
3. Home Address:		Phone:	
4. Student email address:			
5. Branch:		6. Internship Semester: _____	
7. Internship Preferences			
	Company/Industry	Core Area	Location
Preference-1			
Preference-2			
Preference-3			
Faculty mentor Signature: _____ Date _____.			
Student Signature: _____ Date _____.			
Signature confirms that the student agrees to the terms, conditions, and requirements of the Internship Program			

Signature with seal
HOD/Principal

(ANNEXURE-I)

REQUEST LETTER FROM INSTITUTE TO INTERNSHIP/INDUSTRIAL TRAINING PROVIDER

Ref. No.: _____

Date: _____

To,
The HR Manager/Training Coordinator
.....
.....

Subject: Request for Internship/Industrial Training for Diploma Students

Sir/Madam,

We are pleased to introduce....., a premier institution affiliated with Board of Technical Education, Uttar Pradesh, offering diploma programs in various diploma disciplines.

As a part of the curriculum, our students are required to undergo Internship/Industrial Training to gain practical exposure and enhance their technical competencies. Therefore, we kindly request your esteemed organization to provide Internship/Training opportunities to our students during the period from to

S. No.	Name	Enroll. No.	Semester/Year	Discipline

Yours sincerely,

(Head of Department/Principal)

PROFORMA FOR EVALUATION OF INTERNSHIP BY INDUSTRY

Student Name:Evaluation Date:

Industry Supervisor Name:

Company/Organization:

Title of the Project:

Please evaluate your intern by indicating the frequency with which you observed the following behaviors:

Parameters	Max. Marks	Marks Given
Attendance and Punctuality	20	
Discipline and Professional Behavior	20	
Technical Knowledge and Understanding of Processes	30	
Practical Skills and Quality of Work	20	
Ability to Apply Theoretical Knowledge	20	
Problem Solving and Analytical Ability	10	
Communication and Interpersonal Skills	20	
Teamwork and Collaboration	10	
Internship Report/Documentation	20	
Presentation and Viva-Voce	30	
Total Marks	200	

Additional comments, if any:

Signature with seal of Industry supervisor

HR Manager

INTERNSHIP REPORT

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed after every day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and got ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

- Regularity in maintenance of the diary.
- Adequacy & quality of information recorded.
- Drawings, sketches and data recorded.
- Thought process and recording techniques used.
- Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

- i. Originality.
- ii. Adequacy and purposeful write-up.
- iii. Organization, format, drawings, sketches, style, language etc.
- iv. Variety and relevance of learning experience.
- v. Practical applications, relationships with basic theory and concepts taught in the course.

MONITORING & EVALUATION OF INTERNSHIP

The industrial training of the students will be evaluated in three stages:

1. Evaluation by Industry.
2. Evaluation by faculty supervisor of Industry.
3. Evaluation through seminar presentation/viva-voce at the Institute.

1. EVALUATION BY INDUSTRY

The industry will evaluate the students based on the Punctuality, eagerness to learn, Maintenance of Daily Diary and skill test in addition to any remarks.

2. MONITORING/ SURPRISE VISIT BY TPO/ STAFF/ FACULTY MENTOR

TPO/Staff/ Faculty Mentor of the institutes will make a surprise visit to the internship site, to check the student's presence physically, if the student is found absent without prior intimation to the T & P Cell, entire training will be cancelled. Students should inform the TPO, faculty mentor as well as the industry supervisor at least one day prior to availing leave by email. Students are eligible to avail 1-day leave in 4 weeks and 2 days leave in 6 weeks of the internship period apart from holidays and weekly offs.

3. EVALUATION THROUGH SEMINAR PRESENTATION/VIVA-VOCE AT THE INSTITUTE

The student will give a seminar based on his training report, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria:

- Quality of content presented.
- Proper planning for presentation.
- Effectiveness of presentation.
- Depth of knowledge and skills.
- Attendance record, daily diary, departmental reports shall also be analyzed along with the Internship Report.

Seminar presentation will enable sharing knowledge & experience amongst students & teachers and build communication skills and confidence in students.