

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.	Subject	Category & Course Type	L-T-P	Credits (C)	Internal (Th/Pr/Tot)	External Th (Marks / Hrs)	External Pr (Marks / Hrs)	External Total	Grand Total
5.1	Object Oriented Programming using Java	Prog. Core (Practicum)	1-0-4	3	60/-/60	40 (03 Hrs)	-	40	100
5.2	Fundamentals of Internet of Things	Prog. Core (Practicum)	1-0-4	3	60/-/60	40 (03 Hrs)	-	40	100
5.3	Program Elective -2	Prog. Elective (Practicum)	3-0-4	5	40/-/40	60 (03 Hrs)	-	60	100
5.4	Program Elective -3	Prog. Elective (Practicum)	3-0-4	5	40/-/40	60 (03 Hrs)	-	60	100
5.5	(Q) Open Elective-2 OR Advance Skill Development Certification Course	Open Elective (Theory)	2-0-0	2	50*/-/50*	-	-	-	-
5.6	Summer Internship - II (6 Weeks)	-	-	2	60/-/60	40 (03 Hrs)	-	40	100
5.7	(Q) Indian Constitution	Audit Course	2-0-0	-	50*/-/50*	-	-	-	-
-	Student Centered Activities (SCA)	-	-	-	50/-/50	-	-	-	50
	Total		12-0-8	20	80/230/310	120	-	120	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.	Subject	Category & Course Type	L-T-P	Credits (C)	Internal (Th/Pr/Tot)	External Th (Marks / Hrs)	External Pr (Marks / Hrs)	External Total	Grand Total
6.1	Program Elective-4	Program Elective	4-0-0	4	40/-/40	60 (03 Hrs)	-	60	100
6.2	Entrepreneurship and Start-ups	Humanities (Theory)	2-0-0	2	40/-/40	60 (03 Hrs)	-	60	100
6.3	In House Project	Project	4-0-16	12	240/-/240	-	160	160	400
6.4	(Q) Open Elective-3 OR Advance Skill Development Course	Open Elective (Theory)	2-0-0	2	50/-/50	-	-	-	-
-	Student Centered Activities (SCA)	-	-	-	50/-/50	-	-	-	50
	Total		12-0-24	20	80/290/370	120	160	280	650

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

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

Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, library, Cultural Activities and self-study etc. The periods allotted to SCA can also be utilized to complete the syllabus for other subjects.

OR

INDUSTRIAL PATHWAY

Sr. No.	Subject	Category & Course Type	Periods / Week	Credits (C)	Th	Pr	Total Marks
6.1	Entrepreneurship and Start-ups (Online Mode)	Humanities & Social Science (Theory)	2	-	100 (Ext.)	-	100
6.2	Industrial Hands On Practice	Industrial Training	12	-	-	-	350
6.3	Industrial Project	Industrial Training	4	-	-	-	100
6.4	Seminar	In House	2	-	100	-	100
	Total		20	-	-	-	650

1. The Industrial training tenure should not be less than 4 months.
2. Industry must be registered with MSME / Directorate of Industries / Limited Organization / State / Central Government establishments.
3. Monthly progress reports of Intern/Trainee should be attested and forwarded by the industrial supervisor (allotted to the Intern/Trainee) during the Industrial Internship/Training.
4. The Industrial unit/organisation must evaluate students using the format provided by the polytechnic in the form of marks.
5. The Industrial Hands on Practice, Industrial Project and Seminar must be evaluated on the basis of the BTE Internship / Training Policy - 2025.

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6. “Entrepreneurship and Start-up” course is also mandatory in Industrial internship/training mode. It will be conducted online by his/her polytechnic institute. After completing the online course, students must appear for the exam conducted by the Board of Technical Education, Lucknow.

ANNEXURE 1

LIST OF COURSES CONDUCTED BY TATA TECHNOLOGIES (OPEN ELECTIVE)

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

LIST OF PROGRAM ELECTIVE COURSES (PE-2)

Sr. No.	Course Title	L	T	P	C
1	Mobile App Development	3	-	4	5
2	Multimedia Technologies	3	-	4	5

LIST OF PROGRAM ELECTIVE COURSES (PE-3)

Sr. No.	Course Title	L	T	P	C
1	Information Security	3	-	4	5
2	Advance Computer Networks	3	-	4	5

LIST OF PROGRAM ELECTIVE COURSES (PE-4)

Sr. No.	Course Title	L	T	P	C
1	Fundamental of Artificial Intelligence	4	-	-	4
2	Data Science and Machine Learning	4	-	-	4

LIST OF OPEN ELECTIVE COURSES (OE-2)

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

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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 ELECTIVES – 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 NIELIT

DETAILED CONTENTS

5.1 Object Oriented Programming Using Java

Practicum	L	T	P
	1	-	4

COURSE OBJECTIVES

This course offers the modern programming language JAVA that will help the students to implement the various concepts of object orientation practically. The students will be able to program in object oriented technology using JAVA.

COURSE OUTCOMES

- CO 1: Install Java IDE, Compiler, Java virtual machines and understand basic concepts of Java
- CO 2: Implement basic Java programs
- CO 3: Explain and implement the concept of Object-oriented Programming
- CO 4: Explain and implement Abstract class, Interface and Polymorphism using Java program
- CO 5: Understand Exceptions and develop multithreaded programs

COURSE CONTENTS

UNIT 1: Introduction and Features (2 Periods)

Fundamentals of object oriented programming – procedure oriented programming vs. object oriented programming (OOP); OOP 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 statements, conditional expressions, input using Scanner class and output statements, 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, protected/private/public data, constructor chaining, order of invocation, types of inheritance (single, multilevel, hierarchical, hybrid), 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, catch, 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 inheritance and static members that show all functions of a bank (withdrawal, deposit).
3. WAP to design a class using abstract methods and classes.
4. WAP to design a String class that performs string methods (equal, reverse the string, change case).
5. Consider a Class of Cars under which Santro Xing, Alto and Wagon R represent individual Objects, each with Model, Year of Manufacture, Colour, Top Speed, etc. as properties and Create(), Sold(), display() as methods of the Car class.
6. In a software company, Software Engineers, Sr. Software Engineers, Module Lead, Technical Lead, Project Lead, Project Manager, Program Manager, and Directors are all employees but their work, perks, roles and responsibilities differ. Create an Employee base class providing common behaviours/properties that all employees must have.
7. Using the concept of multiple inheritance, create classes: Shape, Circle, Square, Cube, Sphere, Cylinder with the specified class variables, constructors and base classes, with Area and/or Volume methods.
8. WAP to handle exceptions using try and multiple catch blocks.
9. WAP that implements nested try statements.
10. WAP to create a package that accesses members of an external class as well as of the same package.
11. WAP that shows the partial implementation of an interface.
12. WAP to create a thread that implements the Runnable interface.

RECOMMENDED BOOKS

1. Programming with Java: A Primer – E. Balagurusamy
2. Head First Java – O'Reilly, Kathy Sierra & Bert Bates
3. OCA Java SE Programmer I Certification Guide – Wiley Publisher, Mala Gupta
4. Programmer's Guide to Java SE 8 – Pearson, Khalid A. 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 Fundamentals of Internet of Things

Practicum	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 domains like agriculture, space, healthcare, manufacturing, construction, water and mining. IoT-based applications such as innovative shopping systems, infrastructure management in 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 enables learners to leverage their business and/or technical knowledge across IoT-related functions in the workplace.

LEARNING OUTCOMES

- Understand the concepts of Internet of Things.
- Understand what constitutes an IoT design solution.
- Identify the sensors and other devices needed for different IoT solutions.
- Understand the component parts of an IoT network and its connections.
- Build small IoT applications.

COURSE CONTENT

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 APIs, 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-colour LED, resistor; introduction to end devices, sensors and actuators; differentiating between different sensor types.

3. IoT Networks (12 Periods)

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

4. Arduino (12 Periods)

Features of Arduino device, Arduino device introduction, components of Arduino board, C Arduino programming language, understanding basics of Arduino IDE, functions, control statements, loops, datatypes, 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.

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LIST OF PRACTICALS (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 a 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 Mobile App Development

Practicum	L	T	P
	3	-	4

COURSE OBJECTIVES

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

COURSE OUTCOMES

- Identify various concepts of mobile programming that make it unique from programming for other platforms
- Critique mobile applications on their design pros and cons
- Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces
- Program mobile applications for the Android operating system that use basic and advanced phone features
- Deploy applications to the Android marketplace for distribution

COURSE CONTENT

UNIT I

Introduction to Android: the Android platform, Android SDK, Eclipse installation, Android installation, building your first Android application, understanding the anatomy of an Android application, Android manifest file.

UNIT II

Android Application Design Essentials: anatomy of an Android application, Android terminologies, application context, activities, services, intents, receiving and broadcasting intents, Android manifest file and its common settings, using intent filters, 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 applications, 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 an Android application to the world.

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, Barry Burd

OR

5.3.2 Multimedia Technologies

Practicum	L	T	P
	3	-	4

COURSE OBJECTIVES

To introduce students to the domain of Multimedia Technologies, explaining the technologies underlying digital images, videos and audio content, including various compression techniques and standards, and the issues involved in delivering multimedia content over the Internet.

COURSE OUTCOMES

- Understand various aspects of multimedia and related standards
- Build multimedia content and applications
- Multimedia-enable web applications and mobile applications

COURSE CONTENT

UNIT 1: Introduction to Multimedia (10 Periods)

Multimedia foundation and concepts: multimedia hardware, multimedia software, multimedia operating systems, multimedia communication systems.

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 (CorelDRAW, Photoshop, PageMaker); 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 using 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 different formats on CD/DVD
4. Transporting audio and video files
5. Using various features of Flash
6. Using various features of Photoshop/GIMP
7. Using various features of Blender
8. Making multimedia presentations combining Flash, Photoshop/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, 2018
4. Fundamentals of Multimedia, Ramesh Bangia, Khanna Book Publishing Co., New 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 Information Security

Practicum	L	T	P
	3	-	4

COURSE OBJECTIVES

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

COURSE OUTCOMES

- Understanding of security needs and issues of IT infrastructure
- Basic skills in security audit of networks, operating systems and application software

COURSE CONTENT

UNIT 1 (8 Periods)

Introduction to Information Security; various aspects of information security (PAIN); security features of operating systems – authentication, logs, audit features, file system protection, user privileges, RAID options, anti-virus software, etc.

UNIT 2 (10 Periods)

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

UNIT 3 (8 Periods)

Basics of cryptography, PKI, security considerations while developing software.

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.

LIST OF PRACTICALS

1. Study the security provided within the Windows operating system.
2. Recover the password of Windows machines using a password recovery utility (John the Ripper) or any other utility.
3. Trace the origin of an email using an email trace pro utility.
4. Use of Keylogger and anti-keylogger to secure your 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 a 3×3 Hill Cipher (CrypTool).
7. Create a digital signature document using CrypTool.
8. Send and receive a secret message using steganography techniques using Steghide.

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, ISO 27001 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/>

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

OR

5.4.2 Advanced Computer Networks

Practicum	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.

COURSE CONTENT

UNIT 1: Review of Networking Basics (10 Periods)

Advanced topics in IPv4 – subnetting, multicasting, multicast routing protocols (IGMP, PIM, DVMRP); advanced 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.).

LIST OF PRACTICALS

1. Study different types of network cables and implement cross-wired and straight-through cables using clamping tools.
2. From given data, find subnet, broadcast, range, subnet bits.
3. Study various basic network commands and network configuration commands.
4. Perform an initial router configuration.
5. Interpret ping and trace-route output.
6. Connect the computers in a Local Area Network.
7. Perform logical troubleshooting.
8. Observe static and dynamic routing.
9. Configure the router as a DHCP server.
10. Perform various networking operations using Packet Tracer.

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

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
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

Theory	L	T	P
	2	-	-

COURSE OBJECTIVES

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

COURSE CONTENT

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; brainstorming.

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 and financial feasibility in design; design for manufacturing; rapid prototyping (RP) and its application 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.

REFERENCE BOOKS

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

SUGGESTED DISTRIBUTION OF MARKS

Topic 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

5.5.2 Engineering Economics & Accountancy

Theory	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, and think critically about economic models, evaluating their assumptions and implications.

COURSE CONTENT

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. Sociology & Economics for Engineers, Premvir Kapoor, Khanna Publishing House, New Delhi, 2018
2. Managerial Economics: Applications, Strategy and Tactics, McGuigan, Moyer and Harris, Thomson South Western, 10th Ed., 2005
3. Fundamentals of Financial Management, Prasanna Chandra, Tata McGraw Hill, 4th Ed., 2005
4. Economics, Samuelson & Nordhaus, Tata McGraw Hill, New Delhi, 2004
5. Basic Financial Accounting for Management, Paresh Shah, Oxford University Press, New Delhi, 2007
6. Managerial Economics in a Global Economy, Salvatore Dominick, Thomson South Western, 4th Ed., 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

5.5.3 Artificial Intelligence and Machine Learning (TATA)

Theory	L	T	P
	2	-	-

COURSE OBJECTIVES

This course is designed to equip students with essential theoretical and practical skills needed for understanding the requirements, collection of data, preprocessing of data, and 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 the latest technologies in line with industry requirements and build competency in the Machine Learning and Artificial Intelligence field.

COURSE CONTENTS (TABLE OF CONTENTS)

1. Industrial Safety Practices

Fire extinguishers & their types; safely handling tools & equipment; use of proper tools & equipment and their 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, processing and cleaning; types of data sources (structured, unstructured, semi-structured, real-time, open data set, data scraping); data acquisition techniques (APIs, web scraping, surveys and forms, sensor data, database and data warehouse); data integration (combining data from multiple sources, data merging, data aggregation); data pre-processing (data cleaning, outlier detection and removal, duplicate data).

3. Programming concepts for AI and ML

Python basics and 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 neighbours (KNN), use cases of regression and classification; introduction to unsupervised learning – clustering (K-means, hierarchical, DBSCAN), dimensionality reduction, anomaly detection, use cases; building, evaluating and validating a machine learning model; 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 Keras. Generative AI: understanding

of Gen AI, applications of Gen AI, development of a Gen AI model, integration of Gen AI in a 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.

LIST OF PRACTICALS

1. Load a dataset and perform basic preprocessing
2. Split a dataset into training and testing sets
3. Explore Python libraries: Pandas, NumPy, Matplotlib, etc.
4. Build a machine learning model for linear regression analysis to predict outcomes
5. Implement K-means clustering to segment customers 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 an SVM model and evaluate performance (precision, recall, F-score and confusion matrix)
10. Build a neural network using Keras or TensorFlow to classify handwritten digits
11. Implement a convolutional neural network to classify images using a 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 a mobile app for prediction
16. Case studies
17. Mini project

COURSE OUTCOMES

- Understand the fundamentals of Machine Learning and AI and their practical applications.
- Understand basic mathematical concepts used in AI and ML.
- Understand data collection and data pre-processing.
- Understand the basics of AI and Machine Learning.
- Develop Python programming skills for Machine Learning and AI.
- Understand the role of supervised, unsupervised and deep learning in real-world applications.
- Select the appropriate Machine Learning algorithm for specific applications.
- Implement regression analysis for prediction.
- Train a logistic regression model for binary classification.
- Train and evaluate SVM for classification.
- Implement a decision tree machine learning model.
- Implement K-means clustering.
- Build a supervised machine learning model.
- Build an unsupervised machine learning model.
- Build a reinforcement machine learning model.
- Train a convolutional network (CNN) for an image classification task.
- Evaluate a machine learning model.
- Deploy a machine learning model.
- Understand ethical challenges in AI and ML.
- Understand the importance of data protection.
- Understand the social impact of AI.

- Evaluate the responsibility and accountability of AI systems.
- Familiarize with key ethical frameworks and guidelines governing AI deployment.

5.6 SUMMER INTERNSHIP – II (6 Weeks after 4th Semester)

It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. Summer Internship provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares students 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 a guided and supervised Summer Internship of 4 weeks duration to be organized during the semester break starting after the second year, i.e. after the 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 the start of the internship in consultation with the internship providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, and 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 a daily report in their diary to enable them to write a final report and its presentation later. An external assessment of 50 marks has been provided in the study and evaluation scheme of the 5th semester. Evaluation of the professional Summer Internship report through viva-voce/presentation aims at assessing the student's understanding of materials, industrial processes and practices in the industry/field organization, and their ability to engage in activities related to problem solving in an industrial setup, as well as understanding the application of knowledge and skills learnt in real-life situations.

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

Component	Weightage
Punctuality and regularity	15%
Initiative in learning new things	15%
Presentation and Viva	15%
Industrial training report	55%

5.7 INDIAN CONSTITUTION (Audit Course)

L-T-P: 2-0-0

Unit 1 – The Constitution - Introduction

The history of the making of the Indian Constitution; preamble and the basic structure, and its interpretation; fundamental rights and duties and their interpretation; state policy principles.

Unit 2 – Union Government

Structure of the Indian Union; President – role and power; Prime Minister and Council of Ministers; Lok Sabha and Rajya Sabha.

Unit 3 – State Government

Governor – role and power; Chief Minister and Council of Ministers; State Secretariat.

Unit 4 – Local Administration

District administration; Municipal Corporation; Zila Panchayat.

Unit 5 – Election Commission

Role and functioning; Chief Election Commissioner; State Election Commission.

SUGGESTED LEARNING RESOURCES

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

Suggested Software/Learning Websites:

<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 Fundamentals of Artificial Intelligence

Theory	L	T	P
	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 and judge the applicability of more advanced techniques; and participate in the design of systems that act intelligently and learn from experience.

COURSE CONTENT

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

6.1.2 Data Science and Machine Learning

Theory	L	T	P
	4	-	-

COURSE OBJECTIVES

This course introduces the concepts of data warehousing and data mining, giving a complete description of the principles, uses, architectures, applications, design and implementation of data mining and data warehousing concepts.

COURSE CONTENT

UNIT 1: Introduction to 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 techniques – mean removal, scaling, normalization, binarization, one-hot encoding, label encoding; data analysis – 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 (kNN), SVM; 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. Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber, Jian Pei, Elsevier
2. Data Mining Introductory and Advanced Topics, Margaret H Dunham, Pearson Education
3. Data Warehousing, Amitesh Sinha, Thomson Learning, India

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4. The Top Ten Algorithms in Data Mining, Xingdong Wu, Vipin Kumar, CRC Press, UK

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1	10	22
2	6	16
3	10	22
4	8	20
5	8	20
Total	42	100

6.2 Entrepreneurship and Start-ups

Humanities	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 fundamental to all innovation and development.

COURSE OUTCOMES

- CO 1: Understand the basics of Entrepreneurship and Business Structures
- CO 2: Planning and implementation of business ideas
- CO 3: Understanding strategic market analysis
- CO 4: Manage organizational roles
- CO 5: Understanding various financial schemes

COURSE CONTENT

Unit 1 – Introduction to Entrepreneurship and Start-Ups (2 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 (6 Periods)

Discovering ideas and visualizing the business; activity map; business plan (case study).

Unit 3 – Ideas to Start-up (6 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 (4 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 (6 Periods)

Financing methods available for entrepreneurship/start-ups in India (government schemes, 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 (4 Periods)

Ways of succession; types of dissolution.

SUGGESTED LEARNING RESOURCES

1. The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company, Steve Blank and Bob Dorf, K & S Ranch
2. Entrepreneurship Development (A New Venture Creation), Vasant Desai, Himalaya Publication
3. Entrepreneurship Development, Khanka S.S., S Chand & Company Limited, New Delhi
4. Entrepreneurship Development, Gupta and Srinivasan, 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

6. The Lean Startup, Eric Ries, Penguin UK
7. The Innovator's Dilemma, Clayton M. Christensen, Harvard Business

SUGGESTED DISTRIBUTION OF MARKS

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

6.3 IN HOUSE PROJECT

In-House Project Work aims at developing innovative skills in students, whereby they apply in totality the knowledge and skills gained through the course work in the solution of a particular problem or by undertaking a project. Individual students have different aptitudes and strengths, so project work should match the strengths of students. 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 hold a brainstorming session to identify suitable project assignments for their students. The project assignment can be an individual assignment or a group assignment; there should not be more than 3 students if the project work is given to a group. Students should identify or accept the given project assignment at least two to three months in advance. 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

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

6.4 OPEN ELECTIVE – 3

6.4.1 Disaster Management

Theory	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 CONTENT

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, thunderstorms, 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); 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, 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; 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); disaster communication system (early warning and 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. An overview on natural & man-made disasters and their reduction, R. K. Bhandari, CSIR, New Delhi
3. Management of Natural Disasters in Developing Countries, H. N. Srivastava and G. D. Gupta, Daya Publishers, Delhi
4. Natural Disasters, David Alexander, Kluwer Academic, London
5. Disaster Management, G. K. Ghosh, A P H Publishing Corporation
6. Disaster Management: Text & Case Studies, D. B. N. Murthy, Deep & Deep Pvt. Ltd.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1	6	17
2	10	22
3	10	22
4	10	22
5	6	17
Total	42	100

OR

6.4.2 Renewable Energy Technologies

Theory	L	T	P
	2	-	-

COURSE CONTENT

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; measurement of solar radiation; flat plate and concentrating collectors; solar direct thermal applications; solar thermal power generation; fundamentals of solar photovoltaic 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. Energy Technology, O.P. Gupta, 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. Fundamentals 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 et al., Tata McGraw Hill
7. Energy and The Environment, RA Ristinen and JJ Kraushaar, 2nd Ed., John Wiley & Sons, New York, 2006
8. Renewable Energy Resources, JW Twidell and AD Weir, ELBS, 2006

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 evaluation. The marks may be distributed as follows:

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

10 Marks for attendance (by HODs in consultation with all the teachers of the department), as per the following:

Attendance	Marks
75 - 80%	06 Marks
80 - 85%	08 Marks
Above 85%	10 Marks

25 Marks (maximum) for Sports/NCC/Cultural/Co-curricular/NSS activities (by In-charge Sports/NCC/Cultural/Co-curricular/NSS), as per the following:

Level of Participation	Marks
State/National level participation	25
Participation in two of the above activities	20
Inter-Polytechnic level participation	15

RESOURCE REQUIREMENT

A: Laboratory

1. Computer Center

S. No.	Description	Qty	Total Price
1.	Computer Desktop (i7, 8th Generation, 1TB Hard disk/500 GB SSD, 8GB RAM, pre-loaded Windows 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	1,00,000/-
4.	Component Storage Rack	05	1,00,000/-
5.	Online UPS, 6KVA	2	2,00,000/-
6.	Printer	1	25,000/-
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 – The Sleuth Kit, Autopsy, NetworkMiner, Wireshark, Volatility, John 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 – LibreOffice/OpenOffice (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/-

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S. No.	Description	Qty	Total Price
15.	Web camera, mike and speakers	01	20,000/-
16.	Air Conditioner, 2 ton	02	1,40,000/-
17.	Antivirus software (5 user)	-	10,000/-
18.	Internet connectivity	60 Nodes	3,00,000/-

2. Programming Lab

S. No.	Description	Qty	Total Price
1.	Computer Desktop (i7, 8th Generation, 1TB Hard disk/500 GB SSD, 8GB RAM, pre-loaded Windows 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	1,00,000/-
4.	Component Storage Rack	05	1,00,000/-
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	25,000/-
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 – The Sleuth Kit, Autopsy, NetworkMiner, Wireshark, Volatility, John the Ripper, Disk Drill, CrypTool, OpenPuff, MailTracker, etc.	LS	-
14.	Android Studio or other FOSS like Xamarin	LS	-
15.	MS Office (latest) or equivalent FOSS – LibreOffice/OpenOffice (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 (5 user)	-	10,000/-
21.	Internet connectivity	60 Nodes	3,00,000/-