GOVERNMENT OF TAMIL NADU

DEPARTMENT OF TECHNICAL EDUCATION

Diploma in Engineering and Technology

Computer Engineering and Internet of Things

Regular Curriculum

1058 - Diploma in Computer Engineering and Internet of Things

Program Outcomes (PO's)

POs are statements that describe what students are expected to know and be able to do upon graduating from the program. These relate to the skills, knowledge, analytical ability, attitude, and behavior that students acquire through the program.

The POs essentially indicate what the students can do from subject-wise software knowledge acquired by them during the program. As such, POs define the professional profile of an engineering diploma graduate.

NBA has defined the following seven POs for an Engineering diploma graduate:

PO1: Basic and Discipline-specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and an engineering specialization to solve the engineering problems.

PO2: Problem analysis: Identify and analyze well-defined engineering problems using codified standard methods.

PO3: Design/ development of solutions: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

PO4: Engineering Tools, Experimentation, and Testing: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

PO5: Engineering practices for society, sustainability and environment: Apply appropriate technology in the context of society, sustainability, environment and ethical practices.

PO6: Project Management: Use engineering management principles individually, as a team member or as a leader to manage projects and effectively communicate about well-defined engineering activities.

PO7: Life-long learning: Ability to analyze individual needs and engage in updating in the context of technological changes.

Credit Distribution

Semester	No of Courses	Periods	Credits
Semester I	9	640	20
Semester II	9	625	20
Semester III	8	640	20
Semester IV	7	640	22
Semester V	8	610	20
Semester VI	3	645	18
		Total Credits	120

SEMESTER III

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	1058233110	Fundamentals of IOT	3-0-0	45	3	Theory
2	Program Core	Practicum	1058233230	Basics of Digital Electronics	3-0-2	75	4	Theory
3	Program Core	Practical	1058233320	E-Publishing Practical	0-0-4	60	2	Practical
4	Program Core	Practicum	1052233440	C Programming	1-0-4	75	3	Practical
5	Program Core	Practicum	1052233540	Web Designing	1-0-4	75	3	Practical
6	Program Core	Practicum	1052233640	Operating System	1-0-2	45	2	Practical
7	Open Elective	Advanced Skill Certification	1058233760	Advanced Skills Certification – 3	1-0-3	60	2	NA
8	Humanities & SocialScience	Integrated Learning Experience	1058233880	Growth Lab	0-0-2	30	1	NA
9	Audit Course	Integrated Learning Experience	1058233881	Induction Program II	-	16	0	-
10	Audit Course	Integrated Learning Experience	1058233882	I&E/ Club Activity/ Community Initiatives	-	15	0	-
11	Audit Course	Integrated Learning Experience	1058233883	Shop floor Immersion	-	8	0	-
12	Audit Course	Integrated Learning Experience	1058233884	Student-Led Initiative	-	23	0	-
13	Audit Course	Integrated Learning Experience	1058233885	Emerging Technology Seminars	-	8	0	-
14	Audit Course	Integrated Learning Experience	1058233886	Health & Wellness	-	30	0	-
					Test & Revisions	**60**		
					Library	**15**		
					Total Periods	**640**	**20**	

SEMESTER IV

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	1058234110	Microprocessors & Microcontrollers	3-0-0	45	3	Theory
2	Program Core	Practicum	1058234230	IOT Sensors and Devices	3-0-2	75	4	Theory
3	Program Core	Practicum	1058234340	Data Structures using C	2-0-3	75	4	Practical
4	Program Core	Practicum	1058234440	Object Oriented Programming in Java	1-0-4	75	3	Practical
5	Program Core	Practicum	1058234540	Database Management System	1-0-4	75	3	Practical
6	Program Core	Project/Internship	1058234652	Mini Project using IOT	0-0-6	90	3	Practical
7	Open Elective	Advanced Skill Certification	1058234760	Advanced Skills Certification – 4	1-0-3	60	2	NA
8	Audit Course	Integrated Learning Experience	1058234882	I&E/ Club Activity/ Community Initiatives		15	0	
9	Audit Course	Integrated Learning Experience	1058234883	Shop floor Immersion	-	08	0	-
10	Audit Course	Integrated Learning Experience	1058234884	Student-Led Initiative	-	16	0	-
11	Audit Course	Integrated Learning Experience	1058234885	Emerging Technology Seminars	-	08	0	-
12	Audit Course	Integrated Learning Experience	1058234886	Health & Wellness	-	15	0	-
13	Audit Course	Integrated Learning Experience	1058234887	Special Interest Groups (Placement Training)	-	08	0	-
					Test & Revisions	60		
					Library	15		
					Total Periods	**640**	**22**	

SEMESTER V

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	1058235110	Advanced Internet of Things and Application	3-0-0	45	3	Theory
2	Program Elective	Theory		**Elective – 1**	3-0-0	45	3	Theory
3	Program Core	Practical	1058235320	Internet of Things Practical	0-0-4	60	2	Practical
4	Program Core	Practicum	1058235440	Computer Networks and Cloud Computing	1-0-4	75	3	Practical
5	Program Elective	Practicum		**Elective – 2**	1-0-4	75	3	Practical
6	Humanities & SocialScience	Practicum	1052235654	Innovation & Start-ups	1-0-2	45	2	Project
7	Project / Internship	Project/ Internship	1052235773	Industrial Training [Summer vacation – 90 Hrs]	-	-	2	Project
8	Open Elective	Advanced Skill Certification	1058235860	Advanced Skills Certification – 5	1-0-3	60	2	NA
9	Audit Course	Integrated Learning Experience	1058234882	I&E/ Club Activity/ Community Initiatives		15	0	
10	Audit Course	Integrated Learning Experience	1058234883	Shop floor Immersion	-	8	0	-
11	Audit Course	Integrated Learning Experience	1058234884	Student-Led Initiative	-	24	0	-
12	Audit Course	Integrated Learning Experience	1058234885	Emerging Technology Seminars	-	8	0	-
13	Audit Course	Integrated Learning Experience	1058234886	Health & Wellness	-	30	0	-
14	Audit Course	Integrated Learning Experience	1058234887	Special Interest Groups	-	30	0	-
				Test & Revisions		**75**		
				Library		**15**		
				Total Periods		**610**	**20**	

Elective 1

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Elective	Theory	1058235211	Embedded Systems	3-0-0	45	3	Theory
2	Program Elective	Theory	1052235212	Data Warehousing and Data Mining	3-0-0	45	3	Theory
3	Program Elective	Theory	1058235213	RFID and Wireless Networks	3-0-0	45	3	Theory
4	Program Elective	Theory	1058235214	Storage Technologies	3-0-0	45	3	Theory
5	Program Elective	Theory	1046234110	Software Engineering	3-0-0	45	3	Theory

Elective 2

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Elective	Practicum	1058235541	Python Programming	1-0-4	75	3	Practical
2	Program Elective	Practicum	1058235542	Computer Privacy and Security	1-0-4	75	3	Practical
3	Program Elective	Practicum	1058235543	Basics of Machine Learning Techniques	1-0-4	75	3	Practical
4	Program Elective	Practicum	1058235544	Object Oriented System Design	1-0-4	75	3	Practical
5	Program Elective	Practicum	1046236242	Software Testing	1-0-4	75	3	Practical

SEMESTER VI

#	Course Category	Course Type	Course Title	L-T-P	Period	Credit	End Exam
1	Open Elective	Theory	Elective-3 (Pathway)	3-0-0	45	3	Theory
2	Open Elective	Practicum	Elective-4 (Specialization)	2-0-2	60	3	Theory
3	Project / Internship	Project / Internship	In-house Project / Internship / Fellowship	-	540	12	Project
			Total Periods		**645**	**18**	

Elective 3 (Pathway)

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Elective | Higher Education	Theory	6000236111	Advanced Engineering Mathematics	3-0-0	45	3	Theory
2	Elective | Entrepreneurship	Theory	6000236112	Entrepreneurship	3-0-0	45	3	Theory
3	Elective | Technocrats	Theory	6000236113	Project Management	3-0-0	45	3	Theory
4	Elective | Technocrats	Theory	6000236114	Finance Fundamentals	3-0-0	45	3	Theory
5	Elective | Technologists	Theory	1052236115	5G Technology	3-0-0	45	3	Theory
6	Elective | Technologists	Theory	1052236116	DevOps	3-0-0	45	3	Theory

Elective 4 (Specialization)

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Elective	Practicum	1058236231	Foundation of Data Science	2-0-2	60	3	Theory
2	Elective	Practicum	1058236232	Artificial intelligence	2-0-2	60	3	Theory
3	Elective	Practicum	1058236233	Virtual Reality and Augmented Reality	2-0-2	60	3	Theory
4	Elective	Practicum	1058236234	Open Source Technologies	2-0-2	60	3	Theory
5	Elective	Practicum	1058236235	Mobile Application Development for IoT	2-0-2	60	3	Theory

Project / Internship:

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Project / Internship	Project / Internship	1052236351	Internship	-	540	12	Project
2	Project / Internship	Project / Internship	1052236353	Fellowship	-	540	12	Project
3	Project / Internship	Project / Internship	1052236374	In-house Project	-	540	12	Project

DIPLOMA IN COMPUTER ENGINEERING AND IOT

II YEAR

SEMESTER III

1058233110	FUNDAMENTALS OF IOT	L	T	P	C
Theory		3	0	0	3

Introduction:

The Internet is evolving to connect people to physical things and also physical things to other physical things all in real time and termed as Internet of Things (IoT). The course enables student to understand the basics of Internet of things and protocols. It introduces some of the application areas where Internet of Things can be applied. Students will also learn about the middleware for Internet of Things to understand the concepts of Web of Things.

Course Objectives:

- Understand the fundamental principles in IOT
- Provide the skills needed for building IOT building blocks for various situations that one may encounter in a career in Computer field.
- Gain knowledge of the underlying IOT architecture, the limitations and efficiency of various design techniques of IOT implementation.
- Get exposed to Python and Ardinuo programming.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Demonstrate basic concepts, principles and challenges in IoT

CO2: Illustrate functioning of hardware devices and sensors used for IoT

CO3: Apply IoT for developing real life applications using Ardunio programming

CO4: Analyze network communication aspects and protocols used in IoT

CO5: Develop IoT infrastructure for popular applications

Pre-requisites:

Knowledge of basic Computers and Networking

CO/PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	-	-	-	-	1
CO2	3	3	3	3	1	1	1
CO3	3	3	3	3	2	2	1
CO4	2	2	2	2	1	-	1
CO5	2	2	2	2	2	2	2

Legend:3-HighCorrelation, 2-MediumCorrelation, 1-LowCorrelation

Instructional Strategy:

1. Lecturer based Teaching.
2. Massive open online courses (MOOCs) may be used to teach various topics/subtopics.
3. Guide student(s) in undertaking micro-projects.
4. Different types of teaching methods such as flipped classroom, tutorials, peer-peer learning may be employed by teachers to develop the outcomes.
5. About 10-15% of the topics/sub-topics which is relatively simpler or descriptive in nature is to be given to the students for self-learning, but to be assessed using different assessment methods.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of one will be considered for the internal assessment of 15 Marks.

CA1and CA2 Assessment test should be conducted for two units as below.

PART A: (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write five questions. Each unit four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1058233110	FUNDAMENTALS OF IOT	L	T	P	C
Theory		3	0	0	3

Unit I	IOT – INTRODUCTION	
IoT Definition- IoT Characteristics-IoT Applications - Key Components of IoT System- Things/Device, Gateway, Cloud/Server, Analytics, User Interface. Architecture of IoT -Sensing Layer, Network Interface Layer, Data Processing Layer, Application Layer. IoT Challenges - Design Challenges - Connectivity, Power Requirements, Complexity, Storage and Computational Capability, Data Extraction from complex environment- Security Challenges.		9
Unit II	**SENSORS AND ACTUATORS**	
Various IOT Sensors, actuators and technologies - Temperature sensors, Moisture sensors, Light sensors, Acoustic and noise sensors, Water level sensors, Proximity sensors, motion sensors, Gyroscope, Chemical sensors, Image sensors, Light actuators, motors, relays, solenoids etc., - Data sheet reading of sensors.		9
Unit III	**PROGRAMMING WITH ARDUINO UNO**	
ARDUINO UNO board Block diagram - Sketch Structure - Data types & Built in Constants - Operators: Arithmetic, Bitwise, Compound, Comparison, and Boolean, Control statements and Loops. Functions and library functions - User defined functions - Library functions - I/O Functions-digitalRead, digitalWrite, pinMode, analogRead, analogWrite, analogReference - Char functions: isAlpha, isAlphaNumeric,isDigit, isHexadecimalDigit, isSpace, isWhitespace, isUpperCase, isLowerCase - Math Functions: abs, constrain, max, min, pow, sqrt - LED Blinking using Arduino - Serial Communication Functions: Serial, available, begin, end, print, println, write, read, readBytes, readString.		10
Unit IV	**IOT PROTOCOLS**	
Messaging Protocols – MQTT, CoAP, XMPP- Transport Protocols - Introduction of BLE - Introduction to Li-Fi - Basics of Sensor Network Topologies - Point to Point Topology, Mesh topology, Ring topology, Star Topology.		9
Unit V	**CASE STUDIES / INDUSTRIAL APPLICATIONS**	
Case studies with architectural analysis: IoT applications – Smart City – Smart Water – Smart Agriculture – Smart Energy – Smart Healthcare – Smart Transportation – Smart Retail – Smart waste management.		8
TOTAL HOURS		**45**

Suggested List of Students Activity:

1. Students can undertake micro-projects in teams.
2. Give seminar on any relevant topics.
3. Visit any Industry with IoT in your area and learn the IoT systems used in Industry.
4. Students are encouraged to register themselves in various MOOCs such as: Swayam, edx, Coursera, Udemy etc to further enhance their learning.
5. Undertake Swayam MOOC online course: "Introduction to Internet of Things": https://onlinecourses.nptel.ac.in/noc24_cs35/preview

Text and Reference Books:

1. Rajkamal, Internet of Things: Architecture and Design Principles, 2 nd Edition, McGraw Hill
Education, 2017.
2. David Hanes, Gonzalo salgueiro, IoT Fundamentals Networking Technologies, Protocols and UseCases for Internet of Things, Cisco Press, 2017.
3. Adrian McEwen, Hakim Cassimally, Designing the Internet of Things, John Wiley and Sons, Ltd.
2014.

Web-based/Online Resources:

- Swayam MOOC online course for the introduction to internet of Things: https://onlinecourses.nptel.ac.in/noc24_cs35/preview
- Arduino tutorial: https://www.arduino.cc/reference/en/
- Online Simulator for Arduino: https://www.tinkercad.com/dashboard

1058233230	BASICS OF DIGITAL ELECTRONICS	L	T	P	C
Practicum		3	0	2	4

Introduction:

The digital electronics is to process and transmit information in the form of digital signals, typically using binary logic (0s and 1s). This field focuses on designing, building, and analyzing digital circuits and systems that can perform tasks such as arithmetic operations, data storage, and logical operations. Digital electronics is fundamental to modern computing, telecommunications, and many other fields where digital data processing is required.

Course Objectives:

- To understand common forms of number representation, logic gates, and Boolean algebra in digital electronic circuits.
- To Learn the basic logic gates (AND, OR, NOT) and their truth tables, as well as more complex gates (NAND, NOR, XOR, XNOR).
- To use Karnaugh maps to simplify Boolean functions and minimize the number of logic gates required for implementation.
- To implement adders and subtractors using logic gates.
- To analyze basic sequential circuits using flip-flops, gates, and other components.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Perform conversion of given number between various types of number.

CO2: Apply Boolean algebra for circuit optimization.

CO3: Optimize given Boolean expression with K-map.

CO4: Elaborate various types of Combinational circuits.

CO5: Recognize Flip-flops as Sequential circuits.

Pre-requisites:

1. A basic understanding of algebra, including Boolean algebra, is essential for understanding digital electronics concepts.
2. Understanding the basic principles of logic gates and their truth tables is helpful for learning about digital circuits.
3. Basic computer skills are often necessary, as digital electronics often involves using software tools for circuit simulation and design.

CO/PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	-	-	-
CO2	3	-	2	-	-	-	-
CO3	3	3	2	-	-	-	-
CO4	2	3	2	2	-	2	-
CO5	1	3	3	2	-	2	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

1. Lecturer based Teaching.
2. Hands on Lab activities.
3. Group projects.
4. Real world examples.

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written Test Theory (Any Two Units)	Written Test Theory (Another Two Units)	Practical Test (All Exercises)	Written Test (Complete Theory Portions)	Written Examination (Complete Theory Portions)
Duration	2	2	3	3 Hours	3 Hours
Exam Marks	50	50	100	100	100
Converted to	10	10	15	15	60
Marks	10		15	15	60
Tentative Schedule	6th Week	12th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** Assessment written test should be conducted for 50 Marks. The marks scored will be converted to 10 Marks for each test. Best of one will be considered for the internal assessment of 10 Marks.

  CA1 and CA2, Assessment written test should be conducted for two units as below.

  PART A: (5 X 10 Marks = 50 Marks).

  Eight questions will be asked, students should write Five questions.

  Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded will be converted to 15 Marks for the internal mark.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. Each exercise/experiment should be evaluated for 10 Marks. The total marks awarded should be converted to 30 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement

of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification

SCHEME OF EVALUATION - Practical Test

Sl.No.	Description	Marks
A	Aim (05) ,Program (30)	35
B	Execution	20
C	Output	10
D	Practical document (All Practicals)	30
E	Viva Voce	05
Total		100

- **CA4:** Model examination should be conducted for complete theory portions as per the end semester question pattern. The marks awarded should be converted to 15 marks for the internal assessment.

  Question Pattern: Model Examination and End Semester Examination- Theory Exam

  Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

  Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1058233230	BASICS OF DIGITAL ELECTRONICS	L	T	P	C
Practicum		3	0	2	4

Unit I	BINARY SYSTEMS	
Theory:		
1.1 Introduction of Digital System Define analog -digital signal- distinction between analog and digital signal- applications and advantages of digital signals.		2
1.2 Number System Binary numbers - Base Conversion –Binary- octal and hexadecimal number system- conversion from decimal and hexadecimal to binary and vice-versa- Binary addition- subtraction- multiplication - division - Sign magnitude method of representation- 1's and 2's complement -method of addition/subtraction, floating point representation.		4
1.3 Codes and Parity Concept of code- Binary Codes -Weighted Codes -Non weighed codes -Gray Code -Excess-3 Code - Concept of parity, single - double parity - error detection and correction(Hamming Code)		4
Practical: Ex.no.1 Convert Number system to another (Binary, Decimal, Octal, Hexadecimal) Ex.no.2 Calculate 1's and 2's Complements.		8
Unit II	**BINARY LOGIC AND BOOLEAN ALGEBRA**	
Theory:		
2.1 Logic Gates and Families Concept of negative- positive logic- Definition- symbols - truth tables of gates-Construction of NOT-AND -OR - EX-OR, NOR, NAND, EX-NOR gates - Universal Gates -NAND Gate -NOR Gate		7
2.2 Logic Simplification Postulates - Laws - Boolean algebra - De-Morgan's Theorems- Boolean functions- Formulation of truth table and Boolean equation for simple problem- Implementation of Boolean (logic) equation with gates		4

Practical: Ex.No.3 Implement the basic logic gates. Ex.No.4 Implement the NAND gate as a universal building block. Ex.No.5 Implement the NOR gate as a universal building block.	 2 2 2
Unit III	**BOOLEAN FUNCTION IMPLEMENTATION**
Theory: **3.1 Boolean Simplification** Need for simplification - Simplification by Karnaugh map(K-map) method -2 – Variable K – map -3 – Variable K – map -4 – variable K – map -K – Map using Don't care condition - NAND Implementation - NOR Implementation	8
Practical: Ex.No.6 Simplify and design Boolean expression using basic logic gates Ex.No.7 Simplify and design Boolean expression using Universal gates	4
Unit IV	**BASIC COMBINATIONAL CIRCUITS**
Theory: **4.1 Arithmetic circuits** Introduction to combinational circuits -Arithmetic and Logical Combinational Circuits -Half adder and Full adder circuit, design and implementation- Half and Full Subtractor circuit, design and implementation- 4 bit adder/Subtractor- Adder and Subtractor IC (7484)- 2-bit comparator **4.2 Decoders, Multiplexers and De-Multiplexers** Basic functions and block diagram of Encoders and decoders- Basic functions and block diagram of multiplexers and De-Multiplexers-Different types and ICs.- Four bit decoder circuits for 7 segment display and decoder/driver ICs.	6 5
Practical: Ex.No.8 Design and implement Half Adder and full adder circuit. Ex.No.9 Design and implement Half Subtractor and full Subtractor circuit. Ex.No.10 Realize Multiplexer and Demultipxer circuit. Ex.No.11 Realize Decoder and Encoder circuit.	8
Unit V	**BASIC SEQUENTIAL CIRCUITS**

Theory: **5.1 Latches and flip flops** Introduction to sequential circuits- Concept and types of latch with their working and applications - Flip-flops -SR Flip flop -JK Flip flop -D Flip flop -T Flip flop- Master/Slave- Difference between a latch and a flip flop.	4
5.2 Shift Register Introduction and basic concepts including shift left and shift right- Serial in parallel out- serial in serial out- parallel in serial out- parallel in-parallel out- Universal shift register- Buffer register- Tristate Buffer register.	3
Practical: Ex.No.12 Implement various types of flip-flops	2
TOTAL HOURS	**75**

Suggested List of Students Activity:

1. **Binary Number Conversion**
    a. Practice converting decimal numbers to binary and vice versa to reinforce understanding of the binary number system.
2. **Logic gate truth table construction**
    a. to create truth tables for different logic gates (AND, OR, NOT, etc.) to understand their behaviour.
3. **Logic circuit design**
    a. design simple logic circuits using logic gates to perform basic functions (e.g., adder, comparator, multiplexer).
4. **Karnaugh map simplification**
    a. Assign problems where students simplify Boolean expressions using Karnaugh maps to reinforce simplification techniques.
5. **Flip flop operation**
    a. Demonstrate the operation of flip-flops (e.g., SR, D, JK) and have students analyze and design circuits using flip-flops.
6. **Counter design**
    a. Assign a project where students design and build a counter circuit using flip-flops to count in binary or other counting sequences.
7. **Digital system simulation**
    a. Use simulation software to simulate and analyze digital circuits designed by

students, allowing them to see the behaviour of the circuits.

8. Error detection and correction
    a. Introduce error detection and correction codes (e.g., parity, Hamming codes) and have students implement them in digital circuits.
9. Project based learning
    a. Assign a project where students design and build a digital system to solve a specific problem or perform a certain function.
10. Lab exercises
    a. Conduct hands-on lab exercises where students build and test basic digital circuits using breadboards and electronic components.

Text and Reference Books:

1. Mano M Morris, Digital logic and Computer Design, Pearson publication latest Edition, 2017
2. Charles H. Roth , Fundamentals of Logic Design, Cengage LEanring, 5th, Edition, 2004.
3. Thomas L. Floyd ,Digital Fundamentals – A Systems Approach , Pearson, 2013.

Web-based/Online Resources:

1. www.williamson-labs.com
2. www.nptel.iitm.ac.in
3. www.khanacademy
4. www.vlab.co.in
5. www.asic-world.com/digital/tutorial.html

Equipment / Facilities required conducting the Practical Course. (Batch Strength: 30 Students)

1. Logic gates Digital Electronics Trainer kit.
2. Variable DC power supply 0- 30V, 2A, SC protection, display for voltage and current.
3. Digital Multimeter: 3 1/2 digit display, 9999 counts digital multimeter measures: Vac, Vdc (1000V max) , Adc, Aac (10 amp max) , Resistance (0 - 100 M∧) , Capacitance and temperature measurement.
4. Electronic Work Bench: Bread Board 840 -1000 contact points: Positive and Negative power rails on opposite side of the board , 0-30 V , 2 Amp Variable DC power supply, Function Generator 0-2MHz, CRO 0-30MHz, Digital Multimeter.

1058233320	E PUBLISHING PRACTICAL	L	T	P	C
Practical		0	0	4	2

Introduction:

E-Publishing is the creation of electronic forms of information such as documents, presentations, brochures, books, or even website content using computer programs. It has evolved to be an important component of creating and disseminating information as it allows an amalgamation of various tasks that are generally performed independently at printing presses such as layouts, typesetting, graphic design, etc

Course Objectives:

- Learn all tools and options in e-publishing software
- Learn page setup, placing objects in the pages and creating logos.
- Create designs using layers, tools, text effects and filters with open source software.
- Learn to use character styles, paragraph styles, text effects and text frame open source software

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Understand how to handle text with different styles

CO2: Understand the use of variety of line properties

CO3: Use various open source softwares tools for e-publishing

CO4: Design a poster, magazine and newspaper

CO5: Critically engage with different case studies of e-publishing

Pre-requisites:

Working knowledge of computer with any one operating system

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	1	3	1	1	2
CO2	1	1	1	3	1	1	2
CO3	1	1	1	3	1	1	2
CO4	1	1	1	3	1	1	2
CO5	1	1	1	3	1	1	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

Demonstration of text tools and graphics tools

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Practical Document	Practical Test	Practical Examination
Portion	Part A Exercises	Part B Exercises	All Exercises	All Exercises	All Exercises
Duration	2 Periods	2 Periods	Regularly	3 Hours	3 Hours
Exam Marks	50	50	Each Practical 10 Marks	100	100
Converted to	10	10	10	20	60
Marks	10		10	20	60
Internal Marks	40				60
Tentative Schedule	7th Week	14th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments as per the portions mentioned above should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded will be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim & Program/Procedure	35
2	Execution and Result	15
TOTAL		50

- **CA 3:** Practical document should be maintained for every exercise / experiment immediately after completion of the practice. The same should be evaluated for 10 Marks. The total marks awarded should be converted to 10 Marks for the internal

assessment. The practical document should be submitted for the Practical Test and End Semester Examination with a bonafide certificate.

The details of the documents to be prepared as per the instruction below.

The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

PART	DESCRIPTION	MARKS
1	Aim (05), Program/Procedure from Part-A (30)	35
2	Aim (05), Program/Procedure from Part-B (30)	35
3	Execution of any one experiment from Part-A **OR** Part-B	25
4	Viva voce	05
	TOTAL	100

1058233320	E PUBLISHING PRACTICAL	L	T	P	C
Practical		0	0	4	2

Practical Exercises	
PART A	
1. Design a visiting card	
2. Design a letterhead	
3. Design a logo	30
4. Design an invitation	
5. Design a poster	
6. Design a brochure	
PART B	
7. Design a menu card	
8. Design a calendar	
9. Design a greeting card	
10. Design a ebook cover page	30
11. Change the background of an image	
12. Mixing of images	
TOTAL HOURS	60

Suggested List of Students Activity:

Practice the exercises

Text and Reference Books:

1. Balakirev D. , Learn Gimp_ Introduction To Photo Editing, 2015
2. Daniel James -,Crafting Digital Media_ Audacity, Blender, Drupal, GIMP, Scribus, and other Open Source Tools, APress, 2009

Web-based/Online Resources:

1. https://www.gimp.org/
2. https://www.scribus.net

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

Hardware Requirements:

- Desktop Computers ….. 30 Nos
- Laser printer ….. 1 No
- Scanner ….. 1 No

Software Requirements:

Any Open Source Software

- GIMP
- Scribus
- Inkscape
- Krita
- Pinta
- Shotwell or any equivalent open source software. [or]
- Corel draw, Photoshop, Adobe indesign.(optional)

[Open source software usage is recommended than proprietary for doing lab exercises]

BOARD PRACTICAL EXAMINATION

PART A

1. Design a visiting card
2. Design a letterhead
3. Design a logo
4. Design an invitation
5. Design a poster
6. Design a brochure

PART B

7. Design a menu card
8. Design a calendar
9. Design a greeting card
10. Design a ebook cover page
11. Change the background of an image
12. Mixing of images

SCHEME OF VALUATION

Section	Description	Marks
1	Aim (05) ,Program for the experiment from Part – A (30)	35
2	Aim (05) ,Program for the experiment from Part – B (30)	35
3	Executing any one program (Part A **OR** Part –B)	25
4	Viva Voce	5
TOTAL MARKS		100

1052233440	C PROGRAMMING	L	T	P	C
Practicum		1	0	4	3

Introduction

In this course, students will learn the C programming language and its fundamental concepts. Also, they gain the knowledge to write simple C programs and undertake future courses that assume some background in computer programming. This course introduces programming principles using the C language. Students will learn C tokens, variables, data types, control structures, functions, arrays, pointers, structures and file concepts. Through hands-on students will develop proficiency in writing structured and efficient C programs to solve a variety of computational problems.

Course Objectives

The objectives of this course are enabling the students

- To learn problem solving skills.
- To gain knowledge of arrays and strings.
- To understand the concept of functions and their role in modular programming.
- To comprehend the basics of structures and its importance in application development.
- To recognize the importance of files and its related operations.

Course Outcomes

At the end of the course, students will be able

CO1: Demonstrate knowledge on C Programming concepts.

CO2: Develop simple programs in C using basic constructs.

CO3: Design modular C programs with reusable functions to improve code readability and maintainability.

CO4: Develop applications using structures and unions.

CO5: Apply programming skills to solve numerical problems and real-time problems.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	1	1	1
CO2	3	3	3	3	1	2	2
CO3	3	3	3	3	1	2	1
CO4	3	3	3	3	1	2	2
CO5	3	3	3	3	1	1	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable, real-life examples and engineering applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice-activity strategy throughout the course to ensure outcome-driven learning and employability.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 hours
Exam Marks	60	60	100	100	100
Converted to Marks	10	10	15	15	60
Marks	10		15	15	60
Internal Marks	40				
Tentative Schedule	7th Week	14th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

- **CA 3:** Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			100 Marks

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

S. NO	ALLOCATION	MARKS
1	Aim (05) ,Program from Part – A (30)	35
2	Aim (05) ,Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

1052233440	C PROGRAMMING	L	T	P	C
Practicum		1	0	4	3

Unit I	INTRODUCTION TO C	
Overview of C: Basic Structure of C program, Compiling and Executing a C program. C Basics: Constants, Variable, Operators and Datatypes -Character Set - C Tokens -Keywords and Identifiers – Declaration and Use of Variables – Managing Input and Output Operations: Formatted and Unformatted Input and Output statements.		3
Ex No 1: Write a C program to calculate the simple interest and compound interest. **Ex No 2**: Write a C program to find the area of a circle and a rectangle (use preprocessing directives for defining pi value).		12
Unit II	**CONTROL STRUCTURES AND LOOPING**	
Decision Making and Branching: Simple if Statement - if-else Statement – Nested if-else Statements - else if ladder – Switch case statement. Looping: While Statement – do..while statement – for loop statement-break and continue statement- goto statement.		3
Ex No 3: Write a C program to find the largest of three numbers. **Ex No 4:** Write a C program to generate all prime numbers from 1 to N.		12
Unit III	**ARRAYS AND FUNCTIONS**	
Arrays: One-dimensional Arrays- Declaration of One-dimensional Arrays - Initialization of One-dimensional Arrays-Two-dimensional Arrays- Declaration of Two-dimensional Arrays - Initialization and accessing Two-dimensional Arrays. User-Defined Functions: Need for Functions -Elements of User Defined Functions –Functions Types – Call by Value-Call by Reference-Passing Arrays to Functions-Recursion		3
Ex No 5: Write a C program to demonstrate matrix addition and transpose operations. **Ex No 6:** Write a C program to find factorial of a given number using recursion.		12
UNIT IV	**STRINGS AND POINTERS**	
Strings: Declaring and Initializing String Variables –String Built-in Functions. Pointer: Declaring, Initialization and Accessing a pointer Variable-Pointer		3

Expressions – Pointer Arithmetic – Pointer to Pointer - Pointer to an Array.		
Ex No 7: Write a C program to find the length and reverse a string using pointers. **Ex No 8**: Write a C program for implementing linear search using pointer to an array.		12
UNIT V	**STRUCTURES AND FILE MANAGEMENT**	
Structures and Union: Introduction -Defining a Structure -Declaring Structure Variables – Accessing Structure Members – structure initialization -Array of Structures-Union. File Management in C: Introduction – File Types- Defining File Modes -Opening and Closing a File – File Operations.		3
Ex No 09: Write a C program to collect and print students details like name, marks, etc. and then calculate total and average mark using structure. **Ex No 10:** Write a C program to count the number of characters, words and lines in a file.		12
TOTAL PERIODS		**75**

Textbook for Reference:

1. Reema Thareja, “Programming in C”, Oxford University Press, Second Edition, 2015.
2. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009.
3. E.Balaguruswamy, “Programming in ANSI C”, Tata McGraw-Hill, Third Edition Edition,2012.

Website links for reference:

- https://www.w3schools.com/c/
- https://www.programiz.com/c-programming
- https://www.tutorialspoint.com/cprogramming/index.htm
- https://egyankosh.ac.in/
- https://archive.nptel.ac.in/courses/106/104/106104128/

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based on the course Programming assignments
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.

Equipment / Facilities required to conduct the Practical Portion

1. **Hardware(s) Requirement:**
    - Desktop / Laptop
    - Printer
2. **Software(s) Requirement:**
    - Windows / Linux Operating System
    - Code Blocks / Turbo C

BOARD PRACTICAL EXAMINATION

PART – A

1. Write a C program to calculate the simple and compound interest.
2. Write a C program to find the area of a circle and a rectangle (use preprocessing directory for defining pi value).
3. Write a C program to find the largest of three numbers.
4. Write a C program to generate all prime numbers from 1 to N..
5. Write a C program to find factorial of a given number using recursion.

PART - B

6. Write a C program to demonstrate matrix addition and transpose operations.
7. Write a C program to find the length of a string and reverse a string using pointers
8. Write a C program for implementing linear search using pointer to an array.
9. Write a C program to collect and print students details like name, marks, etc. and then calculate total and average mark using structure.
10. Write a C program to count the number of characters, words and lines in a file.

S NO	ALLOCATION	MARKS
1	Aim (05) ,Program from Part – A (30)	35
2	Aim (05) ,Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

1052233540	WEB DESIGNING	L	T	P	C
Practicum		1	0	4	3

Introduction:

This course provides an introductory overview of the principles and practices of web design. Students will learn the fundamentals of creating visually appealing and user-friendly websites. Through a combination of theory and hands-on projects, students will explore various aspects of web design through basic coding languages such as HTML, CSS and client-side scripting language like JavaScript.

Course Objectives:

1. Learn the syntax, structure, and basic elements of HTML, including tags, attributes, and semantic markup.
2. Gain proficiency in creating and organizing content using HTML elements such as headings, paragraphs, lists, and links and media elements.
3. Explore CSS syntax, selectors, properties, and values for styling HTML elements.
4. Learn how to apply CSS styling to text, backgrounds, borders, and other page elements.
5. Understand the role and importance of client-side scripting in web development.
6. Gain proficiency in JavaScript syntax, data types, and operators.
7. Learn how to manipulate the Document Object Model (DOM) using JavaScript.
8. Explore various techniques for handling user interactions and events on web pages.
9. Learn how to validate form inputs and handle form submissions using JavaScript.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Develop well-structured web pages using HTML.

CO2: Develop web pages using HTML links and media elements.

CO3: Apply CSS to effectively style and format HTML elements to create visually appealing web pages.

CO4: Write and deploy Javascript code to solve practical web design problems

CO5: Utilize JavaScript to add interactivity and dynamic behavior to web pages including event handling, DOM manipulation, and form validation.

Pre-requisites: Knowledge of web browsers, websites, and basic internet terminologies.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	3	3	2	1	1	2
CO2	2	3	3	3	1	1	2
CO3	2	3	3	2	1	1	2
CO4	2	3	3	3	1	1	2
CO5	2	3	3	3	1	1	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- It is advised to assign practical projects that allow students to apply concepts learned in class. Projects could include designing and coding websites from scratch, creating prototypes, or redesigning existing websites to improve usability and aesthetics.
- Conduct of interactive demos to help students learn specific techniques and tools. Provide step-by-step guidance and encourage questions and participation.
- Real-world examples of websites to understand design principles, usability issues, and best practices and discuss how different design choices impact user experience and business goals.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 hours
Exam Marks	60	60	100	100	100
Converted to Marks	10	10	15	15	60
Marks	10		15	15	60
Internal Marks	40				
Tentative Schedule	7th Week	14th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement

of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

- **CA 3:** Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			100 Marks

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

SNO	ALLOCATION	MARKS
1	Aim (05) ,Program from Part – A (30)	35
2	Aim (05) ,Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

1052233540	WEB DESIGNING	L	T	P	C
Practicum		1	0	4	3

Unit I HTML & HTML Tags	
Introduction to HTML: HTML editors-HTML5- HTML Elements & Attributes. HTML Tags -Page Formatting Tags: DOCTYPE Tag- html tag- head, title, body, meta, script, style tags Text Formatting Tags: Heading Tags- Paragraph Tags- Horizontal rules- Line breaks- Superscript- Subscript- Underline- Italic- Bold- Emphasis- del tags HTML List Tags: Unordered List- Ordered List-Definition List HTML Link Tags & attributes- HTML Table Tags: table, th, tr, td, colspan, rowspan	3
1. Write a HTML code to display welcome text using different text formatting tags.(Use h1-h6, bold, italic, underline, strikethrough,div,p,pre tags) **(HTML Basic tags)**	6
2. Design a HTML page to list the computer languages where each language is a link.Prepare separate HTML documents for each language and call them in the appropriate link. **(Lists and Links)**	6
Unit II HTML & CSS	
HTML Document Layout Tags: header, footer, main, section tags HTML Media Tags- Images- <img> tags & attributes, Image Mapping using <map> and <area> tags - background images- Other media tags- <audio>, <video>, <iframe>, <embed>, <svg>, <canvas> CSS- Introduction- Need for CSS- Syntax- Selector- Declaration, Property, value- Types of CSS selector: Class, id, pseudo-class, attribute, universal selector- Types of style sheets: Internal - External- Inline- Color values. CSS background properties- Border properties- margin properties- padding properties- height, width properties- CSS Text properties- CSS Fonts properties	4
3. Write a HTML program to display the image of a computer as a link to the web page describing the components of computers. **(Images and link tags)**	6
4. Develop a web page using CSS to create a timetable for the class using different border style. **(Table tags and internal style sheets)**	6
5. Design a webpage of your college with attractive background color, text-color, font-face, an image by using external CSS formatting .**(External Stylesheets)**	6
Unit III JavaScript	

Scripting Languages: Client Side Scripting- Server Side Scripting- Need for javascript - structure of javascript - Variables- Datatypes- String- Number- Boolean- Undefined- Null JavaScript Objects: Array- String- Date- Math- Number- Boolean- User Defined Objects. Operators: Arithmetic - Assignment - Comparison - String - Logical - Bitwise - Ternary - Type Conditional Statements: if, if-else, else-if, switch. Loop statements- for, while, do-while- break- continue statements. JavaScript functions: definition- parameters-function call- function invocation	**4**
6. Write a JavaScript program to create a clock in 24 hours format using Date Object. (Do not include AM/PM) (**JavaScript Objects and Functions**)	**6**
7. Write a JavaScript program to control (play, pause, stop) the audio/video in a web page. **(JavaScript User defined Objects and Media Tags)**	**6**
Unit IV JavaScript Advanced	
Forms: Form tag- action, method, target, auto complete attributes, input tag, type attribute values- text, radio, checkbox, button, submit, password, other attributes for input tag -id, name, value , size, required. Special tags in forms -textarea tag, select tag, button tag, label tag. Message Boxes: Dialog Box- Alert Box- Confirm Box- Prompt Box JavaScript Document Object Model: Methods of Document object- Javascript Events- Event Handlers- Mouse events- Keyboard Events- Form Events- Window Events JavaScript Form Validation- Email validation	**4**
8. Write a JavaScript program to change the color of a web page to the color typed by the user in the text box. **(DOM)**	**6**
9.Write a JavaScript program to develop a simple calculator (with basic arithmetic operations like add, subtract, multiply, divide, equal to) by getting two` numbers in two text boxes, buttons for operations and display the result in the third text box. **(Event Handling)**	**6**
10. Create a form with text fields such as username, mail id, password, retype password, gender (radio), languages known (check box), Describe yourself (textarea), submit button and perform form validation such as username must not be less than 8 characters, mail id should contain @ symbol, password and retype password must be the same. **(Forms & Form validation)**	**6**

Total Periods	75

Text Books for Reference:

- Terry Felke-Morris, Web Development and Design Foundations with HTML5, 9th Edition, Pearson, 2018.
- Laura Lemay, Rafe Colburn","Mastering HTML, CSS & JavaScript Web Publishing", First Edition, BPB Publications, 2016.
- Thomas Powell, Fritz Schneider, Java Script: The Complete Reference, 3rd Edition,McGraw Hill Education(India), 2017.

Website Links for Reference:

- https://www.w3schools.com/
- https://javascript.info/
- https://www.javatpoint.com/javascript-tutorial
- https://www.freecodecamp.org/news/html-css-and-javascript-explained-for-beginners/
- https://nptel.ac.in/courses/106105084

Suggested List of Students Activity:

- Quizzes/ Seminars/ Presentations to students to evaluate their learning concepts.
- Mini Project based learning to work on a website project incorporating HTML, CSS, and JavaScript as an extension to real life applications.
- Conduct code reviews to provide feedback on HTML, CSS, and JavaScript code and to debug and troubleshoot it.

Equipment / Facilities required to conduct the Practical Course

Hardware Required:

1. Desktop Computers / Laptop
2. Laser Printer

Software Required:

1. Notepad / Notepad++ / Dreamweaver
2. Any Browser.

BOARD PRACTICAL EXAMINATION
PART – A

1. Write a HTML code to display welcome text using different text formatting tags.(Use h1-h6, bold, italic, underline, strikethrough, div, p, pre tags) **(HTML Basic tags)**
2. Design a HTML page to list the computer languages where each language is a link.

Prepare separate HTML documents for each language and call them in the appropriate link. **(Lists and Links)**

3. Write a HTML program to display the image of a computer as a link to the web page describing the components of computers. **(Images and link tags)**

4. Develop a web page using CSS to create a timetable for the class using different border style. **(Table tags and internal style sheets)**

5. Design a webpage of your college with attractive background color, text-color, font-face, an image by using external CSS formatting .**(External Style sheets)**

PART – B

6.Write a JavaScript program to create a clock in 24 hours format using Date Object. (Do not include AM/PM) (**JavaScript Objects and Functions**)

7. Write a JavaScript program to control (play, pause, stop) the audio/video in a web page. **(JavaScript User defined Objects and Media Tags)**

8. Write a JavaScript program to change the color of a web page to the color typed by the user in the text box. **(DOM)**

9. Write a JavaScript program to develop a simple calculator (with basic arithmetic operations like add, subtract, multiply, divide, equal to) by getting two numbers in two text boxes, buttons for operations and display the result in the third text box. **(Event Handling)**

10.Create a form with text fields such as username, mail id, password, retype password, gender (radio), languages known (check box), Describe yourself (textarea), submit button and perform form validation such as username must not be less than 8 characters, mail id should contain @ symbol, password and retype password must be the same. **(Forms & Form validation)**

SCHEME OF VALUATION		
SNO	**ALLOCATION**	**MARKS**
1	Aim (05) , Program from Part – A (30)	35
2	Aim (05) , Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

1052233640	OPERATING SYSTEMS	L	T	P	C
Practicum		1	0	2	2

Introduction

Students have to be conversant with computer, its terminology and functioning. The heart of a computer is based around its Operating System. An operating system acts as an interface between the user of a computer and the computer hardware. The processor deals with request coming from all directions asynchronously. The operating system has to deal with the problems of contention, resource management and both program and user data management, and provide a useful no-wait user interface. The course provides clear vision, understanding and working of Operating Systems.

Course Objectives

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

- To understand the purpose, goals, functions and evolution of Operating Systems. Login and logoff Procedures
- To know how to use of General purpose and communication commands
- To study the use of Search patterns, simple filters and advanced filters
- To know the details of process status
- To understand shell scripts, define the elements of the shell script and write shell script for various problems.

Course Outcomes

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

CO1: understand functional architecture of an operating system.

CO2: distinguish CPU scheduling algorithms.

CO3: analyze process coordination.

CO4: classify File System and directory implementations.

CO5: Resource Management

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	2	2	2	---	---
CO2	2	3	3	2	2	---	---
CO3	2	2	2	3	3	---	---
CO4	2	2	3	2	2	---	---
CO5	2	3	2	3	3	---	---

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable, real-life examples and engineering applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice-activity strategy throughout the course to ensure outcome-driven learning and employability.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 hours
Exam Marks	60	60	100	100	100
Converted to Marks	10	10	15	15	60
Marks	10		15	15	60
Internal Marks	40				
Tentative Schedule	7th Week	14th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

- **CA 3:** Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			100 Marks

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

S. NO	ALLOCATION	MARKS
1	Aim (05) ,Program from Part – A (30)	35
2	Aim (05) ,Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15

4	Output	10
5	Viva Voce	05
6	Total	100

1052233640	OPERATING SYSTEMS	L	T	P	C
Practicum		1	0	2	2

PART A	INTRODUCTION TO OS	
Introduction to operating system: Basics of Operating system- types of operating system- operating system services – operating system structures – Process Management – Process scheduling Process synchronization, critical section, Deadlocks. Memory Management : swapping, Conntiguous memory allocation, paging, Virtual Memory , Page Replacement Algorithms. Basics of Linux OS: Entering and Exiting from a Linux System – User Accounts – Different shells – Learn the syntax and usage of Directory Management Commands – Check the process status – process management commands – search patterns		8
Ex No:1 Write a syntax and execute the directory management commands : ls, cd, pwd, mkdir, rmdir **Ex No:2** Write a syntax and execute the file management commands such as cat, chmod, cp, mv, rm, more **Ex No:3** Write a syntax and execute the general purpose commands : wc, cal, date, who, tty, ln **Ex No:4** Using the simple filters verify pr, head, tail, cut, paste, nl, sort grep, egrep, fgrep, write and wall		15
PART B	**SHELL SCRIPTS**	
File operations (New, Open, Close, Save, Save and Exit, Print) – Text Editing operations (inserting ,deleting ,finding, replacing, copying and moving)- use of shell scripts – Numerical operations – Looping – Swapping techniques – string operations- using command line arguments – filters-date function- Relational Operations -Logical Operations – Boolean operations – Basic Arithmetic operations – case statement – search directory or file .		7
Ex No 5: Write a shell script that accepts a numerical value N and find sum . **Ex No 6:** Write a shell script to find factorial of the given number . **Ex No 7:** Write a shell script to perform arithmetic calculator using case statement. **Ex No 8:** Write a shell script using command line arguments and reports on		15

whether it is a directory, file or something else.	
TOTAL PERIODS	45

Textbook for Reference:

- Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Operating System Principles, 9th Edition, John Wiley &Sons,2018.
- William Stallings, Operating Systems – Internal and Design Principle", 9thEdition, Pearson Education/PHI,2018.
- Andrew S Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson/PHI,2014.

Website links for reference:

- https://nptel.ac.in/courses/106/105/106105214/
- https://ocw.mit.edu/courses/6-828-operating-system-engineering-fall-2012/pages/lecture-notes-and-readings/
- https://www.geeksforgeeks.org/what-is-an-operating-system/
- https://www.w3schools.in/operating-system/intro

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based on the course.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.

Equipment / Facilities required to conduct the Practical Portion

1. **Hardware Requirement:**
    - Desktop Computers
    - Printer
2. **Software Requirement:**
    - Linux Operating System

BOARD PRACTICAL EXAMINATION
PART – A

Ex No:1 Write a syntax and execute the directory management commands : ls, cd, pwd, mkdir, rmdir

Ex No:2 Write a syntax and execute the file management commands such as cat, chmod, cp, mv ,rm, more

Ex No:3 Write a syntax and execute the general purpose commands : wc, cal, date, who, tty,ln

Ex No:4 Using the simple filters verify pr, head, tail, cut, paste, nl, sort, grep , egrep, fgrep, write and wall

PART – B

Ex No 5: Write a shell script that accepts a numerical value N and find sum .

Ex No 6: Write a shell script to find factorial of the given number .

Ex No 7: Write a shell script to perform arithmetic calculator using case.

Ex No 8: Write a shell script using command line arguments and reports on whether it is a directory, file or something else.

SCHEME OF VALUATION		
S. NO	ALLOCATION	MARKS
1	Aim (05) ,Program from Part – A (30)	35
2	Aim (05) ,Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

DIPLOMA IN COMPUTER ENGINEERING AND IOT

II YEAR

IV SEMESTER

1058234110	MICROPROCESSORS & MICROCONTROLLERS	L	T	P	C
Theory		3	0	0	3

Introduction:

This course includes instruction sets, formats, operation codes, data types, the number and types of registers, addressing modes, main memory access methods, and various I/O mechanisms of microprocessor. Embedded systems based on microcontrollers play a pivotal role in every aspect of contemporary life. Consumer gadgets, entertainments gadgets, medical devices and automobiles all contain embedded Microcontroller. This course is designed to provide an introduction to microcontroller architecture, internal and external peripherals and assembly language programming.

Course Objectives:

- Understand of functional blocks of a Microprocessor and programming in the 8086 microprocessor.
- Explain the functions of common programmable peripheral controllers and interface a processor with another processor/co-processor and other peripheral devices.
- Construct a Microprocessor
- /Microcontroller based system for a given control application.

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: To understand the Architecture of 8086 microprocessor.

CO2: To learn the design aspects of I/O circuits and Memory Interfacing circuits.

CO3: To interface 8086 microprocessor with various programmable peripheral devices.

CO4: To study the Architecture of 8051 microcontroller.

CO5: To design a microcontroller based system by interfacing 8051 Microcontroller with various peripheral devices

Pre-requisites:

- Knowledge of basic Computer Engineering
- Assembly language basics
- Computer Architecture
- Operating system concepts

CO/PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	2	3	3	3	3
CO2	2	2	3	3	3	1	1
CO3	1	3	3	3	3	2	2
CO4	1	2	2	3	3	3	3
CO5	2	2	3	3	3	1	1

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- Lecture method
- Power point Presentation
- Group Discussion
- Quiz

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of one will be considered for the internal assessment of 15 Marks.

CA1and CA2 Assessment test should be conducted for two units as below.

PART A: (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write five questions. Each unit four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination-Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1058234110	MICROPROCESSORS & MICROCONTROLLERS	L	T	P	C
Theory		3	0	0	3

Unit I	THE 8086 MICROPROCESSOR	
Introduction to 8086 Microprocessor - 8086 Microprocessor architecture — Register organization – Memory segmentation - Addressing modes — Major categories of instruction set — Assembly language programming – Steps in assembly program development and execution — Modular Programming - Linking and Relocation — Stack structure of 8086 - Procedures – Re-entrant procedure & Recursive procedure – Passing parameters — Macros – Parameter passing — Interrupts and interrupt service routines — Sources of interrupt – Interrupt types – Interrupt priorities		9
Unit II	**8086 SYSTEM BUS STRUCTURE**	
8086 signals – Minimum mode & Maximum mode signals — Basic configurations - Minimum mode & Maximum mode configuration — System bus timing – Bus Timings for Minimum mode & Maximum mode - Introduction to Multiprogramming & Multiprocessor configurations — Closely coupled and loosely Coupled configurations — Bus arbitration mechanisms to resolve contention – Coprocessor 8087 Numeric processor – Interaction between 8086 and 8087		9
Unit III	**I/O INTERFACING**	
Memory Interfacing –I/O interfacing – Programmed I/O – Interrupt driven I/O - DMA Operation – 8237 DMA controller — 8255A Parallel Peripheral Interface – Operating modes - D/A Interface DAC0808 - A/D Interface ADC0809 – 8251 USART Serial communication interface – Block diagram – Control word & Status word formats — 8253 / 8254 Timer / Counter controller - Block diagram – Mode definition of Timer — 8279 Keyboard / display controller — Block diagram – Operating modes - 8259A Programmable Interrupt controller - Block diagram – Programming 8259A		10
Unit IV	**THE 8051 MICROCONTROLLER**	
Architecture of 8051 — Special Function Registers(SFRs) — Pin Configuration & Signals of 8051 - Register Banks — Addressing modes — Instruction set classification — Assembly language programming – Introduction - Assembling & Running 8051 program - 8051 Interrupts		8
Unit V	**INTERFACING MICROCONTROLLER**	
Programming 8051 Timers — Serial Port Programming — Interrupts Programming — LCD & Keyboard Interfacing — ADC, DAC & Sensor Interfacing — External Memory		9

Interface- Stepper Motor and Waveform generation – Comparison of Microprocessor and Microcontroller	
TOTAL HOURS	**45**

Suggested List of Students Activity:

1. Assignment will be given on any recent technological developments in advanced processors and microcontroller applications
2. Presentation / Seminars by students on any recent technological developments based on the course.
3. Periodic class/online quizzes conducted on a weekly/fortnightly basis to reinforce the basic concepts of the course, blended learning activities to explore the recent trends and developments in this course field.

Text and Reference Books:

1. Douglas V.Hall, 'Microprocessor and Interfacing', McGraw Hill Edu,2016.
2. Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D.Kinely 'The 8051 Micro Controller and Embedded Systems', PHI Pearson Education, 5th Indian reprint, 2003.
3. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', with 8085, Wiley Eastern Ltd., New Delhi, 2013.

Web-based/Online Resources:

1. https://drive.google.com/file/d/1O4mJcm8kwfealivNp0EXk-m4dOH8KxB8/view
2. https://drive.google.com/file/d/1kPk3IkPOSQ4PLTZbLKqx_hb5cZvXukdx/view
3. https://n.stucor.in/semester/STUCOR_EC8691-DJ.pdf?_gl=1*1ncipsr*_ga*NTgzMDUzMDcwLjE3MTAyMDUzMzI.*_ga_54331VJR2D*MTcxMDIwNTMzMi4xLjAuMTcxMDIwNTMzMi4wLjAuMA.

1058234230	IOT SENSORS AND DEVICES	L	T	P	C
Practicum		3	0	2	4

Introduction:

Studying IoT sensors and devices is essential for preparing students to meet industry demands. It provides practical skills in designing, implementing, and managing IoT systems, aligning students with emerging job opportunities. Understanding IoT sensors and devices fosters innovation and entrepreneurship, empowering students to develop solutions for real-world challenges. It equips students with cross-disciplinary skills in electronics, programming, and data analysis, enhancing their employability. Incorporating IoT studies ensures students remain competitive in a technology-driven job market and future-proofs their skillset for evolving industry needs.

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Understand IoT value chain structure (device, data cloud), application areas and technologies involved.

CO2: Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules

CO3: Market forecast for IoT devices with a focus on sensors

CO4: Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

CO5: Implement web-based services on IoT devices

Pre-requisites:

Knowledge of basic concepts of IoT.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3					1
CO2	3	3					1
CO3	3	3	2	1	1	1	1
CO4	3	3	2	1	1	1	1
CO5	3	3	2	1	1	1	1

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

1. Conduct lectures to introduce students to fundamental concepts such as sensor technologies, communication protocols, data processing techniques, and IoT architectures.
2. Use multimedia presentations, diagrams, and real-world examples to illustrate theoretical concepts.
3. Assign readings from textbooks and research papers on IoT sensor and device technologies.
4. Encourage students to critically analyze the material and discuss their understanding in classroom discussions or written assignments.
5. Integrate theoretical learning with practical hands-on labs or demonstrations where students can observe theoretical concepts in action and gain a deeper understanding of how they are applied in real-world IoT sensor and device implementations.

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written Test Theory (Any Two Units)	Written Test Theory (Another Two Units)	Practical Test (All Exercises)	Written Test (Complete Theory Portions)	Written Examination (Complete Theory Portions)
Duration	2	2	3	3 Hours	3 Hours
Exam Marks	50	50	100	100	100
Converted to	10	10	15	15	60
Marks	10		15	15	60
Tentative Schedule	6th Week	12th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** Assessment written test should be conducted for 50 Marks. The marks scored will be converted to 10 Marks for each test. Best of one will be considered for the internal assessment of 10 Marks.

  CA1 and CA2, Assessment written test should be conducted for two units as below.

  PART A: (5 X 10 Marks = 50 Marks).

  Eight questions will be asked, students should write Five questions.

  Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded will be converted to 15 Marks for the internal mark.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. Each exercise/experiment should be evaluated for 10 Marks. The total marks awarded should be converted to 30 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be

evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification

SCHEME OF EVALUATION - Practical Test

Sl.No.	Description	Marks
A	Aim (05) ,Program (30)	35
B	Execution	20
C	Output	10
D	Practical document (All Practicals)	30
E	Viva Voce	05
Total		100

CA4: Model examination should be conducted for complete theory portions as per the end semester question pattern. The marks awarded should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination- Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1058234230	IOT SENSORS AND DEVICES	L	T	P	C
Practicum		3	0	2	4

Unit I	
Theory: **Introduction to Internet of Things-** Definition of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems.	9
Unit II	
Theory: **IoT and M2M-** Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCONF,YANG- NETCONF, YANG, and SNMP NETOPEER	9
Unit III	
Theory: **IoT Physical Devices and Endpoints-** Introduction to Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C) **Controlling Hardware-** Connecting LED, Buzzer, Controlling servo motor, speed control of DC Motor.	9
Practical: **Exp No:1** To implement LED Pattern **Exp No:2** To implement the Buzzer **Exp No:3** To implement the Servo Motor Control	12
Unit IV	
Theory: **Sensors-** Temperature sensor with thermistor, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Level Sensors, Distance Measurement with ultrasound sensor	9
Practical: **Exp No:4** To implement and monitor the Temperature Sensor **Exp No:5** To implement and monitor Ultrasonic Distance Measurement **Exp No:6** To implement Humidity Sensor	12
Unit V	

Theory: **IoT Physical Servers and Cloud Offerings**– Introduction to Cloud Storage models and communication APIs Web Server – Web server for IoT, Cloud for IoT, Python web application framework designing a Restful web API	9
Practical: **Exp No:7** Using ThinkSpeak Cloud Reading Temperature Sensor Monitoring with NodeMCU /Raspberry Pi	6
TOTAL HOURS	**75**

Suggested List of Students Activity:

1. Guide students through building a simple circuit using a sensor (e.g., temperature sensor) and a microcontroller (e.g., Arduino).
2. Instruct them to wire the sensor to the microcontroller and program it to read data from the sensor and display it on an output device (e.g., LED or serial monitor).
3. Conduct a hands-on experiment where students collect data from a sensor (e.g., temperature sensor) over a period of time.
4. Instruct them to record the data at regular intervals and analyze it to observe any trends or patterns.
5. Demonstrate how to establish wireless communication between IoT devices using Bluetooth or Wi-Fi modules.
6. Provide students with a simple scenario (e.g., transmitting sensor data from one device to another) and guide them through setting up the communication link.

Text Books:

1. Arshdeep Bahga and Vijay Madisetti, Internet of Things - A Hands-on Approach, Universities Press, 2015
2. Matt Richardson & Shawn Wallace , Getting Started with Raspberry Pi, ,O'Reilly (SPD), 2014.
3. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016.

Reference Books:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan
2. Peter Friess,'Internet of Things – From Research and Innovation to Market

Deployment', River Publishers, 2014

3. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

Web-based/Online Resources:

- https://www.coursera.org/learn/iot-sensors
- https://www.edx.org/professional-certificate/ibm-iot-foundations-sensors-devices
- https://ieeexplore.ieee.org/browse/technology-topics/internet-of-things/iot-sensors-and-devices
- https://www.iotforall.com/topics/sensors-devices/
- https://www.hackster.io/sensors
- https://learn.adafruit.com/category/iot
- https://github.com/topics/iot-sensors

Equipment / Facilities required for conducting the Practical Course. (Batch Strength: 30 Students)

Software Requirement:

1. Arduino SDK

Components Requirement:

1. Arduino kit - 10 Numbers
2. Node MCU / Raspberry Pi - 10 Numbers
3. LED Bulb – 10 Numbers
4. 330K Resistor - 10 Numbers
5. Push Button - 10 Numbers
6. Servo Motor 5 V DC - 10 Numbers
7. 5V DC Relay - 10 Numbers
8. Mini Bread Board - 10 Numbers
9. 16x2 LCD Display - 10 Numbers
10. IR Sensor - 10 Numbers
11. LM35 Temperature Sensor- 10 Numbers
12. Connecting Wires

1058234340	DATA STRUCTURES USING C	L	T	P	C
Practicum		2	0	3	4

Introduction:

Data structures are fundamental building blocks in computer science that allow us to organize and manage data efficiently. In this course, we will explore various data structures and their implementations using the C programming language. Through lectures, hands-on coding exercises, and practical examples, students will learn how to design, analyze, and implement essential data structures, enabling them to write more efficient and robust programs.

Course Objectives:

- Learn about fundamental data structures such as arrays, linked lists, stacks, queues, and trees.
- Develop the ability to implement these data structures in the C programming language.
- Understand the theoretical and practical aspects of analyzing the time and space complexity of algorithms and data structures.
- Apply data structures to solve real-world problems and algorithmic challenges.
- Explore different sorting and searching algorithms such as bubble sort, insertion sort, selection sort, merge sort, linear search, and binary search.
- Introduce advanced data structures such as graphs, trees, understand their applications and implementation in C.
- Enhance programming skills in C through hands-on exercises and projects involving data structures.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Implement various data structures using C programming language

CO2: Analyze the time complexity of algorithms and make decisions based on this analysis.

CO3: Develop strong problem-solving skills to solve Complex programming challenges.

CO4: Improve their programming skills in C through hands-on exercises.

CO5: Well-prepared for advanced courses in algorithms, data analysis, and software development.

Pre-requisites:

1. Proficiency in the C programming language, including functions, arrays, pointers, and memory management.
2. Basic mathematical skills, including understanding of algebra, logic, and mathematical notation, are important for analyzing algorithms and data structures.
3. Familiarity with using the command line interface for compiling and running C programs.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	-	3	-	-	-	2
CO2	-	3	2	-	-	-	1
CO3	3	3	3	2	-	-	2
CO4	3	3	3	2	-	-	2
CO5	3	2	2	2	-	-	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

1. Hands-On Coding Exercises: This practical approach reinforces theoretical concepts and helps students develop programming skills.
2. Visualizations and Diagrams: Utilize visual aids such as diagrams, charts, and animations to illustrate how data structures are organized and manipulated in memory.
3. Problem-Solving Approach: Emphasize problem-solving skills by presenting real-world problems that can be solved using data structures.
4. Collaborative Learning: Foster collaboration among students through group discussions, pair programming, and peer code reviews.
5. Interactive Lectures: Engage students through interactive lectures that encourage active participation. Use polling questions, quizzes, and coding challenges to assess understanding and reinforce learning.

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 hours
Exam Marks	60	60	100	100	100
Converted to Marks	10	10	15	15	60
Marks	10		15	15	60
Internal Marks	40				
Tentative Schedule	7th Week	14th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

- **CA 3:** Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			100 Marks

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

S. NO	ALLOCATION	MARKS
1	Aim (05) ,Program from Part – A (30)	35
2	Aim (05) ,Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

1058234340	DATA STRUCTURES USING C	L	T	P	C
Practicum		2	0	3	4

Unit I- Introduction to Data Structures and Algorithm	
Definition and importance of data structures – Primitive and Non Primitive data structures –operations on data structures: inserting and deleting an element - searching, sorting and traversal (definition only). Algorithm definition – Properties, different approaches to design an algorithm: top down approach and bottom up approach – Time Complexity: Big O notation.	4
Ex.No1. a) Write a C program to take year as input and checks whether it's a leap year or not. b) Write a C program to find the given number is palindrome or not. **Ex.No.2** Write a C program to Prints the Fibonacci series up to a given number using recursion. Also measure the time taken to compute the Fibonacci series (use clock() function from <time.h> header file)	4 4
Unit II - Linear Data structures :Arrays and Linked list	
Linear data structures: Arrays: Definition of Array – One Dimensional Array – Multidimensional Array – Basic operations on array -Advantages and Disadvantages of Array. Linked lists: Definition of a linked list - Node – Head -Tail – Null - Next Pointer – Empty list – Singly Linked List – Doubly Linked list – circular linked list.	5
Ex.No.3 Write a C program to store and print student information using structures and arrays. **Ex. No. 4** Write a C program to find the average of elements of an Array using pointers. **Ex.No.5** Write a C program to create linked list, insert elements at the beginning and display the linked list.	4 4 4
Unit III - Linear Data structures: Stack and Queue	
Definition of a stack – stack operations (PUSH & POP) – Algorithms for push and pop operations – Applications of stack. Queue : Queue Definition – Basic operations on a queue – Algorithms for enqueue(), dequeue(), isEmpty(), isFull() operations.	4

Ex.No.6 Write a C program to push elements onto the stack, pop elements from the stack and display the elements of the stack. **Ex.No.7** Write a C program to enqueue elements to the queue, dequeue elements from the queue and display the elements of the queue.	4 4
Unit IV -Non Linear Data Structures: Tree and Graph	
Definition of a Tree -Terminologies: Node – Path – Root node– Leaf Node - Parent – Child – Siblings – Level of a Node – Depth of a node – Height of a Tree. Introduction to Binary Tree - Tree traversals (Pre-order, In-order, Post order). Graph: Definition of a Graph – Terminologies: Vertex – Edge – Adjacency – Path – Traversals in Graph (Depth First Search and Breadth First Search).	5
Ex.No.8 Write a C program to create a Tree and insert elements into the tree. **Ex.No.9** Write a C program to perform in-order, preorder, and post-order traversals in a Binary Tree. **Ex.No. 10** Write a C program to perform either Depth First Search or Breadth First Search Traversal.	4 4 4
Unit V - Sorting and Searching Techniques	
Bubble sort – Insertion sort – Selection sort and Merge sort (Examples only). Linear search and binary search: Examples – Algorithms – Analysis of time complexity.	5
Ex. No. 11 Write a C program to implement Insertion Sort. **Ex. No. 12** Write a C program to implement Linear and Binary Search Algorithm.	6 6
TOTAL	75

Suggested List of Students Activity:

1. Challenge students to optimize their code for speed and memory usage.
2. Provide programs with bugs related to data structures and ask students to debug them, improving their understanding of how these structures work.
3. Conduct regular quizzes and tests to assess students' understanding of data structures and their ability to apply them in problem-solving.

Text and Reference Books:

1. Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J. Augenstein, "Data Structures Using C", 2nd Edition, Pearson Education, 2009.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson, 1997.
3. S. K. Srivastava, Deepali Srivastava, "Data Structures Through C in Depth, 2nd Edition, BPB Publications, 2017.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", 2nd Edition, Computer Science Press, 2007.
5. Ashok N. Kamthane, "Introduction to Data Structures in C", 2nd Edition, Pearson Education, 2010.

Web-based/Online Resources:

- GeeksforGeeks - https://www.geeksforgeeks.org/
- Tutorialspoint - https://www.tutorialspoint.com/data_structures_algorithms/index.htm
- Programiz - https://www.programiz.com/
- Codecademy - https://www.codecademy.com/
- Stack Overflow - https://stackoverflow.com/

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

HARDWARE

1. Desktop Computers – 30 Nos
2. Printer – 1 Nos

SOFTWARE

Turbo C / Turbo C++.

BOARD PRACTICAL EXAMINATION

PART A

1. a) Write a C program to take year as input and checks whether it's a leap year or not.
   b) Write a C program to find the given number is palindrome or not.
2. Write a C program to Prints the Fibonacci series up to a given number using recursion. Also measure the time taken to compute the Fibonacci series (use clock() function from <time.h> header file)
3. Write a C program to store and print student information using structures and arrays.

4. Write a C program to find the average of elements of an Array using pointers.
5. Write a C program to create linked list, insert elements at the beginning and display the linked list.
6. Write a C program to push elements onto the stack, pop elements from the stack and display the elements of the stack.

PART B

7. Write a C program to enqueue elements to the queue, dequeue elements from the queue and display the elements of the queue.
8. Write a C program to create a Tree and insert elements into the tree.
9. Write a C program to perform in-order, preorder, and post-order traversals in a Binary Tree.
10. Write a C program to perform either Depth First Search or Breadth First Search Traversal
11. Write a C program to implement Insertion Sort.
12. Write a C program to implement Linear and Binary Search Algorithm

SCHEME OF VALUATION

Section	Description	Marks
1	Aim (05) ,Program for the experiment from Part – A (30)	35
2	Aim (05) ,Program for the experiment from Part – B (30)	35
3	Executing any one program (Part A **OR** Part –B)	15
4	Output	10
	Viva Voce	5
TOTAL MARKS		**100**

1058234440	OBJECT ORIENTED PROGRAMMING IN JAVA	L	T	P	C
Practicum		1	0	4	3

Introduction:

Object Oriented Programming(OOPs) Principles is the foundation of how any Object Oriented Programming Language works. OOPs is the fundamental programming paradigm that treats everything as an Object thereby facilitating efficient code organization and code reuse. Java programming language provides easier implementation of OOPs concepts in programming. Java is a popular programming language widely used in industry and academia. By learning OOPs through Java, you will gain a solid foundation in both OOPs principles and the Java language, which can be applied to other programming languages and paradigms. Java's syntax and structure are designed to be easy to understand and learn, making it a great language for beginners to start with.

Course Objectives:

- To learn about the fundamentals of OOPs principles
- To learn about the fundamentals of Java language constructs
- To familiarize the student with Object Oriented Programming in Java
- To expose the student to creating UI

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Understand fundamentals of OOPs concepts, fundamentals of programming such as datatypes, variables and operators.

CO2: Understand concepts of control flow using Java Programming constructs.

CO3: Analyse the application of OOPs principles to real world scenarios

CO4: Apply exception handling and multithreading concepts to real-world scenarios.

CO5: Apply the AWT controls and event handling to create Java GUI applications.

Pre-requisites:

Basic knowledge of navigation in Operating System

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2				
CO2	3	3	3				
CO3	3	3	3	2	1	1	1
CO4	3	3	3	2	1	1	1
CO5	3	3	3	2	1	1	1

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- Lectures
- Tutorial
- Group discussion on application in real world scenarios

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 hours
Exam Marks	60	60	100	100	100
Converted to Marks	10	10	15	15	60
Marks	10		15	15	60
Internal Marks	40				
Tentative Schedule	7th Week	14th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

- **CA 3:** Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			100 Marks

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

S. NO	ALLOCATION	MARKS
1	Aim (05) ,Program from Part – A (30)	35
2	Aim (05) ,Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

1058234440	OBJECT ORIENTED PROGRAMMING IN JAVA	L	T	P	C
Practicum		1	0	4	3

Unit 1 - Introduction	
Introduction to Object Oriented Programming - Basic Concepts - Objects and Classes – Data abstraction and Encapsulation, Inheritance, Polymorphism. Features of Java, Evolution of Java,Simple Java Program, JDK, JVM, creating and executing a Java program Primitive data types(byte, short, int, long, char, float, double, and boolean), Literals(Integer, Floating point, Boolean, Character, String), Variables, Type conversion, casting, Operators(Arithmetic, Bitwise, Relational, Logical, Assignment), Expression - operator precedence	5
Practical Exercises 1. To write a java program to compute the area of a circle, square and rectangle using variables(command line arguments and variable declaration). 2. To write a java program to print the default value of all primitive data types 3. To write a simple java program to demonstrate type conversion that requires cast	10
Unit II – Control Statements and Arrays	
Control Statements (Selection - if, nested if, if-else-if, switch, Iteration - while, do-while, for, for-each, Jump- break, continue), Arrays, one dimensional and multidimensional arrays	5
Practical Exercises 4. To write a java program to find greatest of three numbers 5. To write a java program to find the average of 5 students marks using one dimensional array 6. To write a java program to perform matrix arithmetic operations using multidimensional arrays	10
Unit III – Classes and Objects	
Class - Class structure, creating objects - new keyword, Methods - Returning a value, parameterized method, Constructors - parameterized constructors, this keyword, finalize method, Method Overloading, Constructor Overloading, Recursion, Access Specifiers - public, private, protected. Static data and methods. Inheritance, Method overriding, abstract class, final keyword, packages - defining a package, importing packages, Interfaces - defining an interface, Implement Interfaces	5

Practical Exercises 7. To write a JAVA program to implement class and objects - create a class student with four data members. Use a constructor to initialize the data members. Define a method display() to display the information of a student. Use Main method to create the objects 8. Write a Java program to illustrate the concept of single inheritance. Create a parent class "Vehicle". Child class "Car", with each class having distinct functionalities. Override the parent functionality in child class.	10
Unit IV – Exception Handling and Multithreading	
Exception Handling - Types of errors, try, catch, throw, throws, finally,Builtin Exceptions - Runtime exceptions multithreading - Life cycle of a thread - thread class and runnable interface, thread priorities, suspend, resume, sleep, stop threads	5
Practical Exercises 9. Write a java program to demonstrate exception handling - Read an integer from user. Throw an exception if user enters a non-integer value. Throw another exception if user enters 0 as input. Use finally block. 10. Write a java program to demonstrate multithreading concept.	10
Unit V – Strings and Event Handling	
Strings- String Class – operations, Difference between String and String Buffer. Files – Byte stream classes –Character stream classes, Event handling - Delegation Event Model - Events, Event sources, Event Listeners, Event Classes. AWT- Windows Fundamentals-Control Fundamentals-Labels-Buttons-Text Field-Text Areas.	5
Practical Exercises 11. Write a java program to read a string in lowercase and write the string in uppercase into a file and close the file. 12. Write a program to create a simple calculator to perform addition, subtraction, multiplication and division using button, label and text field.	10
TOTAL HOURS	**75**

Suggested List of Activities:

1. Students can try to explore Java IDEs to develop Java Applications(Open Source IDEs like Eclipse, Netbeans)

Text and Reference Books:

Text Book

1. Herbert Schildt, "Java The Complete Reference ", Seventh edition, The McGraw-Hill Company

Reference Book

1. E. Balagurusamy , "Programming with Java A primer", Tata Mc-Graw Hill, New Delhi.
2. Cay S. Horstmann, "Core Java - Vol. 1, Fundamentals", 11th Edition, Pearson Education, 2018

Web-based/Online Resources:

https://www.udemy.com/java-tutorial/

https://www.tutorialspoint.com/java/index.htm

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

Hardware

1. Desktop Computers – 30 Nos
2. Laser Printer – 1 No

Software

1. Any Text Editor
2. JDK 1.8 and above

BOARD PRACTICAL EXAMINATION

PART A

1. To write a java program to compute the area of a circle, square and rectangle using variables(command line arguments and variable declaration).
2. To write a java program to print the default value of all primitive data types
3. To write a simple java program to demonstrate type conversion that requires cast
4. To write a java program to find greatest of three numbers
5. To write a java program to find the average of 5 students marks using one dimensional array
6. To write a java program to perform matrix arithmetic operations using multidimensional arrays

PART B

7. To write a JAVA program to implement class and objects - create a class student with four data members. Use a constructor to initialize the data members. Define a method display() to display the information of a student. Use Main method to create the objects
8. Write a Java program to illustrate the concept of single inheritance. Create a parent class "Vehicle". Child class "Car", with each class having distinct functionalities. Override the parent functionality in child class.
9. Write a java program to demonstrate exception handling - Read an integer from user. Throw an exception if user enters a non-integer value. Throw another exception if user enters 0 as input. Use finally blocks.
10. Write a java program to demonstrate multithreading concept.
11. Write a java program to read a string in lowercase and write the string in uppercase into a file and close the file.
12. Write a program to create a simple calculator to perform addition, subtraction, multiplication and division using button, label and text field.

SCHEME OF VALUATION

Section	Description	Marks
1	Aim (05) ,Program for the experiment from Part – A (30)	35
2	Aim (05) ,Program for the experiment from Part – B (30)	35
3	Executing any one program (Part A **OR** Part –B)	15
4	Output	10
5	Viva Voce	5
TOTAL MARKS		**100**

1058234540	DATABASE MANAGEMENT SYSTEM	L	T	P	C
Practicum		1	0	4	3

Introduction:

The Database Management System (DBMS) course aims to introduce students to the fundamental concepts, principles, and practices of database management. Through theoretical teachings and practical exercises, students will develop a solid foundation in designing, implementing, and managing databases efficiently.

Course Objectives:

- To understand the fundamental concepts and principles of database management systems.
- To learn how to design and implement databases using database management systems.
- To develop the ability to manage and maintain databases effectively.
- To apply database management concepts to real-world scenarios through practical exercises.

Course Outcomes:

On successful completion of this course, the student will be able to,

CO1: Understand the importance and role of DBMS in modern computing environments.

CO2: Design and implement databases according to specific requirements.

CO3: Apply normalization techniques to ensure data integrity and efficiency.

CO4: Use SQL to query and manipulate data in databases.

CO5: Manage and maintain databases effectively, including backup and recovery procedures.

Pre-requisites:

- Basic understanding of computer systems and software applications.
- Familiarity with fundamental programming concepts.
- Knowledge of data structures and algorithms is helpful but not required.
- Willingness to learn and explore new database technologies.
- Access to a computer with internet connectivity for online resources and practical exercises.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	-	-	3
CO2	3	3	3	-	-	-	2
CO3	3	3	3	-	-	-	2
CO4	-	2	3	3	-	-	1
CO5	-	2	3	-	3	2	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

1. Hands-On Practice: Provide practical exercises and projects using database management systems to reinforce learning.
2. Real-World Applications: Illustrate the relevance of DBMS through industry examples like banking or e-commerce.
3. Problem-Solving Approach: Engage students with challenging database design problems and optimization tasks.
4. Group Projects: Foster collaboration and teamwork by assigning group projects to design and implement database systems.
5. Interactive Discussions: Facilitate interactive discussions to encourage student engagement and deepen understanding of complex concepts.

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 hours
Exam Marks	60	60	100	100	100
Converted to Marks	10	10	15	15	60
Marks	10		15	15	60
Internal Marks	40				
Tentative Schedule	7th Week	14th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

- **CA 3:** Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			100 Marks

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

SNO	ALLOCATION	MARKS
1	Aim (05) ,Program from Part – A (30)	35
2	Aim (05) ,Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

1058234540	Database Management System	L	T	P	C
Practicum		1	0	4	3

Unit I - CONCEPTS OF DATABASES & MYSQL ADMINISTRATION

Data, Databases, Database Management System – Components of Database – Data Dictionary – Architecture: Overall Architecture of DBMS. Types of Databases - Relational, Object-Oriented, Hierarchical, Network. MySQL Installation - Database Creation - Table Creation - Creating (CREATE cmd)- Selecting (USE cmd) and Describing database (DESC cmd) – SHOW cmd – MySQL Data Types- Primary Key-Foreign Key-Constraints – DDL and DML Commands.	6
Ex No 1 Create a database named 'employee' and use the database 'employee' for doing the following operations • Create 'department' Table with Primary Key as Department_id and 'emp' Table with Foreign Key • Describe the table Schema. • Show all the databases created by user. • Show all the tables in employee database. Ex No 2 Study Basic MySQL commands (create database, create table, use, drop, insert) and execute the following queries using these commands: • create a table 'emp' with attributes 'enumber' ,'ename', 'ecity', 'salary', 'eaddress', and 'deptname'. • Create another table 'Company' with attributes 'cname', 'ccity', • empnumber' in the database 'employee'. • Alter 'enumber' column as 'emp_no' in 'emp' table. • Delete all records in table 'Company'. • Remove the 'emp' table from database. • Rename the table name 'emp' as 'emp_info'.	4 4

<table>
<tr><td>Ex No 3
Study the viewing commands (select, update) and execute the following queries using these commands:
• Find the names of all employees who live in Chennai.
• Increase the salary of all employees by Rs.5,000.
Change the company city to Chennai where the company name is ‘TCS’.</td><td>4</td></tr>
<tr><td colspan="2">Unit II - INTERACTIVE MYSQL</td></tr>
<tr><td>Joins: natural join, inner join, self join, outer join. Union, Union All, Intersect, Union Distinct – order by - Aggregate Functions - COUNT, SUM, AVG, MIN, MAX and Group by - Subqueries - single row - multiple row subqueries with IN, NOT IN, EXISTS, NOT EXISTS, AND, OR, and BETWEEN – AND operators, subqueries in the FROM, HAVING clause.</td><td>6</td></tr>
<tr><td>Ex No 4
Create the following two Tables for executing the query given below,
<u>Table 1: Students_detail</u>

<table><tr><th>Student id</th><th>Student Name</th><th>Age</th><th>Grade</th><th>Subject ID</th></tr><tr><td>1</td><td>John</td><td>18</td><td>A</td><td>101</td></tr><tr><td>2</td><td>Alice</td><td>17</td><td>B</td><td>102</td></tr><tr><td>3</td><td>Bob</td><td>16</td><td>C</td><td>103</td></tr><tr><td>4</td><td>Eve</td><td>17</td><td>A</td><td>105</td></tr><tr><td>5</td><td>Michael</td><td>18</td><td>B</td><td>104</td></tr><tr><td>6</td><td>Sarah</td><td>Null</td><td>Null</td><td>103</td></tr><tr><td>7</td><td>Rafi</td><td>19</td><td>B</td><td>Null</td></tr><tr><td>8</td><td>Ane</td><td>16</td><td>C</td><td>Null</td></tr></table></td><td>4</td></tr>
</table>

Table 2: Subjects_detail

Subject ID	Subject Name	Teacher
101	Mathematics	Mr. Smith
102	Science	Ms. Johnson
103	History	Mrs. Brown
104	English	Ms. Davis
105	Computer Science	Mr. Thompson
106	Geography	Null
107	Null	Mr. Stephan

- **Natural Join:** List the names of students, their ages, grades, along with the names of subjects they are enrolled in, and the respective teachers' names.
- **Self Join**: List pairs of students who are of the same age.
- **Left Outer Join**: List all students along with their subjects, including those who are not enrolled in any subjects.

Ex No 5

Create a Purchases Table using the following data for executing the query given below,

Customer id	Customer name	email	Purchase date	Purchase amount	Purchase type
101	Alice	alice@gmail.com	15-02-24	50	Online
102	Bob	bob@gmail.com	16-02-24	25	In-store
103	Charlie	charlie@gmail.com	17-02-24	40	Online
101	Alice	alice@gmail.com	18-02-24	35	In-store
101	Alice	alice@gmail.com	19-02-24	20	Online

4

Union: Retrieve a list of all unique customers who made purchases either online or in-store, ordered alphabetically by their customer names.

Intersect: Find the customers who made purchases both online and in-store, displaying their names and email addresses.

Order by in MySQL: Display a list of all purchases made in-store, ordered by the purchase date in descending order, including the customer name, purchase date, and total amount spent.

Ex No 06

Create a BankOperations Table using the following data,

Transaction ID	Customer name	Account No.	Operation Type	Amount	Transaction Date
101	Alice	ACC001	Deposit	1000	01-02-24
102	Bob	ACC002	Withdrawal	500	03-02-24
103	Alice	ACC001	Withdrawal	200	05-02-24
104	Charlie	ACC003	Deposit	1500	07-02-24
105	David	ACC004	Deposit	800	10-02-24
106	Eve	ACC005	Withdrawal	300	12-02-24
107	Alice	ACC001	Deposit	1200	15-02-24
108	Charlie	ACC003	Withdrawal	500	18-02-24
109	Bob	ACC002	Deposit	700	20-02-24
110	David	ACC004	Withdrawal	400	25-02-24

- Count the total number of operations (deposits and withdrawals) per account.
- Calculate Average Amount Deposited per Account with Customer Name
- Find Minimum Amount Deposited per Account with Customer Name
- Find Maximum Amount Withdrawn per Account with Customer Name

4

Ex No 07 — 4

create a student data table for the following details,

Student Id	Student Name	Maths	Physics	Chemistry
101	Alice	90	85	80
102	Bob	30	25	35
103	Charlie	50	45	55
104	David	70	65	60
105	Eve	40	35	30
106	Frank	45	40	35
107	Grace	55	50	45
108	Harry	20	15	10
109	Ivy	65	60	55
110	Jack	80	75	70

- Display students with marks in Maths above 70.
- Show students with marks in Chemistry not in pass range (45 and above).
- Show students with marks in Maths or Chemistry above 80.
- Display students with marks in all subjects below 50.

Unit III - VIEWS AND NORMALIZATION

Introduction – Advantages of views – Creating, Updating and Deleting views. Benefits – Normal forms: 1st Normal form, 2nd Normal form, 3rd Normal form. — 6

Ex No 08 — 4

Study the commands for views and execute the following queries using these commands:

- Create a view having ename and ecity
- In the above view change the ecity to ‘Chennai’ where ename is ‘John’.
- Create a view having attributes from both the tables.
- Update the above view and increase the salary of all employees of IT department by Rs.1000.

Unit IV - USER & TRANSACTION MANAGEMENT

DBA tasks - Creating, deleting, renaming users grant & revoke commands. Transaction command: commit, rollback and save points.	4
Ex No 09 Create the following tables in the "CompanyDB" database: ○ Employees (employee_id, name, role) ○ Departments (department_id, name, manager_id) • Use the GRANT statement to give User1 SELECT permission on the Employees table. • Use the GRANT statement to give User2 INSERT and UPDATE permissions on the Departments table. • Use the REVOKE statement to revoke the SELECT permission from User1 on the Departments table. • Use the REVOKE statement to revoke all permissions from User2 on the Employees table.	4
Ex No 10 Create the following tables in the "CompanyDB" database: ○ Employees (employee_id, name, salary) ○ Departments (department_id, name, budget) • Use the SAVEPOINT statement to set a savepoint named "before_update" in the transaction. • Update the salary of an employee in the Employees table. • Use the ROLLBACK TO SAVEPOINT statement to rollback the transaction to the savepoint named "before_update" if the update was incorrect. • If the update was correct, use the COMMIT statement to commit the transaction.	4
Unit V - STORED PROGRAM CONCEPTS & DEVELOPMENT	
Creating – Executing - Deleting Stored Procedures and Functions – Advantages. Use of Trigger – Creating Trigger – Types of Triggers – Cursor: Creation and Deletion. Database connections – Managing Database connections– Performing Queries – Closing Connections.	5

Ex No 11 • Create a Students table including three subject marks, date of birth. Write stored functions for calculating total, average, and age. • Create a stored procedure that accepts a student ID as input and returns the name of the student. Ex No 12 • Implement a Cursor to Calculate Total Salary of Employees in a Department. • Create a table called 'Inventory' containing information about products, including 'ProductID', 'ProductName', and 'Quantity'. Design a trigger that decrements the 'Quantity' column in the 'Inventory' table whenever a product is sold.	4 4
Total	**75**

Suggested List of Students Activity:

1. **Database Creation and Table Operations**
    a. Create a database called "StudentsDB" and create a table called "Students" with columns for student ID, name, age, and grade.
    b. Insert at least three records into the "Students" table.
    c. Display the contents of the "Students" table.
2. **Basic SQL Queries**
    a. Write a SQL query to retrieve the names of all students.
    b. Write a SQL query to retrieve the names of students whose age is greater than 20.
    c. Write a SQL query to retrieve the average age of all students.
3. **Data Manipulation**
    a. Update the grade of a student with a specific ID.
    b. Delete a student from the table based on their ID.
4. **Joins and Relationships**
    a. Create a new table called "Courses" with columns for course ID, course name, and student ID (foreign key referencing the "Students" table).
5. **Aggregate Functions and Group By**
    a. Write a SQL query to calculate the total number of students.
    b. Write a SQL query to calculate the average age of students in each grade.
6. **Advanced Queries**

a. Write a SQL query to find the student with the highest grade.
b. Write a SQL query to find the course with the highest number of students enrolled.

7. **Constraints and Indexes**
   a. Add a primary key constraint to the "Students" table.
   b. Add a unique constraint to the student ID column in the "Students" table.
8. **Transactions**
   a. Begin a transaction.
   b. Update the grade of a student.
   c. Rollback the transaction.
9. **Views, Trigger and Stored Procedures**
   a. Create a view that shows the names and ages of students.
10. **Normalization**
    a. Evaluate the given table structure for normalization and suggest any necessary changes to normalize it.

Text and Reference Books:

1. "Database System Concepts" by Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, McGraw-Hill Education, 7th Edition , 2019
2. "Fundamentals of Database Systems" by Ramez Elmasri and Shamkant B. Navathe, Pearson, 7th Edition , 2015
3. "Database Management Systems" by Raghu Ramakrishnan and Johannes Gehrke, McGraw-Hill Education, 3rd Edition , 2002
4. "Database Management Systems: Designing and Building Business Applications" by Gerald V. Post, McGraw-Hill Education, 6th Edition , 2017
5. "MySQL 8 Cookbook: Over 150 recipes for high-performance database querying and administration" by Karthik Appigatla and Chintan Mehta, Packt Publishing, 2nd Edition, 2019

Web-based/Online Resources:

1. W3Schools - SQL Tutorial: https://www.w3schools.com/sql/
2. MySQL Documentation: https://dev.mysql.com/doc/
3. Tutorialspoint - MySQL Tutorial: https://www.tutorialspoint.com/mysql/index.htm
4. MySQL Tutorial by Derek Banas: https://www.youtube.com/playlist?list=PLGLfVvz_LVvQ5G-LdJ8RLqe-ndo7QityM

5. SQLZoo - Interactive SQL Tutorial: https://sqlzoo.net/

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

HARDWARE

1. Desktop Computers – 30 Nos
2. Printer – 1 Nos

SOFTWARE

1. mysql 8.0

BOARD PRACTICAL EXAMINATION

PART A

Ex No 1

Create a database named 'employee' and use the database 'employee' for doing the following operations

- Create 'department' Table with Primary Key as Department_id and 'emp' Table with Foreign Key
- Describe the table Schema.
- Show all the databases created by user.
- Show all the tables in employee database.

Ex No 2

Study Basic MySQL commands (create database, create table, use, drop, insert) and execute the following queries using these commands:

- create a table 'emp' with attributes 'enumber' ,'ename', 'ecity', 'salary', 'eaddress', and 'deptname'.
- Create another table 'Company' with attributes 'cname', 'ccity',
- empnumber' in the database 'employee'.
- Alter 'enumber' column as 'emp_no' in 'emp' table.
- Delete all records in table 'Company'.
- Remove the 'emp' table from database.
- Rename the table name 'emp' as 'emp_info'.

Ex No 3

Study the viewing commands (select, update) and execute the following queries using these commands:

- Find the names of all employees who live in Chennai.
- Increase the salary of all employees by Rs.5,000.

Change the company city to Chennai where the company name is 'TCS'.

Ex No 4

Create the following two Tables for executing the query given below,

Table 1: Students_detail

Student id	Student Name	Age	Grade	Subject ID
1	John	18	A	101
2	Alice	17	B	102
3	Bob	16	C	103
4	Eve	17	A	105
5	Michael	18	B	104
6	Sarah	Null	Null	103
7	Rafi	19	B	Null
8	Ane	16	C	Null

Table 2: Subjects_detail

Subject ID	Subject Name	Teacher
101	Mathematics	Mr. Smith
102	Science	Ms. Johnson
103	History	Mrs. Brown
104	English	Ms. Davis
105	Computer Science	Mr. Thompson
106	Geography	Null
107	Null	Mr. Stephan

- **Natural Join:** List the names of students, their ages, grades, along with the names of subjects they are enrolled in, and the respective teachers' names.
- **Self Join**: List pairs of students who are of the same age.

Left Outer Join: List all students along with their subjects, including those who are not enrolled in any subjects.

Ex No 5

Create a Purchases Table using the following data for executing the query given below,

Customer	Customer	email	Purchase	Purchase	Purchase

id	name		date	amount	type
101	Alice	alice@gmail.com	15-02-24	50	Online
102	Bob	bob@gmail.com	16-02-24	25	In-store
103	Charlie	charlie@gmail.com	17-02-24	40	Online
101	Alice	alice@gmail.com	18-02-24	35	In-store
101	Alice	alice@gmail.com	19-02-24	20	Online

Union: Retrieve a list of all unique customers who made purchases either online or in-store, ordered alphabetically by their customer names.

Intersect: Find the customers who made purchases both online and in-store, displaying their names and email addresses.

Order by in MySQL: Display a list of all purchases made in-store, ordered by the purchase date in descending order, including the customer name, purchase date, and total amount spent.

Ex No 06

Create a BankOperations Table using the following data,

Transaction ID	Customer name	Account No.	Operation Type	Amount	Transaction Date
101	Alice	ACC001	Deposit	1000	01-02-24
102	Bob	ACC002	Withdrawal	500	03-02-24
103	Alice	ACC001	Withdrawal	200	05-02-24
104	Charlie	ACC003	Deposit	1500	07-02-24
105	David	ACC004	Deposit	800	10-02-24
106	Eve	ACC005	Withdrawal	300	12-02-24
107	Alice	ACC001	Deposit	1200	15-02-24
108	Charlie	ACC003	Withdrawal	500	18-02-24
109	Bob	ACC002	Deposit	700	20-02-24
110	David	ACC004	Withdrawal	400	25-02-24

- Count the total number of operations (deposits and withdrawals) per account.
- Calculate Average Amount Deposited per Account with Customer Name
- Find Minimum Amount Deposited per Account with Customer Name

Find Maximum Amount Withdrawn per Account with Customer Name

PART B

Ex No 07

Create a student data table for the following details,

Student Id	Student Name	Maths	Physics	Chemistry
101	Alice	90	85	80
102	Bob	30	25	35
103	Charlie	50	45	55
104	David	70	65	60
105	Eve	40	35	30
106	Frank	45	40	35
107	Grace	55	50	45
108	Harry	20	15	10
109	Ivy	65	60	55
110	Jack	80	75	70

- Display students with marks in Maths above 70.
- Show students with marks in Chemistry not in pass range (45 and above).
- Show students with marks in Maths or Chemistry above 80.

Display students with marks in all subjects below 50.

Ex No 08

Study the commands for views and execute the following queries using these commands:

- Create a view having ename and ecity
- In the above view change the ecity to 'Chennai' where ename is 'John'.
- Create a view having attributes from both the tables.

Update the above view and increase the salary of all employees of IT department by Rs.1000.

Ex No 09

Create the following tables in the "CompanyDB" database:

  - Employees (employee_id, name, role)
  - Departments (department_id, name, manager_id)

- Use the GRANT statement to give User1 SELECT permission on the Employees table.
- Use the GRANT statement to give User2 INSERT and UPDATE permissions on the Departments table.
- Use the REVOKE statement to revoke the SELECT permission from User1 on the Departments table.

Use the REVOKE statement to revoke all permissions from User2 on the Employees table.

Ex No 10

Create the following tables in the "CompanyDB" database:

- Employees (employee_id, name, salary)
- Departments (department_id, name, budget)

- Use the SAVEPOINT statement to set a savepoint named "before_update" in the transaction.
- Update the salary of an employee in the Employees table.
- Use the ROLLBACK TO SAVEPOINT statement to rollback the transaction to the savepoint named "before_update" if the update was incorrect.
- If the update was correct, use the COMMIT statement to commit the transaction.

Ex No 11

- Create a Students table including three subject marks, date of birth. Write stored functions for calculating total, average, and age.
- Create a stored procedure that accepts a student ID as input and returns the name of the student.

Ex No 12

- Implement a Cursor to Calculate Total Salary of Employees in a Department.
  Create a table called 'Inventory' containing information about products, including 'ProductID', 'ProductName', and 'Quantity'. Design a trigger that decrements the 'Quantity' column in the 'Inventory' table whenever a product is sold.

SCHEME OF VALUATION

Section	Description	Marks
1	Aim (05) ,Program for the experiment from Part – A (30)	35
2	Aim (05) ,Program for the experiment from Part – B (30)	35
3	Executing any one program (Part A **OR** Part –B)	15
4	Output	10
	Viva Voce	5
TOTAL MARKS		**100**

1058234652	MINI PROJECT USING IOT	L	T	P	C
Project		0	0	6	3

Introduction:

Mini Project using IOT aims to develop creative and innovative skills in the students whereby they will apply the knowledge and skills gained through the current semester course - IOT Sensors and Devices and in the previous semesters. This mini project aims to provide hands-on experience in finding solutions to specific real time problem/case study topics. Students will work individually/group to plan, execute, and present their projects. The focus of this project work is on practical application of theory concepts, problem-solving and creative thinking.

Course Objectives:

- Understand the key concepts by breaking down project topic into components and interrelationship between them.
- Implement the theoretical and practical knowledge gained in the curriculum and previous semesters.
- Develop practical skills in specific tools, technologies, or methodologies.
- Apply critical thinking and problem-solving skills to real-world scenarios by evaluating the strengths and limitations of different solutions, concepts and principles.
- Enhance innovation and creativity in approaching and solving problems within the scope of the project by incorporating recent developments and advancements.
- Enhance communication, presentation and team building skills.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Apply practical skills in specific tools, technologies, and methodologies to solve real-world problems.

CO2: Identify, analyse, and solve engineering problems effectively.

CO3: Apply project management principles to successfully complete the project within the specified timeline and resource constraints.

CO4: Develop effective documentation skills, including the ability to create comprehensive project reports and maintain organized documentation of the project.

CO5: Demonstrate effective teamwork and communication skills in a project environment

Pre-requisites:

1. Knowledge of embedded systems like sensors, processors, controllers, actuators, and other IoT related components
2. Programming languages, development environments, and tools related to IoT
3. User Interfaces, data analytics, and other functionalities to develop an application

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	1	1	1	1	1	3	3
CO4	1	1	1	1	1	3	3
CO5	1	1	1	1	1	3	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

GUIDELINES FOR FORMULATION OF MINI PROJECT:

- Each student/group must choose a project title/topic related to any real time problem or case study and get approval from the faculty incharge.
- Student/group can choose from the list of suggested technologies/tools need to develop their project idea into application based on their own interests and skills
- A review committee must be created with faculty members to evaluate the project review.
- Outcomes, Guidelines and assessment must be explained to the students.
- Four project reviews need to be conducted to track the progress of the mini project.
- Zeroth review will not be evaluated.
- A Mini Project report has to be prepared by the students and submitted during board examination

SUGGESTIVE TECHNOLOGIES OF PROJECT WORK:

- Computer hardware and embedded systems
- Artificial Intelligence
- Game Development
- Mobile App Development
- Any other recent thrust area which aligns with student's interest and allows them to apply and enhance their technical skills

SOFTWARE REQUIREMENT:

- Windows 7 64 bit or Higher/ Ubuntu 16.04 or higher
- Arduino SDK
- Raspbian OS
- Simulator tools like Wokwi, Thinger.io, Raspberry Pi Azure IoT Online Simulator
- Python 3 IDE

INTERNAL ASSESSMENT:

The internal assessment should be calculated based on the review of the progress of the work done by the student periodically as follows.

Detail of assessment	Period of assessment	Max.Marks
Zeroth Review	3rd week	-
First Review	6th week	5
Second Review	9th week	5
Third Review	12th week	10
Attendance	Entire semester	5
	Total	**25**

Proper record should be maintained for all reviews and preserved for one semester after the publication of Board Exams results. It should be produced to the flying squad and the inspection team at the time of inspection/verification.

EVALUATION FOR BOARD EXAMINATION:

Details of Mark allocation	Max.Marks
Presentation	25
Demonstration/Implementation	25
Report	30
Viva-Voce	20
Total	**100**

A neatly prepared PROJECT REPORT has to be submitted by individual student during the Mini Project Board examination.

SAMPLE MINI PROJECT REPORT FORMAT

Front Pages

Title Page

Bonafide Certificate

Acknowledgement

Table of Contents

CONTENTS

Abstract

List of Figures

List of Tables

List of Abbreviations

1. INTRODUCTION

1.1 Problem Statement

1.2 Objective of Project

2. SYSTEM ANALYSIS

2.1 Software requirement

2.2 Hardware requirement

3. SYSTEM DESIGN

3.1 DFD / ER / UML diagram (any other project diagrams)

3.2 System Architecture Diagram

3.3 Modules and Description

4. IMPLEMENTATION & RESULTS

4.1 Output Screens / Result Analysis

5. Conclusion and Future Works

6. References

DIPLOMA IN COMPUTER ENGINEERING AND IOT

III YEAR

V SEMESTER

1058235110	ADVANCED INTERNET OF THINGS AND APPLICATION	L	T	P	C
Theory		3	0	0	3

Introduction:

Advanced IoT and Applications opens doors to exciting career opportunities in technology and innovation. Understanding Advanced IoT helps solve real-world problems more efficiently. It enables us to create smarter and more efficient systems in various industries. Mastery in Advanced IoT fosters personal growth and adaptability in a rapidly evolving technological landscape. It empowers individuals to contribute to building sustainable and interconnected communities. Studying Advanced IoT is essential for staying competitive and relevant in today's digital age.

Course Objectives:

- Exploring advanced concepts and technologies in IoT, such as edge computing and AI integration.
- Understanding the practical applications of Advanced IoT across diverse domains like healthcare, smart cities, and industry.
- Developing skills in designing, implementing, and optimizing complex IoT systems.
- Preparing students to address emerging challenges and opportunities in the rapidly evolving field of IoT.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Students will become proficient in advanced IoT concepts

CO2: Students will be able to design, develop, and implement complex IoT systems tailored to specific industry needs.

CO3: Students will understand and apply best practices for securing IoT devices, networks, and data to protect against cyber threats.

CO4: Students will learn techniques to optimize IoT systems for efficiency, scalability, and reliability in real-world applications.

CO5: Students will gain skills in analyzing IoT-generated data to derive meaningful insights and make data-driven decisions for business or operational improvements.

Pre-requisites:

Knowledge of Fundamentals of IOT

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3						
CO2	3	2	2	1	1		1
CO3	3	2	2	2	1		1
CO4	3	2	2	2	1		1
CO5	3	2	2	2	1	1	1

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

1. Facilitate group activities and discussions to encourage collaboration and knowledge-sharing among peers, promoting a supportive learning environment and collective problem-solving.
2. Present complex concepts in a step-by-step manner, using visual aids, diagrams, and simplified explanations to manage cognitive load and ensure comprehension.
3. Structure the curriculum around practical problems or challenges relevant to diploma-level students, guiding them through the process of analyzing, designing, and implementing IoT solutions to address these issues.
4. Encourage active participation through demonstrations, simulations, and interactive sessions, allowing students to actively engage with the material and apply their knowledge in various contexts.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of one will be considered for the internal assessment of 15 Marks.

CA1and CA2 Assessment test should be conducted for two units as below.

PART A: (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write five questions. Each unit four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1058235110	ADVANCED INTERNET OF THINGS AND APPLICATION	L	T	P	C
Theory		3	0	0	3

Unit I	IoT: Components, Communication and Networking	
Introduction to Sensing and Networking: Sensing & actuation, Wireless Senor network, Senor nodes, Communication Protocols, M2M Communication, Networking Hardware, Networking Protocols.		9
Unit II	**IoT System Management**	
Network Operator Requirements, IoT Platform Design Specification – Requirements, Process, Domain Model, Service, IoT Level, Function, Operational view, Device and Component Integration, Application development.		9
Unit III	**Networking and Computing**	
File Handling, Python Packages for IoT, IoT Physical Servers – Cloud Storage Models, Communication APIs.		9
Unit IV	**IoT Clouds and Data Analytics**	
RESTful Web API, Amazon Web Services for IoT, Apache Hadoop, Batch Data Analysis, Chef, Chef Case Studies, Puppet, NETCONF-YANG.		9
Unit V	**IoT Applications**	
Case studies: smart cities, smart home, connected vehicles, Industrial IOT.		9
TOTAL HOURS		**45**

Suggested List of Students Activity:

1. Have students create concept maps to visualize the interconnectedness of IoT components, including sensors, actuators, communication protocols, and cloud platforms.
2. Present students with theoretical scenarios or case studies involving IoT implementation challenges, such as data privacy concerns or network scalability issues.
3. Organize debates on theoretical topics related to Advanced IoT, such as the trade-offs between edge computing and cloud computing, or the ethical implications of IoT data collection.
4. Utilize IoT simulation software or platforms to simulate theoretical IoT deployments in various scenarios, such as smart home environments or industrial settings.

Text and Reference Books:

1. Kamal, R.,"Internet of Things – Architecture and Design Principles," 1st Edition, Mcgraw Hill,2017.
2. Simone Cirani , "Internet of Things- Architectures, Protocolsand Standards", WILEY,2018.
3. Alessandro Bassi,"Enabling Things to Talk- Designing IoT solutions with the IoT Architectural Reference Model", Springer,2013.

Web-based/Online Resources:

- https://www.iotforall.com/
- https://www.embedded.com/
- https://iot-analytics.com/
- https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT

ELECTIVE 1

1058235211	EMBEDDED SYSTEMS	L	T	P	C
Theory		3	0	0	3

Introduction:

An embedded system is a combination of computer hardware and software designed for a specific function. Embedded systems may also function within a larger system. The systems can be programmable or have a fixed functionality. While embedded systems are computing systems, they can range from having no user interface- for example, on devices designed to perform a single task - to complex graphical user interfaces, such as in mobile devices. User interfaces can include buttons, LEDs and touch screen sensing. Some systems use remote user interfaces as well. Industrial machines, consumer electronics, agricultural and processing industry devices, automobiles, medical equipment, cameras, digital watches, household appliances, airplanes, vending machines and toys, as well as mobile devices, are possible locations for an embedded system.

Course Objectives:

The objective of this course is to familiarize learners with the technologies behind embedded computing systems. This course introduces and explains the role of different hardware, software, and firmware components involved in the design and development of embedded systems. It discusses how real time operating systems incorporate specific features to ensure timeliness of critical asks. The course also aims to provide insights about the design followed in several real-world embedded devices and expose the recent trends in embedded system design to the students

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Describe the characteristics of different hardware/software components of an embedded system

CO2: Map the design of an embedded system to an appropriate computational model

CO3: Recommend appropriate process synchronization/communication mechanisms for specific system scenarios

CO4: Describe the role of real-time operating systems in embedded devices

CO5: Make use of design strategies for developing real-world embedded systems

Pre-requisites:

Basic knowledge of operating systems, computer organization and architecture

CO/PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	3	3	-	-	1
CO2	2	3	3	3	-	-	1
CO3	-	3	2	1	-	-	-
CO4	1	3	3	2	-	-	-
CO5	-	-	-	3	3	-	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- Examples provided from daily life, realistic situations, and real world engineering and technological applications will help in real understanding of the subject.
- Multiple teaching aids must be administered to gain students attention and boost their learning confidence.
- Plan demonstrations to make subject exciting and to foster scientific mindset.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of one will be considered for the internal assessment of 15 Marks.

CA1and CA2 Assessment test should be conducted for two units as below.

PART A: (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write five questions. Each unit four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1058235211	EMBEDDED SYSTEMS	L	T	P	C
Theory		3	0	0	3

Unit I	Introduction to Embedded System	
Embedded Systems-Definition, Embedded Systems vs. General Computing Systems, History, Classification, Application Areas, Purpose. Building Blocks of a Typical Embedded System - System Core (Microprocessors, Microcontrollers, DSP, ASICs, PLDs), Memory (Different ROMs and RAMs), Sensors and Actuators, I/O Subsystem Interface, Communication Interface, Embedded Firmware, Other System Components (Reset and Brown –out Protection Circuits, Oscillator Unit, Real-Time Clock, Watch dog Timer), Printed Circuit Board. Embedded System Design Process-Requirements, Specification, Architecture Design, Designing Hardware and Software Components, System Integration		9
Unit II	**System Modeling and Hardware Software Co-Design**	
Computational Models in Embedded Design-Data Flow Graph, Control Data Flow Graph, State Machine Model, Sequential Program Model, Concurrent Process Model, Object-Oriented Model. Hardware Software Co-Design-Traditional Embedded Development Cycle, History, Advantages of the Co-Design Methodology, The Co-Design Process, Fundamental Issues in Hardware Software Co-Design. Hardware software trade-offs.		9
Unit III	**Real-Time Embedded System Design**	
Task Communication – Shared Memory, Message Passing, Remote Procedure Call and Sockets. Task Synchronization- Synchronization Issues-Race Condition, Deadlock, Priority Inversion, Priority Inheritance, Priority Ceiling. Synchronization Techniques-Spin Lock, Sleep & Wakeup, Semaphores. Selection of an RTOS for an Embedded Design- Functional and Non- Functional Requirements		9
Unit IV	**Embedded Firmware Design and Development and EDLC**	
Embedded Firmware Design and Development-Firmware Design Approaches, Firmware Development Languages. Integration of Embedded Hardware and Firmware. Embedded Product Development Life Cycle-Objectives, Different Phases, Modeling Techniques -Waterfall Model, Incremental Model ,Evolutionary Model, Spiral Model		9
Unit V	**Embedded System Industry- Case Studies and Applications**	

Design Case Studies-Battery Operated Smart Card Reader, Automated Meter Reading System, Smart Watch. Automotive and Aerospace Systems-Networked Control Systems in Cars and Airplanes, Vehicular Networks – CAN bus, Time-triggered Architecture, Flex Ray and LIN. Internet of Things Systems – IoT System Architectures –Use Cases (Smart Appliance, Monitoring and Control Systems). Networks for IoT-Networking concepts,. Smart Home Example	9
TOTAL HOURS	**45**

Suggested List of Students Activity:

1. Presentation/Seminars by students on any recent technological developments based on Embedded system.
2. Mini project for specific tasks in real-world environment can be given.
3. Better understanding through work sheets / Quiz /Oral Testing
4. Problem-Solving Tasks: Provide real-life or hypothetical problems that students must solve through discussion and collaboration. This encourages critical thinking and effective communication.

Text and Reference Books:

1. K.V.Shibu, Introduction to Embedded Systems, Mc Graw Hill Education, Second Edition, 2017.
2. James K.Peckol, Embedded Systems: A Contemporary Design Tool, John Wiley & Sons, Second Edition, 2019.
3. Marilyn Wolf, Computers as Components -Principles of Embedded Computing System Design, Morgan Kaufmann, Elsevier, Fourth Edition, 2016.
4. Jorgen Staunstrup and Wayne Wolf, Hardware/Software Co-Design: Principles and Practice, Springer Science & Business Media, 2013.
5. RajKamal, Embedded Systems: Architecture, Programming and Design. Tata Mc Graw - Hill Education, 2011.

1052235212	DATA WAREHOUSING AND DATA MINING	L	T	P	C
Theory		3	0	0	3

Introduction

This course covers key aspects of data management and analysis. It starts with Data Warehousing, covering architecture, Dimensional Modeling, and ETL processes, along with tools and technologies. Then, students explore Data Warehousing Techniques, focusing on lifecycle management, metadata, and cloud-based analysis. The course then moves to Data Mining, covering fundamental concepts, preprocessing, classification, and advanced techniques like Support Vector Machines and Neural Networks. Real-world Applications and Case Studies demonstrate Data Mining's use in retail, healthcare, CRM, and fraud detection.

Course Objectives

The objective of this course is to enable the student to

- Learn Data Warehousing fundamentals.
- Acquaint themselves with various Data Warehousing tools and technologies.
- Understand the Data Warehousing lifecycle, emphasizing quality, metadata management, and cloud analysis.
- Explore core Data Mining concepts, preprocessing, and classification/clustering methods.
- Master advanced Data Mining techniques.
- Analyze real-world Data Mining applications in different sectors.

Course Outcomes

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

CO1: Understand Data Warehousing principles, architecture, and ETL processes, including Dimensional Modeling.

CO2: Utilize tools and technologies proficiently for Data Warehousing.

CO3: Develop skills in core Data Mining concepts.

CO4: Master advanced Data Mining techniques like Support Vector Machines, Neural Networks, Text Mining, and DBSCAN for in-depth analysis.

CO5: Apply Data Warehousing and Data Mining in real-world scenarios.

Pre-requisites: Nil

CO/PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	1	1	2	1
CO2	3	3	3	1	1	3	2
CO3	3	3	3	1	1	3	1
CO4	3	3	3	1	1	3	2
CO5	3	3	3	1	1	3	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable, real-life examples and engineering applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice-activity strategy throughout the course to ensure outcome-driven learning and employability.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activities in a simulated environment, transitioning to real-world scenarios when possible.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of one will be considered for the internal assessment of 15 Marks.

CA1and CA2 Assessment test should be conducted for two units as below.

PART A: (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write five questions. Each unit four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination-Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1052235212	DATA WAREHOUSING AND DATA MINING	L	T	P	C
Theory		3	0	0	3

Unit I	INTRODUCTION TO DATA WARE HOUSING	
Introduction to Data Warehousing: Concepts and Architecture - Data Warehouse Design: Dimensional Modeling, Fact, and Dimension Tables - ETL Processes: Data Extraction, Transformation, and Loading - Data Warehouse Implementation: Tools and Technologies		8
Unit II	DATA WAREHOUSING TECHNIQUES AND TOOLS	
Data Warehouse Lifecycle: Planning, Design, Implementation, and Maintenance - Data Quality and Metadata Management - OLAP and Multidimensional Data Analysis - Data Warehousing in Cloud Environments		9
Unit III	INTRODUCTION TO DATA MINING	
Fundamentals of Data Mining: Concepts, Tasks, and Challenges - Data Preprocessing: Data Cleaning, Integration, Transformation, and Reduction - Classification Techniques: Decision Trees, Naive Bayes, and k-Nearest Neighbors - Clustering Techniques: K-means, Hierarchical Clustering - Association Rule Mining and Frequent Pattern Analysis		10
Unit IV	CLASSIFICATION TECHNIQUES	
Introduction to Classification: supervised learning and classification - Decision Trees: ID3, C4.5, and CART algorithms, handling overfitting and pruning techniques - Naive Bayes Classifier: Principles of Bayesian classification, Naive Bayes algorithm for text classification - k-Nearest Neighbors (KNN): KNN algorithm, Distance metrics and parameter selection		10
Unit V	CLUSTERING TECHNIQUES	
Introduction to Clustering – Basics concepts of clustering – Partitioning Methods: K-Means clustering – hierarchical clustering: Agglomerative and Divisive Hierarchical clustering Methods - Comparison between partitioning and Hierarchical clustering approaches		8
TOTAL PERIODS		45

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based on the course.
- Periodic class/online quizzes conducted based on the course.

- Blended learning activities to explore the recent trends and developments in the field.

Textbook for Reference:

- C.S.R.Prabhu , DATA WAREHOUSING Concepts, Techniques, Products and Applications ,Third Edition, PHI Learning,2008
- Robert Wrembel ,Data Warehouses and OLAP Concepts, Architectures, and Solutions,1st Edition IRM Press,2007
- Mehmed Kantardzic ,Data Mining Concepts, Models, Methods, and Algorithms2nd Edition, Wiley,2011

Website links for reference:

- https://www.geeksforgeeks.org/data-mining/
- https://www.javatpoint.com/data-mining-cluster-analysis
- https://www.tutorialspoint.com/dwh/dwh_schemas.htm

1058235213	RFID AND WIRELESS NETWORKS	L	T	P	C
Theory		3	0	0	3

Introduction:

The learners have to get the knowledge about wireless communication systems and related technologies. Initially this course provides the insights for RFID systems and concepts which support the learner to understand the applications in real time situations. It gives the various communication methods and design procedures applied in different application areas. They gain knowledge about Wireless networks and methods with all levels of evolution. It gives information about how the communication happens in a security manner. The information about various wireless LAN with different types of routing used for communication. The overall objective of this course is to understand the working principle of the RFID and wireless network and understand the application area in real time.

Course Objectives:

- To understand the fundamentals of RFID systems
- To gain knowledge on the architecture and components of RFID with application areas
- To acquire knowledge on the wireless networks with security standards.
- To attain knowledge on the medium access control and telecommunication networks
- To understand various wireless LAN, related devices and latest technologies on 4G.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Able to articulate the concepts, key technologies, strength and applications of RFID

CO2: Able to identify the architecture, procedure, standards and elements of RFID

CO3: Able to analyse the networking and communication methods in wireless networks.

CO4: Able to analyse and understand different medium access control and concepts of Telecommunication systems

CO5: Able to identify and characterize technologies and methodologies of wireless LAN

Pre-requisites:

- Computer Networks
- Wireless Networks
- Sensor Technologies

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	3	3	3	2	2
CO2	2	2	3	3	3	2	2
CO3	2	2	3	3	3	2	2
CO4	2	2	3	3	3	2	2
CO5	2	2	2	2	3	2	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

1. Lecture
2. Seminar
3. Hands-on training
4. Online simulations

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of one will be considered for the internal assessment of 15 Marks.

CA1and CA2 Assessment test should be conducted for two units as below.

PART A: (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write five questions. Each unit four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination-Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1058235213	RFID AND WIRELESS NETWORKS	L	T	P	C
Theory		3	0	0	3

Unit I	BASICS OF RFID SYSTEMS	
Introduction to RFID – Comparison with other identification systems – components of an RFID system- various features of RFID systems- Operating and physical principles. Transponders: Passive Transponders, active Transponders, semi-passive Transponders-RFID frequency Ranges-Applications of RFID systems.		9
Unit II	**COMMUNICATION AND DESIGN METHODS**	
Communication principles: coding, modulation, demodulation – Data integrity multiple access procedures -Anti-collision procedures – Security issues and solutions. Hardware architecture of Tags and readers – Transponder design – memory- Sensors- Reader RF interface- control unit – Middleware – Near field communications, Comparison of successful RFID standards. Case studies- Payment systems, Smart cards, Stock maintenance, vehicle identification systems		9
Unit III	**WIRELESS NETWORKS**	
Introduction to Wireless Networks- communications-advantages- limitations-wireless media- infra modulation techniques- DSSS-FHSS, frequency spectrum: radio and infrared; wireless generation: 1G,2G and 3G. Wireless Security- Trends and Security challenges in wireless networks- Trust in wireless Networks-Wireless Multimedia - QoS- Ad hoc Wireless Networks -Wireless Network Management - Applications of wireless networks.		9
Unit IV	**MEDIUM ACCESS CONTROL**	
Medium access control- Hidden and exposed terminals- Near and far terminals- Space Division Multiple Access (SDMA)- Frequency division multiple access- time division multiple access (TDMA)- code division multiple access- carrier sense multiple access- Spread Aloha multiple access.Telecommunication systems: GSM-DECT, protocol layers, TETRA: frame structure, UMTS: components, domains and interfaces, Spreading and Scrambling- wideband CDMA.		9
Unit V	**WIRELESS LAN**	

WLAN technologies: Introduction - IEEE802.11: System architecture, protocol architecture,802.11b, 802.11a. Mobile IP: IP packet delivery, Agent discovery, tunnelling and encapsulation. Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth, Wireless USB, Zigbee, 6LoWPAN, Wireless HART, IPV6. Mobile ad-hoc network: Routing- 4G: Introduction, 4G features and challenges, Applications of 4G	9
TOTAL HOURS	45

Suggested List of Students Activity:

1. Assignment
2. Case study
3. Simulation

Text and Reference Books:

1. Klaus Finkenzeller, “RFID Handbook – Fundamentals and applications in contact less smart cards, radio frequency identification and near-field communication”, 3rd edition,Wiley 2010. (Unit I,II)
2. Jochen Schiller, ”Mobile Communications”, Second Edition, Pearson Education 2012. (Unit III)
3. Vijay Garg, “Wireless Communications and networking”, First Edition, Elsevier 2007.(Unit IV,V)
4. Curty, Declercq, Dehollain and Joehl, “Design and Optimization of passive UHF RFID Systems”, Springer, 2007.
5. V.D. Daniel, A. Puglia and M. Puglia, “RFID: A Guide to Radio Frequency Identification”, Wiley, 2007.

Web-based/Online Resources:

- https://www.rfidinc.com/
- https://solution.murata.com/en-global/service/rfid-solution/basic/
- https://www.fortinet.com/resources/cyberglossary/wireless-network
- https://www.electronicshub.org/wireless-communication-introduction-types-applications/

1058235214	STORAGE TECHNOLOGIES	L	T	P	C
Theory		3	0	0	3

Introduction:

Data storage technology encompasses the devices, objects, and processes used to store computer data in non-volatile form. This course will provide a solid foundation of common data storage media technologies and explores about storage technologies, RAID configurations, backup processes, and recovery techniques. This course also helps to gain essential skills to protect data integrity and confidentiality in today's digital landscape.

Course Objectives:

The main objectives of this course is to

- Characterize the functionalities of logical and physical components of storage
- Describe various storage networking technologies
- Discuss the different backup and recovery strategies
- Understand common storage management activities and solutions

Course Outcomes:

On successful completion of this course, the student will be able to
CO1: Demonstrate the fundamentals of information storage management
CO2: Illustrate the usage of advanced storage system environment and RAID
CO3: Interpret various storage networking architectures – DAS, SAN, NAS
CO4: Examine backup and recovery processes, including backup methods and technologies
CO5: Infer the security needs and security measures to be employed in information storage management

Pre-requisites:

1. Basic understanding of computer systems and networking concepts.
2. Familiarity with operating systems concepts, such as file systems and data management.
3. Knowledge of data storage and networking fundamentals

CO/PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3		3	2			2
CO2	3	3	2	2			
CO3	2	3	2	2			2
CO4		3	2				2
CO5			3		2		2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

1. Deliver the foundational knowledge through lectures and presentations, covering topics such as storage technologies.
2. Analyze real-world case studies of storage infrastructure vulnerabilities.
3. Facilitate group discussions to explore complex storage system issues and security challenges.
4. Invite industry experts and practitioners to deliver guest lectures on emerging trends and best practices in storage system security.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of one will be considered for the internal assessment of 15 Marks.

CA1and CA2 Assessment test should be conducted for two units as below.

PART A: (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write five questions. Each unit four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination-Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1058235214	STORAGE TECHNOLOGIES	L	T	P	C
Theory		3	0	0	3

Unit I	**STORAGE SYSTEMS**	
Introduction to Information Storage and Management: Information Storage – Data – Types of Data – Information – Storage - Evolution of Storage Technology and Architecture - Data Centre Infrastructure- Core Elements - Key Requirements for Data Centre Elements- Key Challenges in Managing Information - Information Lifecycle.		9
Unit II	**INTELLIGENT STORAGE SYSTEM AND RAID**	
Components of a Storage System Environment – Host – Connectivity – Storage – Hard Disk Drive Components - Disk Drive Performance– RAID - RAID Levels - Components of an Intelligent Storage System -Intelligent Storage Array - Concepts in Practice.		8
Unit III	**STORAGE NETWORKING TECHNOLOGIES**	
Direct-Attached Storage - Types of DAS - DAS Benefits and Limitations - Storage Area Networks- SAN Evolution - Components of SAN - Benefits of SAN - Network-Attached Storage Devices - Components of NAS - Benefits of NAS.		10
Unit IV	**BACKUP AND RECOVERY**	
Backup Purpose- Backup Methods- Backup Process- Backup and Restore operations - Backup Topologies - Backup in NAS Environments - Backup Technologies - Recovery techniques: Replication, failover, and data redundancy.		9
Unit V	**SECURING STORAGE INFRASTRUCTURE**	
Storage Security Framework – Overview of storage security threats and vulnerabilities - Storage Security Domains - Securing Backup, Recovery, and Archive -Security Implementations in Storage Networking -Storage Management Activities.		9
	TOTAL HOURS	**45**

Suggested List of Students Activity:

1. Seminar: seminar on storage system security
2. Backup Plan Design: Create a backup plan for hypothetical data scenarios.
3. Case Study Review: Analyse real storage security breaches and propose solutions.
4. Peer assessment activities: where students evaluate each other's work and provide constructive feedback

Text and Reference Books:

1. EMC Corporation, Information Storage and Management, Wiley, India

2. Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, Introduction to Storage Area Networks, Ninth Edition, IBM - Redbooks, December 2017

3. Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein ,Storage Networks Explained, Second Edition, Wiley, 2009

4. Storage Area Networks For Dummies by Christopher Poelker and Alex Nikitin, John Wiley & Sons, 6 Jan 2009

Web-based/Online Resources:

1. https://www.sciencedirect.com/topics/computer-science/storage-technology
2. https://www.geeksforgeeks.org/data-storage-and-its-sorts/

1046234110	SOFTWARE ENGINEERING	L	T	P	C
Theory		3	0	0	3

Introduction:

This course will provide an in-depth understanding of essential concepts and practical applications in the various stages of software development life cycle. Through this course, students will gain the knowledge and skills necessary to work in various software development environments, from analysis to testing and maintenance. By exploring topics such as SQA, Reverse engineering, Reliability and Code of ethics students will be equipped to tackle industry level software development challenges.

Course Objectives:

The main objectives of this course is to

1. Study software development life cycle models concepts, principles and SRS
2. Learn software analysis along with Software Planning, Project Scheduling and Risk Management
3. Know various tools involved in design, implementation and testing.
4. Study various software maintenance facts and principles
5. Gain knowledge of code of ethics and software quality assurance techniques.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Classify life cycle models and write down the software requirement specifications for the given problem.

CO2: Explain various software design strategies and project planning estimation techniques.

CO3: Identify the different categories of Software Maintenance, Risk management and Project Scheduling

CO4: Explain about different testing methods, need for testing tools and the code of ethics for software professional..

CO5: Explain the software quality assurance, reliability and the reverse engineering process.

Pre-requisites:

Basic knowledge of computer engineering concepts, Program development life cycle and computer application concepts

CO/PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3				
CO2	3	3	3	2	2	3	2
CO3	3	3	3	2	2	3	2
CO4	2			3	2	2	3
CO5					3	2	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- Group discussion on application in real world scenarios
- Project-Based Learning

1046234110	SOFTWARE ENGINEERING	L	T	P	C
Theory		3	0	0	3

Introduction:

This course will provide an in-depth understanding of essential concepts and practical applications in the various stages of software development life cycle. Through this course, students will gain the knowledge and skills necessary to work in various software development environments, from analysis to testing and maintenance. By exploring topics such as SQA, Reverse engineering, Reliability and Code of ethics students will be equipped to tackle industry level software development challenges.

Course Objectives:

The main objectives of this course is to

1. Study software development life cycle models concepts, principles and SRS
2. Learn software analysis along with Software Planning, Project Scheduling and Risk Management
3. Know various tools involved in design, implementation and testing.
4. Study various software maintenance facts and principles
5. Gain knowledge of code of ethics and software quality assurance techniques.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Classify life cycle models and write down the software requirement specifications for the given problem.
CO2: Explain various software design strategies and project planning estimation techniques.
CO3: Identify the different categories of Software Maintenance, Risk management and Project Scheduling
CO4: Explain about different testing methods, need for testing tools and the code of ethics for software professional..
CO5: Explain the software quality assurance, reliability and the reverse engineering process.

Pre-requisites:

Basic knowledge of computer engineering concepts, Program development life cycle and computer application concepts

CO/PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3				
CO2	3	3	3	2	2	3	2
CO3	3	3	3	2	2	3	2
CO4	2			3	2	2	3
CO5					3	2	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- Group discussion on application in real world scenarios
- Project-Based Learning

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of one will be considered for the internal assessment of 15 Marks.

CA1and CA2 Assessment test should be conducted for two units as below.

PART A: (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write five questions. Each unit four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination-Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1046234110	SOFTWARE ENGINEERING	L	T	P	C
Theory		3	0	0	3

Unit I	INTRODUCTION TO SOFTWARE ENGINEERING	
Basics of Software Engineering : Need for Software Engineering – Definition – Software Characteristics – Software Myths – Program versus Software Products **Software Development Life Cycle Models:** Introduction –Waterfall Model – Prototyping model – Spiral Model – Iterative Enhancement model – Agile model – Object Oriented Model - Advantages and Disadvantages of above models – Comparison of various models. **Software Requirement Analysis (SRS):** Value of good SRS- developing SRS from Business Requirements- Requirement Process-Requirement Specification – Desirable Characteristics of SRS.		9

Unit II	SOFTWARE DESIGN AND PLANNING	
Software Design : Definition of software design – Objectives of software design – Process of software design – Architectural design – Modular design – Structure chart – Coupling and Cohesion – Different types – Interface design – Design of Human Computer **Software Planning:** Software metrics - Definition – Types of metrics – Product and product metrics-relevant metrics in agile-Function point and feature point metrics - Software project estimation – Steps for estimation – Reason for poor and inaccurate estimation – Project estimation guidelines – Models for estimation – COCOMO Model – Automated tools for estimation – Sprint planning in agile.		9

Unit III	SOFTWARE MAINTENANCE AND RISK MANAGEMENT	
Software Maintenance: Software as an evolution entity – Software configuration management activities – Change control process – Software version control – Software configuration management – Need for maintenance – Categories of maintenance – Maintenance cost –Factors affecting the effort **Risk management :** Definition of risk – Basics for different types of software risks – Monitoring of risks – Risk management – Risk avoidance – Risk detection – Risk		9

control – Risk recovery – Sources of risks – Types of risks		
Unit IV	**SOFTWARE TESTING**	
Software Testing : Introduction to testing – Testing principles – Testing objectives – Basic terms used in testing – Fault – Error – Failure - Test cases – Black box and white box testing – Advantages and disadvantages of above testing – Methods for Block box testing strategies – Methods for white box testing strategies – Testing activities – Test plan – Tracking defects. **Software Testing Life Cycle:** Phases - Requirement Analysis - Test Planning - Test case - Testing Environment Setup - Test Execution - Defect – Failure **Levels of Testing:** Importance - Benefits - comparison of Functional vs Non-Functional testing - Types of Functional Testing - Types of Non Functional Testing - Regression Testing		9
Unit V	**SOFTWARE RELIABILITY AND QUALITY ASSURANCE**	
Software Quality Assurance : Verification and validation – SQA – Objectives and Goals – SQA plan - Definition of software quality – Classification of software qualities - Software quality attributes – Important qualities of software products - Importance of software quality – SEI – CMM - Five levels - ISO 9000 – Need for ISO Certification – Benefits of ISO 9000 certification – Limitation of ISO 9000 certification – Uses of ISO - Salient features of ISO 9000 Requirements – Introduction to ISO 9126 **Software Reliability:** Definition – Reliability terminologies – Classification of failures – Reliability metrics – Reliability growth modeling - Reliability measurement process.		9
TOTAL HOURS		**45**

Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments on Software Engineering
- Periodic class quizzes conducted on a weekly/fortnightly basis to reinforce the basic SDLC concepts and various software models learned
- Micro project that shall be an extension of any concepts such as software design, implementation, testing, maintenance and quality assurance that can be applied to real-

world environment

Text Books:

- Ian Sommerville,"Software Engineering", Sixth Edition, Pearson Education, New Delhi,
- Roger S. Pressman,"Software Engineering – A Practitioner's Approach", First Edition, McGraw-Hill, International Edition, New Delhi.
- Rajib Mall,"Fundamentals of Software Engineering", PHI Learning Pvt Limited, New Delhi.

Reference Books:

- Bharat Bhusan Agarwal, Sumit Prakash Tayal, "Software Engineering", Firewall Media, New Delhi, Second Edition 2008
- Ali Beh forooz and Fredick J Hudson,"Software Engineering fundamentals", Oxford University press, New Delhi, 2005
- Srinivasan desikan and Gopal swamy Ramesh,"Software Testing Principles and Practices", Pearson Education, New Delhi, First Edition.
- Dr.K.V.K.K. Prasad,"Software Testing Tools",Wiley Dream Tech Press, New Delhi, First Edition.

Web-based/Online Resources:

1. https://youtu.be/unZ4G_McZ44
2. https://youtu.be/27jFCX0k8bg
3. https://youtu.be/K1npoRmZuYg
4. https://youtu.be/Cp_XEhexcDw
5. https://www.youtube.com/watch?v=Y7Wg4508tHo
6. https://www.youtube.com/watch?v=dwWHeFSD9dQ

1058235320	INTERNET OF THINGS PRACTICAL	L	T	P	C
Practical		0	0	4	2

Introduction:

Internet of Things (IoT) uses physical objects embedded with sensors, readout electronics, networking, communication, enabling intelligent data exchange or storage between these devices. Within the last decade, various commercial IoT products are available in the market. These are widely used in applications like smart health care and monitoring, autonomous vehicles, smart home, smart city applications and others. IoT lab encourages interdisciplinary research where different departments share the common platform.

Course Objectives:

- To implement the concepts of IoT.
- To interface with Arduino platforms
- To design and implement the related applications
- To learn how to analyze the data in IoT.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1. Understand the concept of Internet of Things

CO2. Use microcontroller based embedded platforms in IoT

CO3. Use wireless peripherals for exchange of data

CO4. Use of Devices, Gateways and Data Management in IoT

CO5. Use the knowledge and skills acquired during the course to build and test a complete,

working IoT system involving prototyping, programming and data analysis

Pre-requisites:

Knowledge of basic Computers and Networking

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	-	-	-	-	1
CO2	3	3	3	3	1	-	1
CO3	3	3	3	3	2	2	1
CO4	2	1	1	1	-	-	1
CO5	2	2	2	2	1	1	1

Legend:3-HighCorrelation,2-MediumCorrelation,1-LowCorrelation

Instructional Strategy:

a. Massive open online courses (MOOCs) may be used to teach various topics/subtopics.

b. Guide student(s) in undertaking micro-projects.

c. Different types of teaching methods such as flipped classroom, tutorials, peer-peer learning may be employed by teachers to develop the outcomes.

d. About 10-15% of the topics/sub-topics which are relatively simpler or descriptive in nature is to be given to the students for self-learning, but to be assessed using different assessment methods.

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Practical Document	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Exercises	All Exercises	All Exercises
Duration	2 Periods	2 Periods	Regularly	3 Hours	3 Hours
Exam Marks	50	50	Each Practical 10 Marks	100	100
Converted to	10	10	10	20	60
Marks	10		10	20	60
Internal Marks	40				60
Tentative Schedule	7th Week	14th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments as per the portions mentioned above should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded will be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim & Procedure	35
2	Execution and Result	15
TOTAL		50

- **CA 3:** Practical document should be maintained for every exercise / experiment immediately after completion of the practice. The same should be evaluated for 10 Marks. The total marks awarded should be converted to 10 Marks for the internal

assessment. The practical document should be submitted for the Practical Test and End Semester Examination with a bonafide certificate.

The details of the documents to be prepared as per the instruction below.

The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded should be converted to 20 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination- Practical Exam

S. NO.	ALLOCATION	MARKS
1	Aim (05) ,Program from Part – A (30)	35
2	Aim (05) ,Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

1058235320	INTERNET OF THINGS PRACTICAL	L	T	P	C
Practical		0	0	4	2

Theory Portion/Introduction

Introduction to Internet of Things, Characteristics & Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Arduino.	

Practical Exercises

Part - A 1. Study of Arduino Uno board technical specifications and pins. 2. Study of various Sensors and actuators for IoT applications. 3. To implement LED Pattern with Push Button Control With Arduino 4. To turn ON and OFF the 3 LEDs (Red, Green, Blue) based on the 3 Pushbutton switches with Arduino. 5. To implement automated traffic signal system using different colour LED with Arduino. 6. To read analog input from a potentiometer and control the brightness of an LED with Arduino. **Part - B** 7. To monitor DHT sensor to measure temperature and humidity with Arduino. 8. To monitor ultrasonic sensor to measure distance and display it on the Serial Monitor with Arduino. 9. To monitor PIR sensor to detect presence/movement and turn on an LED automatically with Arduino. 10. To control the servo motors back and forth across 180 degrees with Arduino. 11. To print "Hello IoT" on a 16x2 LCD display with Arduino. 12. To implement the IR Sensor Analog Input With Arduino.	60
TOTAL HOURS	60

Suggested List of Students Activity:

- Students are encouraged to register themselves in various MOOCs such as: Swayam, edx, Coursera, Udemy etc to further enhance their learning.
- Undertake Swayam MOOC online course: “Introduction to Internet of Things”:

https://onlinecourses.nptel.ac.in/noc24_cs35/preview

Text and Reference Books:

1. Rajkamal, Internet of Things: Architecture and Design Principles, 2 nd Edition, McGraw Hill Education, 2017.

2. David Hanes, Gonzalo salgueiro, IoT Fundamentals Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017.

3. Adrian McEwen, Hakim Cassimally, Designing the Internet of Things, John Wiley and Sons, Ltd., 2014.

Web-based/Online Resources:

- Swayam MOOC online course for the introduction to internet of Things: https://onlinecourses. nptel.ac.in/noc24_cs35/preview
- Arduino tutorial: https://www.arduino.cc/reference/en/
- Online Simulator for Arduino: https://www.tinkercad.com/dashboard

Equipment/Facilities required to conduct the Practical Course.(Batch Strength: 30 Students)

Software Requirement:

- Computer system with operating system: Windows 7 or higher Ver., macOS, and Linux, with 4GB or higher RAM, Python versions: 2.7.X, 3.6.X
- Arduino Uno, clock speed of 16 MHz,14 digital I/O pins, 6 analog input pins, UART for serial communication, voltage regulator (7v to 12v), USB connector with RESET Button.
- LEDs, Humidity and Temperature Sensor, Ultrasonic Sensor, Light Sensor, Servo motor, 16x2 LCD display, PIR Sensor, Potentiometer, relay etc. ESP8266 (Wi-Fi) board.

BOARD PRACTICAL EXAMINATION

PART A

1. Study of Arduino Uno board technical specifications and pins.
2. Study of various Sensors and actuators for IoT applications.
3. To implement LED Pattern with Push Button Control With Arduino
4. To turn ON and OFF the 3 LEDs (Red, Green, Blue) based on the 3 Pushbutton switches with Arduino.
5. To implement automated traffic signal system using different colour LED with

Arduino.

6. To read analog input from a potentiometer and control the brightness of an LED with Arduino.

PART B

7. To monitor DHT sensor to measure temperature and humidity with Arduino.
8. To monitor ultrasonic sensor to measure distance and display it on the Serial Monitor with Arduino.
9. To monitor PIR sensor to detect presence/movement and turn on an LED automatically with Arduino.
10. To control the servo motors back and forth across 180 degrees with Arduino.
11. To print "Hello IoT" on a 16x2 LCD display with Arduino.
12. To implement the IR Sensor Analog Input With Arduino.

SCHEME OF VALUATION

Section	Description	Marks
1	Aim (05) ,Program for the experiment from Part – A (30)	35
2	Aim (05) ,Program for the experiment from Part – B (30)	35
3	Executing any one program (Part A **OR** Part –B)	15
4	Output	10
	Viva Voce	5
TOTAL MARKS		**100**

1058235440	COMPUTER NETWORKS AND CLOUD COMPUTING	L	T	P	C
Practicum		1	0	4	3

Introduction:

Computer Networks and Cloud Computing is to understand the principles, technologies, and applications of networked systems, including local area networks (LANs), wide area networks (WANs). The cloud computing is to provide on-demand access to a shared pool of configurable computing resources (such as networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

Course Objectives:

- To understand the concept of layering in networks.
- To know the functions of protocols of each layer of TCP/IP protocol suite
- To visualize the end-to-end flow of information
- To introduce the various levels of services that can be achieved by a cloud. .
- To implement the various deployment models such as private, public, hybrid and community with SaaS, Iaas and Paas

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Explain the basic layers and its functions in computer networks.

CO2: Understand the basics of how data flows from one node to another.

CO3: Analyze routing algorithms.

CO4: To familiar with the different service models in cloud computing, such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).

CO5: To analyze real-world case studies and participate in hands-on projects.

Pre-requisites:

- Familiarity with basic networking concepts such as IP addressing, routing, and protocols (TCP/IP, UDP, HTTP, etc.).
- Familiarity with virtualization technologies (e.g., VMware, VirtualBox) helps in understanding how cloud resources are managed and allocated.
- Knowledge of storage systems and data management is important, as cloud computing often involves large-scale data storage and retrieval.
- Awareness of basic security principles and practices is crucial, as cloud computing raises new security challenges.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3						
CO2	3						
CO3		3					
CO4	3	2	2				
CO5	3		3				3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

1. Lectures
2. Hands on Labs
3. Case studies
4. Group projects
5. Simulations

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 hours
Exam Marks	60	60	100	100	100
Converted to Marks	10	10	15	15	60
Marks	10		15	15	60
Internal Marks	40				
Tentative Schedule	7th Week	14th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim (05) , Procedure (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

- **CA 3:** Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			100 Marks

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

SNO	ALLOCATION	MARKS
1	Aim (05) ,Procedure from Part – A (30)	35
2	Aim (05) ,Procedure from Part – B (30)	35
3	Executing any one from (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

1058235440	COMPUTER NETWORKS AND CLOUD COMPUTING	L	T	P	C
Practicum		1	0	4	3

Unit I	INTRODUCTION AND APPLICATION LAYER	
Theory: UNIT I Data Communication - Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Introduction to Sockets - Application Layer protocols: HTTP – FTP – Email protocols (SMTP - POP3 - IMAP - MIME) – DNS – SNMP.		4
Practical Exercises 1. Set up a small Local Area Network (LAN) using Ethernet cables, switches, and computers to understand the basics of network configuration and communication. 2. Create a simple website to understand how web servers and web browsers communicate using the HTTP protocol. 3. Set up an FTP server and client to understand how file transfer protocols work and how files are transferred over a network.		5 5 6
Unit II	**TRANSPORT LAYER**	
Theory: Introduction - Transport-Layer Protocols: UDP – TCP: Connection Management – Flow control - Congestion Control - Congestion avoidance– SCTP – Quality of Service.		3
Practical Exercises **4.** Applications using TCP sockets like: a) Echo client and echo server b) Chat **5.** Write a HTTP web client program to download a web page using TCP sockets		6 6
Unit III	NETWORK LAYER	
Theory: Switching : Packet Switching - Internet protocol - IPV4 – IP Addressing – Subnetting - IPV6, ARP, RARP, ICMP, DHCP		3
Practical Exercises 6. Learn how to configure IP addresses manually and using DHCP (Dynamic Host Configuration Protocol) to enable communication between devices on the network **7.** Use the ping and trace route commands to test connectivity and trace the route of packets between two hosts on a network.		4 4
Unit IV	CLOUD COMPUTING ARCHITECTURE	

Theory: Cloud architecture: Cloud delivery model – SPI framework, SPI evolution, SPI vs. traditional IT Model. Software as a Service (SaaS): SaaS service providers – Web Services –Web 2.0 – Web Operating system -Google App Engine, Salesforce.com and google platform – benefits – Operational benefits, Economic benefits –Evaluating SaaS Platform as a Service (PaaS): Cloud Plat form & Management – Computation& Storage - PaaS service providers – Right Scale – Salesforce.com – Rackspace - Force.com – services and benefits.	3
Practical Exercises 8. To implement program on SaaS to Create an word document of your class time table and store locally and on cloud with doc and pdf format 9. To implement web services by create your BlogSpot and Collaborating via Wikis **10.** To implement on PaaS to Install Google App Engine, create a program to validate user; create a database login (username, password) in mysql and deploy to cloud.	5 5 6
Unit V SECURITY IN THE CLOUD	
Understanding Cloud Security - Securing the Cloud - Security service boundary: CSA Cloud Reference Model - Securing Data – Brokered cloud storage access - Storage location and tenancy – Encryption.	2
Practical: 11. Install Virtual box / VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8. **12.** Install OpenStack and use it as Infrastructure as a Service and use technology own Cloud.	4 4
TOTAL HOURS	**75**

Suggested List of Students Activity:

1. **Network Protocols Exploration**
    a. Have students research and present on different network protocols (e.g., TCP/IP, HTTP, DNS) and their roles in data communication.
2. **Network Design Project**
    a. Assign a project where students design a network for a fictional company. This can include creating a network diagram, specifying hardware and software components, and justifying design decisions.
3. **Network Troubleshooting**
    a. Create scenarios where students troubleshoot network issues, such as connectivity problems, slow performance, or misconfigured devices.

4. **Network Security Scenarios**
    a. Present students with network security scenarios (e.g., malware infection, unauthorized access) and have them propose solutions to mitigate risks and improve network security.
5. **Hands-On Labs**
    a. Provide access to a cloud computing platform (e.g., AWS Educate, Google Cloud Platform Education Grants) for students to complete hands-on labs. This could include deploying virtual machines, setting up databases, or building serverless applications.
6. **Cloud Migration Planning**
    a. Assign a project where students develop a migration plan for moving an on-premises application to the cloud. This can include assessing dependencies, estimating costs, and identifying potential risks.
7. **Cloud Security**
    a. Explore the importance of security in cloud computing and have student's research best practices for securing cloud-based applications and data.
8. **Cloud Certification Preparation**
    a. Provide resources and guidance for students interested in pursuing cloud computing certifications (e.g., AWS Certified Solutions Architect, Azure Fundamentals).

Text and Reference Books:

1. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Eighth Edition, Pearson Education, 2021.
2. Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, Sixth Edition TMH, 2022.
3. CLOUD SECURITY: A Comprehensive Guide to Secure Cloud Computing Ronald L. Krutz Russell Dean Vines Wiley Publishing, Inc.
4. Cloud Computing A Practical Approach 2008 Edition Cloud Computing A practical Approach Tata McGrawHill
5. Cloud Computing Bible Barrie Sosinsky Wiley Publishing, Inc.

Web-based/Online Resources:

- http://www.redbooks.ibm.com/abstracts/gg243376.html
- http://www.tcpipguide.com/

- http://www.ietf.org/rfc.html
- https://cloud.google.com/docs/
- https://www.qwiklabs.com/

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

Hardware

1. Desktop systems
2. Printer

Software

1. Linux (e.g., Ubuntu, CentOS) and windows
2. VirtualBox: Free and open-source software for virtualization.
3. Java
4. Python
5. C++

BOARD PRACTICAL EXAMINATION

PART A

1. Set up a small Local Area Network (LAN) using Ethernet cables, switches, and computers to understand the basics of network configuration and communication.
2. Create a simple website to understand how web servers and web browsers communicate using the HTTP protocol.
3. Set up an FTP server and client to understand how file transfer protocols work and how files are transferred over a network.
4. Applications using TCP sockets like: a) Echo client and echo server b) Chat
5. Write a HTTP web client program to download a web page using TCP sockets
6. Learn how to configure IP addresses manually and using DHCP (Dynamic Host Configuration Protocol) to enable communication between devices on the network

PART B

7. Use the ping and trace route commands to test connectivity and trace the route of packets between two hosts on a network.
8. To implement program on SaaS to Create an word document of your class time table and store locally and on cloud with doc and pdf format

9. To implement web services by create your BlogSpot and Collaborating via Wikis
10. To implement on PaaS to Install Google App Engine, create a program to validate user; create a database login (username, password) in mysql and deploy to cloud.
11. Install Virtual box / VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
12. Install OpenStack and use it as Infrastructure as a Service and use technology own Cloud.

SCHEME OF VALUATION

Section	Description	Marks
1	Aim (05) ,Program for the experiment from Part – A (30)	35
2	Aim (05) ,Program for the experiment from Part – B (30)	35
3	Executing any one program (Part A **OR** Part –B)	15
4	Output	10
	Viva Voce	5
TOTAL MARKS		**100**

ELECTIVE 2

1058235541	PYTHON PROGRAMMING	L	T	P	C
Practicum		1	0	4	3

Introduction:

This course introduces students to the fundamentals of programming using Python. It covers basic to advanced concepts in Python programming, including data types, control structures, functions, file handling, and object-oriented programming. Through this course, students will gain practical experience in programming and problem-solving using Python.

Course Objectives:

The primary objective of this course is to familiarize students with the Python programming language and its applications. By the end of the course, students should be able to write Python programs to solve a variety of computational problems.

Course Outcomes:

On successful completion of this course, the student will be able to,

CO1: Understand the basic syntax and semantics of Python programming language.
CO2: Use Python to solve computational problems and perform data manipulation tasks.
CO3: Develop and implement algorithms in Python.
CO4: Apply object-oriented programming concepts in Python.
CO5: Write efficient and readable Python code.

Pre-requisites:

1. Basic understanding of computer science concepts.
2. Familiarity with programming fundamentals, such as variables, loops, and conditionals.
3. Knowledge of basic mathematics and logic.
4. Ability to use a computer and navigate its file system.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3						
CO2	3	3	3				
CO3	3	3	3				
CO4	3	3	3	2			
CO5			3	3			

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

1. Lectures
2. Tutorial
3. Group discussion on application in real world scenarios

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 hours
Exam Marks	60	60	100	100	100
Converted to Marks	10	10	15	15	60
Marks	10		15	15	60
Internal Marks	40				
Tentative Schedule	7th Week	14th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim (05) , Procedure (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

- **CA 3:** Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			100 Marks

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

SNO	ALLOCATION	MARKS
1	Aim (05) ,Procedure from Part – A (30)	35
2	Aim (05) ,Procedure from Part – B (30)	35
3	Executing any one from (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

1058235541	PYTHON PROGRAMMING	L	T	P	C
Practicum		1	0	4	3

Unit I - Introduction to Python	
Introduction to Python, history, and features of Python programming language. Python identifiers, keywords, variables, and basic data types. Python control structures (if, elif, else, for, while).	3
Ex No. 1 Write a program to perform arithmetic operations using variables. Ex No. 2 Implement a program to find the largest of three numbers using if-elif-else.	6 6
Unit II - Exploring Python's Data Structures and Functions	
Lists, tuples, and their operations in Python - String manipulation and dictionary data structure in Python - Functions, function definition, parameters, and return statement.	3
Ex No. 3 Write a program to sort a list of numbers using the bubble sort algorithm. Ex No. 4 Write a program to find the factorial of a number using a recursive function.	6 6
Unit III - Python File Handling, Exception Handling, and Modules	
File handling in Python (open, read, write, close) - Exception handling in Python (try, except, finally) - Python modules and packages, importing modules.	3
Ex No. 5 Write a program to read a file and count the number of words in it. Ex No. 6 Execute a program to handle divide by zero exception. Ex No.7 Write a program to create a module and import it into another program.	4 4 4
Unit IV - Object-Oriented Programming and Regular Expressions	
Introduction to object-oriented programming (classes, objects, inheritance, polymorphism). Advanced OOP concepts (encapsulation, abstraction, inheritance, polymorphism) - Regular expressions in Python, re module.	3

Ex No. 8 Implement a python program for simple class and create objects. Ex No. 9 Write a program to demonstrate inheritance and polymorphism in Python.	6 6
Unit V- Data Analytics and GUI programming	
Connecting Python with databases (SQLite, MySQL)- Introduction to GUI programming using tkinter - Python in Data Analytics (Basic only).	3
Ex No. 10 Write a program to connect to a database and perform CRUD operations. Ex No. 11 Develop a program to create a simple GUI application. Ex No. 12 Sales Data Analysis with Python: Calculate total sales for each product.	4 4 4
Total	**75**

Suggested List of Students Activity:

1. Write a program to calculate the factorial of a number.
2. Create a simple calculator program using Python functions.
3. Develop a program to manage a student database using dictionaries.
4. Implement a basic text-based game using Python classes.
5. Write a program to simulate a bank account management system.
6. Create a program to analyze and visualize data using matplotlib.
7. Develop a web scraper to extract information from a website.
8. Implement a simple chatbot using Python's natural language processing libraries.
9. Write a program to automate file handling tasks, such as renaming files in a directory.
10. Create a program to generate and analyze statistical data sets using numpy and pandas.

Text and Reference Books:

1. Eric Matthes, "Python Crash Course" , 2nd Edition, No Starch Press, 2019.
2. John Zelle, Franklin , "Python Programming: An Introduction to Computer Science" , 3rd Edition, Beedle & Associates Inc., 2016.
3. Mark Lutz, O'Reilly Media, "Learning Python", 5th Edition, 2013.

4. David Beazley and Brian K. Jones, "Python Cookbook", 3rd Edition, O'Reilly Media, 2013.
5. Luciano Ramalho, "Fluent Python", 1st Edition, O'Reilly Media, 2015.

Web-based/Online Resources:

1. https://www.python.org/ - Official Python website with documentation and tutorials.
2. https://www.codecademy.com - Offers interactive Python programming courses.
3. https://www.geeksforgeeks.com/ - Provides Python programming tutorials and practice questions.
4. https://www.stackoverflow.com/ - Forum for asking and answering Python programming questions.
5. https://www.realpython.com/ - Offers Python tutorials, articles, and resources for all skill levels.

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

HARDWARE

1. Desktop Computers – 30 Nos
2. Printer – 1 Nos

SOFTWARE

1. Python 3.x

BOARD PRACTICAL EXAMINATION

PART A

1. Write a program to perform arithmetic operations using variables.
2. Implement a program to find the largest of three numbers using if-elif-else.
3. Write a program to sort a list of numbers using the bubble sort algorithm.
4. Write a program to find the factorial of a number using a recursive function.
5. Write a program to read a file and count the number of words in it.
6. Execute a program to handle divide by zero exception.

PART B

7. Write a program to create a module and import it into another program.
8. Implement a python program for simple class and create objects.
9. Write a program to demonstrate inheritance and polymorphism in
10. Write a program to connect to a database and perform CRUD operations.

11. Develop a program to create a simple GUI application.

12. Sales Data Analysis with Python: Calculate total sales for each product.

SCHEME OF VALUATION

Section	Description	Marks
1	Aim (05) ,Program for the experiment from Part – A (30)	35
2	Aim (05) ,Program for the experiment from Part – B (30)	35
3	Executing any one program (Part A **OR** Part –B)	15
4	Output	10
	Viva Voce	5
TOTAL MARKS		**100**

1058235542	COMPUTER PRIVACY AND SECURITY	L	T	P	C
Practicum		1	0	4	3

Introduction:

The learners are able to understand various security levels of windows operating systems. This course supports and provides the guidelines for the learner to configure and manage the access policies. The database level security gives the complete information about the user and access management. The background information about antivirus software with features with various analysis methods have been given to the learners. They can understand basic concepts about data encryption and decryption techniques with algorithms in order to secure the communication between parties. The data integrity and key exchange procedure helps the learners to implement their own algorithm during the message transmission. This course provides the intruder detection methods and its types in a distributed manner with auditing mechanisms. The main aim of this course is to secure the host as well as network in a highly secure and reliable manner.

Course Objectives:

- To understand various techniques of operating system and database security
- To gain knowledge about system security with related technologies
- To learn about cryptographic algorithm for securing the data with implementation
- To implement various key exchange and integrity methods
- To understand about intruder detection system with the monitoring of network

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Able to understand different security practices in windows operating system

CO2: Able to analyse various security commands and technologies for securing the system

CO3: Able to gain knowledge about different models of network security

CO4: Able to understand the key exchange during message transfer using various algorithms

CO5: Able to analyse and understand malware and intruder detection models

Pre-requisites:

- Windows operating system commands

- Cryptography and network security
- Open source tools used for security

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	3	3	3	3	2	2
CO2	2	3	3	3	3	2	2
CO3	2	3	3	3	3	2	2
CO4	2	2	2	2	2	2	2
CO5	2	3	3	3	3	2	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

1. Lecture
2. Demo on open source tools
3. Hands-on training
4. Online simulations

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 hours
Exam Marks	60	60	100	100	100
Converted to Marks	10	10	15	15	60
Marks	10		15	15	60
Internal Marks	40				
Tentative Schedule	7th Week	14th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement

of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

- **CA 3:** Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			100 Marks

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

SNO	ALLOCATION	MARKS
1	Aim (05), Program from Part – A (30)	35
2	Aim (05), Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

1058235542	COMPUTER PRIVACY AND SECURITY	L	T	P	C
Practical		1	0	4	3

Unit I	WINDOWS SECURITY	
Theory: Windows 7 security: Lock Your PC Using a USB Drive- Configure Windows Backup- Disallow Remote Assistance- Make Hidden Files Visible- Freeze the Hard Disk- Set a Password for BIOS- Disable Unnecessary Ports/Protocols windows 10 security: Windows Biometric Authentication- Windows Update- Windows Defender- Windows Backup- Recovery- Find My Device- Privacy Settings- Virtual Machines and Portable Apps Database security: Create a MySQL User- Specify the password- Create new user and grant all privileges to schema- revoke privileges from schema.		5
Practical: 1. Write a procedure for the following o To protect your personal computer system o To create User Accounts with Passwords 2. Write a procedure for the following o To protect a Microsoft word document o To remove the password 3. Write a procedure to protecting and securing MYSQL databases with the following o To create a user account o To grant necessary privileges to the user o To revoke privileges from the user		10
Unit II	**SYSTEM SECURITY**	
Theory: Introduction to Antivirus Software- Antivirus Features- Understanding Antivirus Signatures- The Update System- Denial of Service- Static Analysis- Dynamic Analysis		5
Practical: 4. Write a procedure to Installing Antivirus Software on Windows operating system 5. To study of various Privacy and Security Settings Commands on windows operating systems		10
Unit III	**NETWORK SECURITY**	
Theory:		5

Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Data Encryption Standard, Advanced Encryption Standard, RSA Algorithm	
Practical: 6. Perform encryption, decryption using the following substitution techniques o Ceaser cipher o Playfair cipher 7. Perform encryption and decryption using following transposition techniques o Rail fence o Row & Column Transformation 8. Implementation and Performance evaluation of RSA cryptographic algorithms in java	**10**
Unit IV	**CRYPTOGRAPHIC DATA INTEGRITY.**
Theory: Diffie Hellman Key Exchange Algorithm, Hash Functions, Secure Hash Algorithm, Digital Signature Algorithm	**5**
Practical: 9. Implement the Diffie-Hellman Key Exchange algorithm for a given problem. 10. Calculate the message digest of a text using the SHA-1 algorithm.	**10**
Unit V	**INTRUDER DETECTION AND ANALYSIS**
Theory: Malware, Malware Analysis, Types of Malware Analysis, Introduction To Sniffers, Active And Passive Sniffing, ARP Spoofing And Redirection, DNS And IP Sniffing And Spoofing, HTTPS Sniffing, Intruders, Intrusion Detection, Audit Records, Rule Based Intrusion Detection, Distributed Intrusion Detection, Honeypots	**5**
Practical: 11. Working with Sniffers for monitoring network communication using o Wire shark o Snort 12. Study Intrusion Detection Systems and Honey pots.	**10**
TOTAL HOURS	**75**

Suggested List of Students Activity:

1. Assignment

2. Case study
3. Simulation
4. Technology enabled learning

Text and Reference Books:

1. Nihad A. Hassan, Rami Hijaz,"Digital Privacy and Security Using Windows A Practical Guide",Apress, 2017
2. Joxean Koret Elias Bachaalany,"The Antivirus Hacker's Handbook"John Wiley & Sons, Inc.,2015
3. william stallings, "cryptography and network security principles and practices",prentice hall publisher, pearson, fifth edition,2016

Web-based/Online Resources:

- https://repo.zenk-security.com/Magazine%20E-book/EN-Ethical%20Hacking.pdf
- stackoverlfow contributers,"Learning Mysql"-https://riptutorial.com/Download/mysql.pdf
- Hybrid Analysis: https://www.hybrid-analysis.com/
- KernelMode.info: http://www.kernelmode.info/forum/viewforum.php?f=16
- VirusBay: https://beta.virusbay.io/
- Contagio malware dump: http://contagiodump.blogspot.com/
- AVCaesar: https://avcaesar.malware.lu/
- Malwr: https://malwr.com/
- VirusShare: https://virusshare.com/
- theZoo: http://thezoo.morirt.com/

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

Hardware Requirements:

Desktop Computers:	30 Nos
Laser Printer:	1No.

Software Requirements:

Operating System:	Windows 7 and Windows 10
Database:	MySQL 5.5 and above
Language:	JDK1.7 and above
Network analyser:	Wire shark 4.2.3
IDS system:	Snort 2.9.20

BOARD PRACTICAL EXAMINATION

PART A

1. Write a procedure for the following
    - To protect your personal computer system
    - To create User Accounts with Passwords
2. Write a procedure for the following
    - To protect a Microsoft word document
    - To remove the password
3. Write a procedure to protecting and securing MYSQL databases with the following
    - To create a user account
    - To grant necessary privileges to the user
    - To revoke privileges from the user
4. Write a procedure to Installing Antivirus Software on Windows operating system
5. To study of various Privacy and Security Settings Commands on windows operating systems

PART B

6. Perform encryption, decryption using the following substitution techniques
    - Ceaser cipher
    - Playfair cipher
7. Perform encryption and decryption using following transposition techniques
    - Rail fence
    - Row & Column Transformation
8. Implementation and Performance evaluation of RSA cryptographic algorithms in java.
9. Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
10. Calculate the message digest of a text using the SHA-1 algorithm.
11. Working with Sniffers for monitoring network communication using
    - Wire shark
    - Snort
12. Study Intrusion Detection Systems and Honey pots.

SCHEME OF VALUATION

Section	Description	Marks
1	Aim (05) ,Program for the experiment from Part – A (30)	35
2	Aim (05) ,Program for the experiment from Part – B (30)	35
3	Executing any one program (Part A **OR** Part –B)	15
4	Output	10
	Viva Voce	5
TOTAL MARKS		**100**

1058235543	BASICS OF MACHINE LEARNING TECHNIQUES	L	T	P	C
Practicum		1	0	4	3

Introduction:

This course introduces principles, algorithms, and applications of machine learning from the point of view of modeling and prediction. It includes formulation of learning problems and concepts of representation, over-fitting, and generalization. These concepts are exercised in supervised learning and reinforcement learning, with applications to images and to temporal sequences.

Course Objectives:

- To understand the basic concepts of machine learning
- To appreciate supervised learning and their applications.
- To understand unsupervised learning like clustering and EM algorithms.
- To understand the theoretical and practical aspects of probabilistic graphical models.
- To learn other learning aspects such as reinforcement learning, representation learning, deep learning, neural networks and other technologies

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Gain knowledge about basic concepts of machine learning techniques

CO2: Develop predictive model based on both input and output data

CO3: Apply various classification algorithms for classifying the categories of input data

CO4: Apply the unsupervised learning algorithm and dimensionality reduction techniques

CO5: Design systems that uses the appropriate graphical models of machine learning

Pre-requisites:

Knowledge of basic mathematics and python programming

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	3	3	1	1	2
CO2	2	2	3	3	1	1	2
CO3	2	2	3	3	1	1	2
CO4	2	2	3	3	1	1	2
CO5	2	2	3	3	1	1	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- Teachers must take steps to gain pupils' attention and boost their learning confidence by using multiple teaching aids.
- Teachers should provide examples from daily life, realistic situations, and real world engineering and technological applications.
- Plan demonstrations to make subject exciting and to foster scientific mindset.
- Theory-demonstrate-practice-activity strategy may be used to ensure that the learning outcome is achieved.

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 hours
Exam Marks	60	60	100	100	100
Converted to Marks	10	10	15	15	60
Marks	10		15	15	60
Internal Marks	40				
Tentative Schedule	7th Week	14th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement

of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

- **CA 3:** Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			100 Marks

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION
Model Practical Examination and End Semester Examination - Practical Exam

S. NO	ALLOCATION	MARKS
1	Aim (05) ,Program from Part – A (30)	35
2	Aim (05) ,Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

1058235543	BASICS OF MACHINE LEARNING TECHNIQUES	L	T	P	C
Practicum		1	0	4	3

Unit I	INTRODUCTION TO MACHINE LEARNING	
Theory: Machine Learning – Types of Machine Learning – Supervised Learning – Unsupervised Learning – Basic Concepts in Machine Learning – Machine Learning Process – Weight Space – Testing Machine Learning Algorithms.		5
Practical: 1. Python programming using numpy 2. File handling in python		10
Unit II	**SUPERVISED LEARNING – REGRESSION**	
Linear Models for Regression – Linear Basis Function Models – The Bias-Variance Decomposition – Bayesian Linear Regression – Common Regression Algorithms – Simple Linear Regression – Multiple Linear Regression		5
Practical: 3. implementation of simple linear regression 4. implementation of multiple linear regression		10
Unit III	**SUPERVISED LEARNING – CLASSIFICATION**	
Linear Models for Classification – Discriminant Functions – Probabilistic Generative Models – Probabilistic Discriminative Models – Laplace Approximation – Bayesian Logistic Regression – Common Classification Algorithms – k-Nearest Neighbors – Decision Trees – Random Forest model – Support Vector Machines		5
Practical: Implementation of the following algorithms 5. Logistic regression 6. Decision Tree 7. Ramdom forest 8. SVM		10
Unit IV	**UNSUPERVISED LEARNING**	
Mixture Models and EM – K-Means Clustering – Dirichlet Process Mixture Models – Spectral Clustering – Hierarchical Clustering – The Curse of Dimensionality – Dimensionality Reduction – Principal Component Analysis – Latent Variable Models(LVM) – Latent Dirichlet Allocation (LDA)		5

Practical: Implementation of the following algorithms 9. K-Means clustering 10. Principal Component Analysis	10
Unit V **GRAPHICAL MODELS**	
Bayesian Networks – Conditional Independence – Markov Random Fields – Learning – Naive Bayes Classifiers – Markov Model – Hidden Markov Model	5
Practical: Implementation of the following algorithms 11. Naive Bayes 12. Markov model	10
TOTAL HOURS	**75**

Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments based on Machine Learning.
- Periodic class quizzes conducted on a weekly/fortnightly basis to reinforce the basic Machine Learning.
- Mini project that shall be an extension of any algorithms in Machine Learning that can be applied to real-world environment.
- Better understanding through work sheets / Quiz/Oral Testing
- Problem-Solving Tasks

Text and Reference Books:

1. Willi Richert, Luis Pedro Coelho - Building Machine Learning Systems with Python-Packt Publishing (2013)
2. Michael David - A Practical Introduction to Python Programming _ Hand-On Machine Learning With Python (2021)
3. Sujit Bhattacharyya, Subhrajit Bhattacharya, Practical Handbook of Machine Learning (2021)

Web-based/Online Resources:

- MachineHack Generative AI Feed
- Learn AI, Machine Learning, Deep Learning & Big Data | CloudxLab
- Welcome To Colaboratory - Colaboratory (google.com)
- Kaggle: Your Machine Learning and Data Science Community

- OpenML

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

HARDWARE REQUIREMENTS

Desktop Computers ….. 30 Nos

SOFTWARE REQUIREMENTS

Python

BOARD PRACTICAL EXAMINATION

PART A

1. Python programming using numpy
2. File handling in python
3. implementation of simple linear regression
4. implementation of multiple linear regression
5. Logistic regression
6. Decision Tree

PART B

7. Ramdom forest
8. SVM
9. K-Means clustering
10. Principal Component Analysis
11. Naive Bayes
12. Markov model

SCHEME OF VALUATION

Section	Description	Marks
1	Aim (05) ,Program for the experiment from Part – A (30)	35
2	Aim (05) ,Program for the experiment from Part – B (30)	35
3	Executing any one program (Part A **OR** Part –B)	15
4	Output	10
	Viva Voce	5
TOTAL MARKS		**100**

1058235544	OBJECT ORIENTED SYSTEM DESIGN	L	T	P	C
Practicum		1	0	4	3

Introduction:

This course introduces students to the principles and techniques of object-oriented system design. Students will learn how to analyze, design, implement, and test software systems using object-oriented methodologies. Topics covered include object-oriented analysis and design, UML diagrams, design patterns, and software architecture.

Course Objectives:

- Gain a deep understanding of object-oriented programming (OOP) concepts.
- Learn common design patterns and how to apply them to solve design problems in software development.
- Learn to use Unified Modeling Language (UML) diagrams to model software systems and communicate design ideas.
- Gain proficiency in using design tools and integrated development environments (IDEs) to design and implement software systems.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Understand the principles of object-oriented programming.

CO2: Apply object-oriented analysis and design techniques to solve real-world problems.

CO3: Create UML diagrams to model software systems.

CO4: Implement object-oriented designs using a programming language such as Java or C++.

CO5: Use UML tools to draw class diagrams, sequence diagrams, activity diagrams etc.

Pre-requisites:

1. Basic knowledge in programming concepts and problem-solving.
2. Proficiency in object-oriented programming (OOP) concepts

3. Familiarity with the software development lifecycle (SDLC) and software engineering principles, including requirements analysis, design, implementation, testing, and maintenance.
4. Basic knowledge of operating systems concepts.
5. Proficiency in at least one programming language (e.g., Java, C++, Python)

CO/PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	-	-	-	-
CO2	3	3	2	-	-	-	-
CO3	3	2	-	-	-	-	2
CO4	3	2	3	-	3	-	-
CO5	2	1	-	-	2	-	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

1. Lectures
2. Tutorial
3. Group discussion on application in real world scenarios

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 hours
Exam Marks	60	60	100	100	100
Converted to Marks	10	10	15	15	60
Marks	10		15	15	60
Internal Marks	40				
Tentative Schedule	7th Week	14th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

- **CA 3:** Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			100 Marks

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION
Model Practical Examination and End Semester Examination - Practical Exam

SNO	ALLOCATION	MARKS
1	Aim (05) ,Program from Part – A (30)	35
2	Aim (05) ,Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

1058235544	OBJECT ORIENTED SYSTEM DESIGN	L	T	P	C
Practicum		1	0	4	3

Unit – I Introduction to Object-Oriented System Design	
Classes - Attributes – Methods- Relationship: Association - Aggregation – Composition. Objects - Inheritance – Polymorphism- Encapsulation- Abstraction - Introduction to UML (Unified Modelling Language) Diagrams – Need for UML diagrams.	4
Ex.No.1 Familiarization of features of any one of the standard UML case tool. **Ex.No.2** Draw Class and Object diagrams for online student information system. **Ex.No.3** Design classes for a banking system that hide the complexities of internal operations from the user. **Ex.No.4** Draw a class for a vending machine that encapsulates the details of product dispensing and payment processing.	4 4 4 4
Unit – II Static UML Diagrams	
Class diagram, when to use class diagram, object diagram, component diagram – when to use component diagram - deployment diagram: component – artifact- interface- node.	4
Ex.No.5 Create a class hierarchy for different types of vehicles, such as cars, bicycles, and motorcycles. **Ex. No. 6** Draw Component and deployment diagrams for banking system.	4 4
Unit – III Dynamic UML Diagrams	
Use case diagram - Collaboration diagram - Sequence diagram - Activity diagram - State machine diagram: States - Transitions – Events – Actions - Initial and Final states - when to use state machine diagram.	4

Ex.No.7 Draw Use case diagram and Activity diagram for Exam Registration System. **Ex.No.8** Draw Sequence diagram and collaboration diagram for Exam Registration System. **Ex.No.9** Draw State machine diagram for Library Management System.	4 4 4
Unit – IV Design Patterns	
Cohesion – Coupling - Usage of design patterns – Types of design patterns: Creational design patterns – Structural and behavioural design patterns.	3
Ex.No.10 Create a simple real time application using Java programming language (Use case tool for automatic code generation). **Ex.No.11** Use singleton (ensuring a class has only one instance) design pattern for the above application.	4 4
Unit – V Testing and Refactoring	
Unit Testing – Integration Testing – System Testing – Acceptance testing, Regression testing (Definition only) – Refactoring Definition – Uses of refactoring – Common refactoring techniques.	4
Ex.No.12 Case study on different software testing tools.	12
Total	**75**

Suggested List of Students Activity:

1. **Design Patterns**: Introduce students to common design patterns like Singleton, Factory Method, Observer, and have them apply these patterns to solve specific design problems.
2. **Refactoring Exercises**: Provide code snippets or small programs with design flaws and ask students to identify and refactor them to improve the design.
3. **Group Projects**: Assign group projects where students have to design and implement a small software system, starting from requirements analysis to final implementation.

4. **Code Reviews**: Conduct code reviews where students review each other's design and provide constructive feedback on improving the design quality.
5. **Documentation Practice**: Have students practice documenting their designs using tools like UMLet, Lucidchart, or draw.io, and explain their design choices.
6. **Interview Scenarios**: Present students with real-world scenarios or problems and have them design a solution using OOAD principles, simulating a job interview scenario.

Text and Reference Books:

1. Grady Booch, Pearson, "Object-Oriented Analysis and Design with Applications", 3rd Edition, 2007.
2. Brett McLaughlin, O'Reilly Media, "Head First Object-Oriented Analysis and Design", 1st Edition, 2006.
3. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Pearson, 3rd Edition, 2004.
4. Ali Bahrami,"Object-Oriented Analysis and Design", McGraw-Hill Education, 1st Edition, 1999.
5. Simon Bennett, Steve McRobb, and Ray Farmer,"Object-Oriented Systems Analysis and Design Using UML", McGraw-Hill Education, 2nd Edition, 2010.

Web-based/Online Resources:

- https://www.coursera.org/learn/object-oriented-java
- https://www.edx.org/course/object-oriented-programming-oop-using-c
- https://www.udemy.com/course/python-oops/
- https://www.geeksforgeeks.org/object-oriented-programming-in-cpp/
- https://www.tutorialspoint.com/object_oriented_analysis_design/index.htm

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

1. ArgoUML/StarUML/PlantUML/Dia/Violet UML Editor
2. Eclipse or Netbeans IDE.

BOARD PRACTICAL EXAMINATION

PART A

1. Familiarization of features of any one of the standard UML case tool.
2. Draw Class and Object diagrams for online student information system.

3. Design classes for a banking system that hide the complexities of internal operations from the user.
4. Draw a class for a vending machine that encapsulates the details of product dispensing and payment processing.
5. Create a class hierarchy for different types of vehicles, such as cars, bicycles, and motorcycles.
6. Draw Component and deployment diagrams for banking system.

PART B

7. Draw Use case diagram and Activity diagram for Exam Registration System.
8. Draw Sequence diagram and collaboration diagram for Exam Registration System.
9. Draw State machine diagram for Library Management System.
10. Create a simple real time application using Java programming language (Use case tool for automatic code generation).
11. Use singleton (ensuring a class has only one instance) design pattern for the above application.
12. Case study on different software testing tools.

SCHEME OF VALUATION

Section	Description	Marks
1	Aim (05) ,Program for the experiment from Part – A (30)	35
2	Aim (05) ,Program for the experiment from Part – B (30)	35
3	Executing any one program (Part A **OR** Part –B)	15
4	Output	10
5	Viva Voce	5
TOTAL MARKS		**100**

1046236242	SOFTWARE TESTING	L	T	P	C
Practicum		1	0	4	3

Introduction:

Software testing is the process of evaluating and verifying that a software application meets its specified requirements and quality standards. This involves conducting various types of tests, such as functional testing, performance testing, security testing, and usability testing, etc. The goal of software testing is to identify any issues or bugs before the software is released to end-users, minimizing the risk of errors, and improving the overall quality of the software. This course serves as a foundation for acquiring basic knowledge and practical exposure towards Software Testing. It provides an overview of some of the basic concepts required for understanding Software Testing life cycle.

Course Objectives:

- To understand the basics of software testing
- To learn how to do the testing and planning effectively
- To build test cases and execute them
- To focus on wide aspects of testing and understanding multiple facets of testing
- To get an insight about test automation and the tools used for test automation

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Understand the basic concepts of software testing and the need for software testing.

CO2: Design Test planning and different activities involved in test planning.

CO3: Design effective test cases that can uncover critical defects in the application.

CO4: Carry out advanced types of testing.

CO5: Automate the software testing using Selenium and TestNG.

Pre-requisites:

- Familiar with De-bugging an application.
- Basics of Java and Selenium.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	1	1	1	1	2
CO2	1	1	1	1	1	1	2
CO3	1	1	1	1	1	1	2
CO4	1	1	1	1	2	2	2
CO5	1	1	2	2	2	2	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

1. Teacher-Centred Learning Techniques,
2. Learner-Centred Learning Techniques,
3. Experiential-Learning Techniques

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Practical Test	Practical Test	Written Test Theory	Practical Test	Practical Examination
Portion	PART A Exercises	PART B Exercises	All Units	All Exercises	All Exercises
Duration	2 Periods	2 Periods	3 Hours	3 Hours	3 hours
Exam Marks	60	60	100	100	100
Converted to Marks	10	10	15	15	60
Marks	10		15	15	60
Internal Marks	40				
Tentative Schedule	7th Week	14th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

- **CA 3:** Written Test for complete theory portions should be conducted for 100 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	Answer any ten questions out of twelve. Each carries three marks.	10 x 3	30
Part – B	Answer any seven questions out of ten. Each carries ten marks	7 x 10	70
TOTAL			100 Marks

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

- **CA 4:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION
Model Practical Examination and End Semester Examination - Practical Exam

SNO	ALLOCATION	MARKS
1	Aim (05) ,Program from Part – A (30)	35
2	Aim (05) ,Program from Part – B (30)	35
3	Executing any one program (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100

1046236242	SOFTWARE TESTING	L	T	P	C
Practicum		1	0	4	3

UNIT 1	INTRODUCTION	
Introduction to Software Testing - Introduction to Software Quality – Quality Assurance vs Quality Control – Software Quality Assessment Factors – SDLC – Types of SDLC Models – Waterfall, Agile, Scrum, V-Model, DevOps – SDLC vs STLC – Introduction to Software Testing – Importance and Need of Software testing – Software Testing Methods: Black Box Testing, White Box Testing, Grey Box Testing.		7
Practical Exercises 1. Analyse the given defect and identify the bug type and classify the type of bug it belongs to from the following defects type listed, • Functional Bugs, • Logical Bugs, • Workflow Bugs, • Unit Level Bugs, • System-Level Integration Bugs, • Security Bugs. 2. Analyse the quality of application, Find out defects on the page from any test website and validate the testing quality based on the number of defects captured. Rate the quality of testing by following metrics. 0 – 4 defects => Poor 5 – 6 defects => Average 7 – 8 defects => Good 9 – 10 defects => Excellent 10+ defects => Best tester!		8
UNIT II	**PHASES OF SOFTWARE TESTING LIFE CYCLE**	
Phases of STLC: Test planning, Test Case Development, Test execution, Defect Tracking/ Defect Management, Closure		6
Practical Exercises 3. Develop the test plan for testing an e-commerce web/mobile application (www.amazon.in). 4. Design the test cases for testing the e-commerce application. 5. Write a detailed defect report for this sample defect: After logging into Gmail, it		9

navigates to Google.com. you can decide upon the fields you want to include while reporting the defect in the best way. 6. Defect Reporting – Analyze the below incident and report the bug, I logged into the order management site as a sales manager and when I clicked on the purchase order report page, it opened the page where I could choose the filter criteria. Once I selected all the filter criteria and clicked the 'Show Report' button, I got a 404 error. I tried other filtering criteria with the same result. I also tried logging into the site as a non-sales manager user and I still see the issue.	
UNIT III	**FUNCTIONAL TESTING TECHNIQUES**
Functional Testing: Unit Testing, Integration Testing, System Testing, Acceptance Testing, Smoke Testing, Sanity Testing, User Acceptance Testing – Maintenance Testing: Regression Testing	5
Practical Exercises 7. Perform Unit Testing to Test the login component functionality of e-commerce and report any bugs observed. 8. Perform End-to-End testing of the e-commerce application and report the status.	10
UNIT IV	**NON-FUNCTIONAL TESTING TECHNIQUES**
Objectives of Non-Functional Testing – Non-Functional Testing Types: Performance Testing, Load Testing, Stress Testing, Usability Testing, Reliability Testing, Security Testing, Volume Testing – Advantages and Limitations of Non-Functional Testing – Performance Testing Tool: Apache JMeter	7
Practical Exercises 9. Verify e-commerce website compatibility on Cross-Browser and Cross-Device. 10. Verify e-commerce website accessibility across all Users.	8
UNIT V	**TEST AUTOMATION AND TOOLS**
Selenium: Introducing Web Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports.	8
Practical Exercises 11. Automate the testing of e-commerce applications using Selenium. 12. Integrate TestNG with the above test automation.	7
Total	**75**

Suggested List of Students Activity:

1. Understand the context and purpose of the e-commerce website being developed and create a document.
2. Test the e-commerce website considering boundary conditions, positive/negative scenarios, and edge cases and Document the defects observed during testing.
3. Perform regression testing of e-commerce application test results, metrics, and any blockers encountered.

Text and Reference Books:

1. Srinivasan Desikan and Gopalaswamy Ramesh, —Software Testing – Principles and Practices‖, Pearson Education, 2006.
2. Ron Patton, —Software Testing‖, Second Edition, Sams Publishing, Pearson Education, 2007. AU Library.com
3. Yogesh Singh, “Software Testing”, Cambridge University Press, 2012
4. AdityaMathur, “Foundations of Software Testing”, Pearson Education, 2008
5. Ron Patton, “Software Testing” , Second Edition, Pearson Education, 2007
6. Unmesh Gundecha, Satya Avasarala, "Selenium WebDriver 3 Practical Guide" - Second Edition 2018

Web-based/Online Resources:

1. Glenford J. Myers, Corey Sandler, Tom Badgett, The Art of Software Testing, 3rd Edition, 2012, John Wiley & Sons, Inc.
2. Ron Patton, Software testing, 2nd Edition, 2006, Sams Publishing

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

1. IDE – Eclipse
2. Programming language – Java
3. Testing Tool – Selenium, Postman, SoapUI, JMeter

BOARD PRACTICAL EXAMINATION

PART A

1. Analyse the given defect and identify the bug type and classify the type of bug it belongs to from the following defects type listed,
    - Functional Bugs,
    - Logical Bugs,

- Workflow Bugs,
- Unit Level Bugs,
- System-Level Integration Bugs,
- Security Bugs.

2. Analyse the quality of application,

Find out defects on the page from any test website and validate the testing quality based on the number of defects captured. Rate the quality of testing by following metrics.

0 – 4 defects => Poor

5 – 6 defects => Average

7 – 8 defects => Good

9 – 10 defects => Excellent

10+ defects => Best tester!

3. Develop the test plan for testing an e-commerce web/mobile application (www.amazon.in).
4. Design the test cases for testing the e-commerce application.
5. Write a detailed defect report for this sample defect: After logging into Gmail, it navigates to Google.com. you can decide upon the fields you want to include while reporting the defect in the best way.
6. Defect Reporting – Analyze the below incident and report the bug,

I logged into the order management site as a sales manager and when I clicked on the purchase order report page, it opened the page where I could choose the filter criteria. Once I selected all the filter criteria and clicked the 'Show Report' button, I got a 404 error. I tried other filtering criteria with the same result. I also tried logging into the site as a non-sales manager user and I still see the issue.

PART B

7. Perform Unit Testing to Test the login component functionality of e-commerce and report any bugs observed.
8. Perform End-to-End testing of the e-commerce application and report the status.
9. Verify e-commerce website compatibility on Cross-Browser and Cross-Device.
10. Verify e-commerce website accessibility across all Users.
11. Automate the testing of e-commerce applications using Selenium.
12. Integrate TestNG with the above test automation.

SCHEME OF VALUATION

Section	Description	Marks
1	Aim (05) ,Program for the experiment from Part – A (30)	35
2	Aim (05) ,Program for the experiment from Part – B (30)	35
3	Executing any one program (Part A **OR** Part –B)	15
4	Output	10
	Viva Voce	5
TOTAL MARKS		**100**

1052235654	INNOVATION AND STARTUP	L	T	P	C
Practicum		1	0	2	2

Introduction:

The integration of Innovation and Start-ups concept within the syllabus is testament to the forward thinking nature of educational institutions. By introducing this concept, students are provided with a solid foundation upon which they can build their skills in Innovation and Start-ups. This course can bridge the gap between theory and practice. It allows students to apply the knowledge they have acquired in a real world context, thereby enhancing their understanding and retention of the above concept. This experimental learning approach not only fosters a deeper level of engagement but also trains student with practical skills necessary to navigate the complexities of the business world. This also empowers students to become an Innovator or Entrepreneur. With necessary tools and knowledge, educational institutions are preparing the next generation of entrepreneurs to tackle the challenges and opportunities that lie ahead. This syllabus will explore the different facets of innovation, including its importance, types and strategies for fostering a culture of innovation within organizations

Course Objectives:

The objective of this course is to enable the students

- To understand the concept of Innovation and Start-ups
- To acquire knowledge of Prototype development, IPR, Patents and Copyrights
- To have the practical experience in preparing Business plan for Start-ups
- To visit the existing nearby industry to prepare project report about the present challenges of that industry
- To know the different funding supports available from Government and Non-Government schemes for Start-ups

Course Outcomes:

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

CO1: Differentiate between Innovation and Start-ups

CO2: Explain the importance of IPR, Patents and Copyrights.

CO3: Describe the methodology to be adopted for preparing the Business Plan

CO4: Gain practical experience by Industrial training and visiting the nearby industry

CO5: Explore and identify various funding facilities available from Government and Non-Government Schemes for Start-ups

Pre-requisites:

There are no specific prerequisites for this course, although a basic understanding of business and technology concepts would be beneficial.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	-	1	-	2	3	3
CO2	-	-	1	-	2	3	3
CO3	-	-	1	-	2	3	3
CO4	-	-	1	-	2	3	3
CO5	-	-	1	-	2	3	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Assessment Methodology

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Class Assessment (Unit I,II & Unit III)	Seminar Presentations (Unit IV)	Submission of Industry Visit Project Report (Unit V)	Practical Examination (Project)
Duration	2 hours	---	---	3 hours
Exam Marks	50	20	30	100
Converted to	10	10	20	60
Marks	**10**	**10**	**20**	**60**

Continuous Assessment - 40 marks

S. No	Description	Marks
CA1 i) ii)	**Class Assessment (50 marks) - Unit – I,II & III** Written Examination - Theory Questions 10 questions out of 15 questions (10 x 3 marks :30 marks) 4 questions out of 6 questions (4 x 5 marks : 20 marks)	10 marks
CA 2	**Seminar Presentations (20 marks- each topic carries 10 marks) - Unit IV** Students should present any two topics with PPTs	10 marks
CA 3	Submission of Industry Visit Project Report - **(30 marks) - Unit V**	20 marks
	Total	**40 marks**

End Semester Examination –Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Board of Examinations.

Detailed Allocation of Marks

S. No	Description	Marks
Part A i) ii)	Written Examination – Unit –I,II & III Theory Questions 10 questions out of 15 questions (10 x 3 marks = 30 marks) 3 questions either or pattern (3 x 5 marks = 15 marks)	45
Part B i)	Presentation of Industry Visit Project Report	25
ii)	Interaction and Evaluation	30
	TOTAL	**100**

1052235654	INNOVATION AND STARTUP	L	T	P	C
Practicum		1	0	2	2

Unit I	INTRODUCTION TO INNOVATION	
An Introduction to Innovation and Creativity- Innovation in current Environment - Types of Innovation - Challenges of Innovation - Steps of Innovation Management - Divergent v/s Convergent thinking - Design thinking and Entrepreneurship		6
Unit II	**INCUBATION CLUBS, IPR, PATENTS AND COPYRIGHTS**	
Idea Generation - Incubation Clubs - Prototype Development - Marketing of Innovation - Management of Innovation - Creation of IPR -Types of IPR - Patents and Copyrights - Patents in India - Technological and Non-Technological Innovation Process.		6
Unit III	**GOVERNMENT AND NON-GOVERNMENT FUNDING SCHEMES FOR START-UPS**	
An introduction to Start-up - Start-ups in India - Procedure for registration of Start-ups - Business Model- Business Plan - Case Studies - Opportunities and Challenges - Funding supports from Government Schemes -MUDRA, TANSEED, NEEDS, PMEGP, UYEGP – Non-Government Schemes - CSR Fund - Angel Investors - Venture Capitalist		6
Unit IV	**SEMINAR**	
All the students have to select a minimum of 2 topics from the list given below. They are expected to collect the resources with the help of faculty assigned to them to prepare PPTs for presentation 1. Idea Generation 2. Innovation Management 3. Product Development 4. Business Model Innovation 5. Organizational Culture and Change Management 6. Leadership and Innovation 7. Barriers to Innovation 8. Innovation Marketing 9. E-Commerce success stories (any one) 10. Role of Start-ups in Higher Education		9

11. Professional Networking in Building Brands How to start a start-up in India		
Unit V	**EXPOSURE TO INDUSTRY**	
All the students should visit and study the nearby industries, incubation centres, start-ups etc., and select any one to prepare a project report which covers the Name of the Industry/Organization, Introduction of the Industry, Type of the Industry, Scope of the Industry, Plant Layout and Location, Details of Plant and Machineries, Process flow chart, Manufacturing Methods, Process of Manufacturing, Product Manufacturing, Quality Control, Marketing, Product selling – Conclusion		18
TOTAL HOURS		**45**

1052235773	INDUSTRIAL TRAINING	SUMMER VACATION	C
Theory			2

Introduction

Industrial training is a crucial component of the diploma engineering curriculum, designed to bridge the gap between theoretical knowledge and practical application. Typically conducted during vacation periods, this two-week training program provides students with hands-on experience in their respective engineering fields. The primary objectives are to enhance practical skills, familiarize students with industry standards, and prepare them for future employment.

Two-week industrial training during vacation periods is an invaluable part of diploma engineering education. It not only equips students with practical skills but also provides a comprehensive understanding of the industry, preparing them for successful engineering careers.

Objectives

1. Practical Exposure: Students gain direct exposure to real-world engineering practices, tools, and technologies.
2. Skill Enhancement: The training helps in developing technical and soft skills that are essential for professional growth.
3. Industry Insight: Students learn about the working environment, operational procedures, and challenges faced by industries.
4. Professional Networking: The training offers opportunities to interact with industry professionals, which can be beneficial for career prospects.
5. Application of Knowledge: It allows students to apply classroom knowledge to solve practical problems, enhancing their understanding and retention of engineering concepts.

Structure of the Training Program

- Orientation: Introduction to the company, its operations, and safety protocols.
- Project Assignment: Students are assigned specific projects or tasks relevant to their field of study.
- Supervision and Mentorship: Industry professionals guide and mentor students throughout the training.

- Skill Development Workshops: Sessions on technical skills, software tools, and industry best practices.
- Assessment and Feedback: Performance evaluations and constructive feedback to help students improve.

Benefits for Students

- Enhanced Employability: Practical experience makes students more attractive to potential employers.
- Confidence Building: Working in a real-world setting boosts confidence and professional demeanor.
- Clarified Career Goals: Exposure to various roles and responsibilities helps students define their career paths.

Course Outcomes

CO 1: Demonstrate proficiency in using industrial machinery, tools, and software.

CO 2: Able to identify, analyze, and solve engineering problems using industry-standard methods and practices.

CO 3: Gain a comprehensive understanding of industrial manufacturing processes, quality control, and safety practices.

CO 4: Exhibit improved communication, teamwork, and professional behavior in an industrial setting.

CO 5: Apply theoretical concepts learned in their coursework to practical engineering tasks and projects.

Duties Responsibilities of the Faculty Mentor.

One faculty mentor should be assigned for every 30 students by the HOD / Principal. Faculty mentors shall play a crucial role in overseeing and guiding students during their industrial training program in Diploma engineering.

Pre-Training Responsibilities:

1. Orientation and Preparation:
    - Conduct orientation sessions to familiarize students with the objectives, expectations, and guidelines of the industrial training program.
    - Assist students in understanding the importance of industrial training in their academic and professional development.
2. Placement Coordination:
    - Collaborate with the placement cell or industry liaison office to secure suitable training placements for students that align with their academic specialization and career interests.

- Facilitate communication between the institution and host organizations to ensure smooth coordination of training arrangements.

3. Training Plan Development:
    - Help students develop a detailed training plan outlining learning objectives, tasks, and expected outcomes for the training period.
    - Guide students in setting SMART (Specific, Measurable, Achievable, Relevant, Time-bound) goals for their training experience.

During Training Responsibilities:

1. Monitoring and Support:
    - Regularly monitor the progress of students during their industrial training. Maintain communication with both students and industry supervisors to track performance and address any issues that may arise.
    - Provide ongoing support and guidance to students, offering advice on technical challenges, professional conduct, and workplace etiquette.
2. Technical Guidance:
    - Offer technical guidance and mentorship related to the specific engineering discipline or specialization of the students. Help them apply theoretical knowledge to practical situations encountered in the industry.
3. Problem-Solving Assistance:
    - Assist students in overcoming obstacles or challenges encountered during their training. Encourage them to develop problem-solving skills and resilience in real-world engineering scenarios.
4. Feedback and Evaluation:
    - Provide constructive feedback on students' performance based on reports, assessments, and observations gathered from industry supervisors.
    - Evaluate students' achievements in relation to their training objectives and competencies developed during the program.

Post-Training Responsibilities:

1. Reflection and Debriefing:
    - Conduct debriefing sessions with students to reflect on their training experiences, discuss lessons learned, and identify areas for further improvement.
    - Help students articulate their learning outcomes and how these experiences contribute to their professional growth.

2. Documentation and Reporting:
    - Ensure comprehensive documentation of students' training activities, achievements, and feedback received from industry supervisors.
    - Prepare reports summarizing students' performance and submit these to relevant departments or committees for review and assessment.
3. Career Counseling:
    - Provide career guidance and counseling to students based on their industrial training experiences. Assist them in leveraging these experiences for future job applications or further academic pursuits.
4. Continuous Improvement:
    - Collaborate with industry partners to continuously improve the quality and relevance of the industrial training program.
    - Incorporate feedback from students and industry supervisors to enhance the effectiveness of future training placements.

By fulfilling these duties and responsibilities, faculty mentors contribute significantly to the overall educational experience and professional development of Diploma engineering students during their industrial training program.

Instructions to the students

Before Starting Industrial Training:

1. **Orientation and Preparation:**
    - Attend orientation sessions conducted by the institution or faculty mentors to understand the objectives, expectations, and guidelines of the industrial training program.
    - Familiarize yourself with the specific policies, procedures, and safety regulations of the host organization where you will be undergoing training.
2. Setting Goals:
    - Set clear and specific goals for your industrial training period. Define what skills, knowledge, and experiences you aim to gain during this time.
    - Discuss your goals with your faculty mentor and seek their guidance in developing a training plan that aligns with your career aspirations.

3. Professional Attire and Conduct:
    - Dress appropriately and professionally according to the standards of the industry and host organization.
    - Maintain a positive attitude, demonstrate punctuality, and adhere to workplace etiquette and norms.

During Industrial Training:

1. Learning and Engagement:
    - Actively engage in all assigned tasks and projects. Seek opportunities to learn new skills and technologies relevant to your field of study.
    - Take initiative in asking questions, seeking clarification, and participating in discussions with supervisors and colleagues.
2. Adaptability and Flexibility:
    - Adapt to the work environment and demonstrate flexibility in handling various responsibilities and challenges that arise during your training.
    - Be open to different roles and tasks assigned to you, as this will broaden your experience and skill set.
3. Professionalism and Communication:
    - Communicate effectively with supervisors, colleagues, and clients as required. Practice clear and concise verbal and written communication.
    - Demonstrate professionalism in all interactions, respecting confidentiality, and adhering to company policies and procedures.
4. Safety and Compliance:
    - Prioritize safety at all times. Familiarize yourself with safety protocols, procedures, and emergency exits in the workplace.
    - Follow all safety guidelines and regulations to ensure your well-being and that of others around you.

After Completing Industrial Training:

1. Reflection and Documentation:
    - Reflect on your training experience. Evaluate what you have learned, the challenges you faced, and how you have grown professionally.
    - Maintain a journal or log documenting your daily activities, achievements, and lessons learned during the training period.
2. Feedback and Evaluation:
    - Seek feedback from your industry supervisor and faculty mentor on your performance and areas for improvement.

- Use constructive feedback to enhance your skills and competencies for future career opportunities.

3. Career Planning:
    - Use your industrial training experience to inform your career planning and decision-making process.
    - Discuss your career goals and aspirations with your faculty mentor or career counselor for guidance on next steps after completing your diploma.

By following these instructions, Diploma engineering students can make the most of their industrial training experience, gain valuable insights into their chosen field, and prepare themselves effectively for future professional endeavors.

Attendance Certification

Every student has to get their attendance certified by the industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution faculty mentor.

Training Reports

The students have to prepare reports: The report in the form of a diary to be submitted to the concerned faculty mentor of the institution. This will be reviewed while awarding Internal assessment.

Industrial Training Diary

Students are required to maintain the record of day-to-day work done. Such a record is called Industrial training Diary. Students have to write this report regularly. All days for the week should be accounted for clearly giving attendance particulars (Presence, absence, Leave, Holidays etc.). The concern of the Industrial supervisor is to periodically check these progress reports.

In addition to the diary, students are required to submit a comprehensive report on training with details of the organisation where the training was undergone after attestation by the supervisors. The comprehensive report should incorporate study of plant / product / process / construction along with intensive in-depth study on any one of the topics such as processes, methods, tooling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of Industrial training. Any data, drawings etc. should be incorporated with the consent of the Organisation.

SCHEME OF EVALUATION

Internal Assessment

Students should be assessed for 40 Marks by industry supervisor and polytechnic faculty mentor for the Internal Assessment.

Sl. No.	Description	Marks
A	Punctuality and regularity. (Attendance)	10
B	Level / proficiency of practical skills acquired. Initiative in learning / working at site	10
C	Self expression / communication skills. Interpersonal skills / Human Relation.	10
D	Report and Presentation.	10
Total		50

End Semester Examination - Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Board of Examinations after the completion of industrial training. The marks scored will be converted to 60 marks for the End Semester Examination.

Sl. No.	Description	Marks
A	Daily Activity Report and Attendance certificate.	20
B	Comprehensive report on Internship, Relevant Internship Certificate from the concerned department.	30
C	Presentation by the student at the end of the Internship.	30
D	Viva Voce	20
Total		100

DIPLOMA IN COMPUTER ENGINEERING AND IOT

III YEAR

SEMESTER VI

6000236111	ADVANCED ENGINEERING MATHEMATICS	L	T	P	C
Theory		3	0	0	3

Introduction:

Mathematics is essential for engineering students to understand core engineering subjects. It provides the framework for engineers to solve problems in engineering domains. This course is designed to bridge the gap between diploma mathematics and B.E/B.Tech mathematics in matrix algebra, differential calculus, vector calculus, differential equations, and Laplace transforms.

Course Objectives:

The objective of this course is to enable the students to

1. Understand the concepts of eigen-values and eigen-vectors of matrices.
2. Learn the notation of partial differentiation and determine the extremities of functions of two variables.
3. Acquire knowledge in vector calculus which is significantly used to solve engineering problems.
4. Formulate and solve differential equations.
5. Understand Laplace transformation and its engineering applications.

Course Outcomes:

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

CO1: Find eigenvalues and corresponding eigenvectors of a square matrix.

CO2: Apply the knowledge of partial differentiation to evaluate Jacobian and extremities of two variable functions.

CO3: Evaluate the gradient of a scalar field and the divergence and curl of vector fields.

CO4: Solve ordinary differential equations using various techniques.

CO5: Use Laplace transforms to solve first-order ordinary differential equations.

Pre-requisites: Matrices, Determinants, Differentiation, Integration and Vector Algebra.

CO/PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	1	1	1	3
CO2	3	3	2	1	1	1	3
CO3	3	3	2	1	1	1	3
CO4	3	3	2	1	1	1	3
CO5	3	3	2	1	1	1	3

Legend: 3 - High Correlation, 2 - Medium Correlation, 1 - Low Correlation

Instructional Strategy:

- A theory-demonstrate-practice-activity strategy may be used to ensure that learning is outcome-based.
- All demonstrations/Hands-on practices might be under a simulated environment.
- Use inducto-deductive approach to achieve the desired learning objectives.
- Use open-ended questions to nurture the problem-solving and reasoning skills among students.
- Support and guide the students for self-study.
- State the need for mathematics with engineering studies and provide real-life examples.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of one will be considered for the internal assessment of 15 Marks.

CA1and CA2 Assessment test should be conducted for two units as below.

PART A: (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write five questions. Each unit four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination-Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

6000236111	ADVANCED ENGINEERING MATHEMATICS	L	T	P	C
Theory		3	0	0	3

Unit I	**EIGENVALUES AND EIGENVECTORS**	
	Characteristic equation – Eigen-values of 2×2 and 3×3 real matrices – Eigen-vectors of 2×2 real matrices – Properties of eigen-values (excluding proof) – Cayley-Hamilton theorem (excluding proof) – Simple problems.	7
Unit II	**FUNCTIONS OF SEVERAL VARIABLES**	
	Partial derivatives of two variable and three variable functions (up to second order) – Homogeneous functions and Euler's theorem (excluding proof) – Jacobian matrix and determinant – Maxima and minima of functions of two variables – Simple problems.	7
Unit III	**VECTOR CALCULUS**	
	Scalar filed and Vector field – Vector differential operator – Gradient of a scalar field – Directional derivative – Divergence and curl of a vector field (excluding properties) – Solenoidal and irrotational vector fields – Simple problems.	7
Unit IV	**DIFFERENTIAL EQUATIONS**	
	Differential equation – Formation – Order and degree – Solution of a differential equation – Equations of first order and first degree – Variable separable method – Leibnitz's Linear equations – Second order equations of the form $(aD^2 + bD + c)y = e^{nx}$ where a, b, c and n are constants and the auxiliary equation $am^2 + bm + c = 0$ has only real roots) – Complementary function – Particular integral – General solution – Simple problems.	7
Unit V	**LAPLACE TRANSFORMS**	
	Definition of Laplace transform – Laplace transforms of standard functions - Linearity and change of scale property (excluding proofs) – First shifting property – Laplace transforms of derivatives – Properties (excluding proofs) – Inverse Laplace transforms – Properties (excluding proofs) – Solving first order ordinary differential equation using Laplace transforms – Simple problems.	7
	TEST AND REVISION	10
	TOTAL	45

Suggested List of Students Activities:

- Demonstrate the applications of eigen-values in stability analysis, decouple of three-phase systems and vibration analysis.
- Demonstrate maxima and minima of two variable functions using GeoGebra graphing calculator.
- Demonstrate solenoidal vector field and irrotational vector field using engineering applications.
- Demonstrate the applications of differential equations in solving engineering problems.
- Presentation /Seminars by students.
- Quizzes.

Text Books for Reference:

1. John Bird, Higher Engineering Mathematics, Routledge, 9th Edition, 2021.
2. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2012.
3. Arumugam, S., Thangapandi Isaac, A., & Somasundaram, A., Differential Equations and Applications, Yes Dee Publishing Pvt. Ltd., 2020.
4. Duraipandian, P., & Kayalal Pachaiyappa, Vector Analysis, S Chand and Company Limited, 2014.
5. Narayanan, S., & Manicavachagom Pillai T.K., Calculus Volume I and II, .Viswanathan Publishers Pvt. Ltd., 2007.

Website Links for Reference:

- www.khanacademy.org/math/
- https://www.mathportal.org/
- https://openstax.org/subjects/math
- www.mathhelp.com/
- https://www.geogebra.org/
- https://www.desmos.com/
- https://phet.colorado.edu/

6000236112	ENTREPRENEURSHIP	L	T	P	C
Theory		3	0	0	3

Introduction

Development of a diploma curriculum is a dynamic process responsive to the society and reflecting the needs and aspiration of its learners. Fast changing society deserves changes in educational curriculum particularly to establish relevance to emerging socio-economic environments; to ensure equity of opportunity and participation and finally promoting concern for excellence. In this context the course on entrepreneurship and start ups aims at instilling and stimulating human urge for excellence by realizing individual potential for generating and putting to use the inputs, relevant to social prosperity and thereby ensure good means of living for every individual, provides jobs and develop Indian economy.

Course Objectives

After completing this subject, the student will be able to

- Acquire entrepreneurial spirit and resourcefulness
- Familiarize Acquire knowledge about the business idea and product selection
- Analyze the banking and financial institutions
- Understand the pricing policy and cost analysis
- Get knowledge about the business plan preparation

Course Outcomes

CO1: Understand the process of entrepreneurship

CO2: Analyse the importance of generation of ideas and product selection

CO3: Familiarization of various financial and non financial schemes

CO4: Acquire various cost components to arrive pricing of the product

CO5: Learn the preparation of project feasibility report

Pre-requisites

Knowledge of basics of Engineering and Industrial engineering

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	-	-	-	3	1	3
CO2	-	-	-	-	3	3	3
CO3	-	-	-	1	-	3	2
CO4	-	1	3	3	2	3	2
CO5	-	2	3	3	3	3	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable, real-life examples and applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice- activity strategy throughout the course to ensure outcome-driven learning and employability.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activities in a simulated environment, transitioning to real- world scenarios when possible.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of one will be considered for the internal assessment of 15 Marks.

CA1and CA2 Assessment test should be conducted for two units as below.

PART A: (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write five questions. Each unit four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination-Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

6000236112	ENTREPRENEURSHIP	L	T	P	C
Theory		3	0	0	3

UNIT I	Entrepreneurship – Introduction and Process	
Concept of entrepreneurship - Importance, Myths about Entrepreneurship, Pros and Cons of Entrepreneurship, Process of Entrepreneurship, , Competencies and characteristics of an entrepreneur -, Ethical Entrepreneurship, Entrepreneurial Values and Attitudes, Creativity, Innovation and entrepreneurship- Entrepreneurs - as problem solvers, Mindset of an employee and an entrepreneur, - Risk Taking-Concepts		7
UNIT II	**Business Idea**	
Types of Business: Manufacturing, Trading and Services, Stakeholders: sellers, vendors and consumers and Competitors, E- commerce Business Models, business idea generation -Types of Resources - Human, Capital and Entrepreneurial tools and resources, etc.,- setting business goals- Patent, copyright and Intellectual property rights, Customer Relations and Vendor Management, -Business Ideas vs. Business Opportunities, Opportunity – SWOT ANALYSIS of a business idea - Business Failure – causes and remedies.- Types of business risks,		7
UNIT III	**Banking**	
Size and capital based classification of business enterprises- Role of financial institutions, Role of Government policy, Entrepreneurial support systems, Incentive schemes for state government, and Incentive schemes for Central governments.		7
UNIT IV	**Pricing and Cost Analysis**	
Types of Costs - Variable - Fixed- Operational Costs - Break Even Analysis - for single product or service, -financial Business Case Study, Understand the meaning and concept of the term Cash Inflow and Cash Outflow- Pricing- Calculate Per Unit Cost of a single product, , Understand the importance and preparation of Income Statement, Prepare a Cash Flow Projection- Factors affecting pricing.- GST.		7
UNIT V	**Business Plan Preparation**	
Feasibility Report – Technical analysis, financial analysis- Market Research - Concept, Importance and Process- tools for market research- Market Sensing and Testing, Marketing and Sales strategy, Digital marketing, Branding - Business name, logo, tag line, Promotion strategy, Business Plan Preparation, -Concept and Importance, , Execution of Business Plan		7

Revision and Test	10
TOTAL HOURS	45

Suggested list of Students Activity.

1. Students can explore app development or web design. They'll learn about technology, user experience, and marketing.
2. Hosting events, workshops, or conferences allows students to practice project management, networking, and marketing skills.
3. Encourage students to address social or environmental issues through innovative business solutions. This fosters empathy and creativity.
4. Part of entrepreneurship clubs or organizations provides networking opportunities, mentorship, and exposure to real-world challenges.
5. Competitions like business plan contests or pitch events allow students to showcase their ideas and receive feedback.
6. Students can create and sell handmade crafts, artwork, or other products. This teaches them about production, pricing, and customer relations.
7. Students can provide consulting services in areas they're knowledgeable about, such as social media marketing or financial planning.
8. Encourage students to create and manage their own small business or offer freelance services. This hands-on experience helps them understand various aspects of entrepreneurship.

Text Books for References:

1. G.K. Varshney, Fundamentals of Entrepreneurship, Sahitya Bhawan Publications, Agra., 2019.
2. H.Nandan, Fundamentals of Entrepreneurship, Prentice Hall India Learning Private Limited, Third Edition, 2013.
3. R.K. Singal, Entrepreneurship Development & Management, S K Kataria and Sons, 2013.

Website Links for References:

- https://ocw.mit.edu/courses/15-390-new-enterprises-spring-2013/resources/lecture-1/
- https://onlinecourses.nptel.ac.in/noc20_ge08/preview

6000236113	PROJECT MANAGEMENT	L	T	P	C
Theory		3	0	0	3

Introduction

Project management is the systematic application of knowledge, skills, tools, and techniques to project activities to meet specific project requirements. It involves planning, organizing, and managing resources to achieve project goals within defined scope, time, and budget constraints. Project management encompasses several key processes and phases, including initiation, planning, execution, monitoring and controlling, and closing. It is essential across various industries to ensure projects are completed successfully, efficiently, and effectively, aligning with organizational objectives and stakeholder expectations. Project managers play a crucial role in leading teams, managing risks, ensuring quality, and communicating with stakeholders to drive project success.

Course Objectives

After completing this subject, the student will be able,

- To understand the concept, characteristics and elements of projects.
- To understand the stages in Project Life Cycle.
- To appreciate the need for Project Portfolio Management System.
- To know the considerations in choosing appropriate project management structure.
- To understand the components of techno-economic feasibility studies.
- To know about the detailed project report
- To learn about project constraints.
- To understand the techniques of evaluation.
- To get insight into the Social Cost Benefit Analysis Method.
- To know how to construct project networks using PERT and CPM.
- To learn how to crash project networks
- To understand the meaning of project appraisal.
- To understand the meaning of project audits.
- To know the qualities of an effective project manager.
- To understand the stages in Team Development model.

Course Outcomes

CO 1: Understand the Project Management Principles.

CO 2: Learn to create and manage project schedules.

CO 3: Create structure and manage the project commitments.

CO 4: Gain enterprise support.

CO 5: Prepare Detailed Project Report (DPR).

Pre-requisites :

Basic Knowledge.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	-	-	-	2	2
CO2	2	2	1	-	1	3	2
CO3	3	2	3	3	1	3	3
CO4	3	2	2		1	3	2
CO5	3	2	3	3	1	3	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- It is advised that teachers take steps to pique pupils' attention and boost their curiosity to learn.
- Implement task-based learning activities where students work on specific tasks or projects.
- Incorporate technology tools and resources, such as online platforms, interactive multimedia, and virtual communication tools, to enhance engagement and provide additional practice opportunities.
- All demonstrations/Hand-on practices may be followed in the real environment as far as possible.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of one will be considered for the internal assessment of 15 Marks.

CA1and CA2 Assessment test should be conducted for two units as below.

PART A: (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write five questions. Each unit four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination-Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

6000236113	PROJECT MANAGEMENT	L	T	P	C
Theory		3	0	0	3

UNIT I	Project Management – An Overview, Project Portfolio Management System and Structure, Steps in Defining Project and Project Delays	
Project – Classification – Importance of Project Management – An Integrated Approach – Project Portfolio Management System – The Need – Choosing the appropriate Project Management Structure: Organizational considerations and project considerations – steps in defining the project – project Rollup – Process breakdown structure – Responsibility Matrices – External causes of delay and internal constraints.		7

UNIT II	Various Stages and Components of Project Feasibility Studies, Phases of a Project, Stages in Project Life Cycle and Project Constraints	
Project feasibility studies - Opportunity studies, General opportunity studies, specific opportunity studies, pre-feasibility studies, functional studies or support studies, feasibility study – components of project feasibility studies – Managing Project resources flow – project planning to project completion: Pre-investment phase, Investment Phase and operational phase – Project Life Cycle – Project constraints.		7

UNIT III	Project Evaluation under Certainty and Uncertainty, Project Evaluation, Commercial and Social Cost Benefit Analysis	
Project Evaluation under certainty - Net Present Value (Problems - Case Study), Benefit Cost Ratio, Internal Rate of Return, Urgency, Payback Period, ARR – Project Evaluation under uncertainty – Methodology for project evaluation – Commercial vs. National Profitability – Social Cost Benefit Analysis, Commercial or National Profitability, social or national profitability.		7

UNIT IV	Developing Project Network using PERT and CPM, Project Appraisal and Control Process.	
Developing a Project Plan - Developing the Project Network – Constructing a Project Network (Problems) – PERT – CPM – Crashing of Project Network (Problems - Case Study) – Resource Leveling and Resource Allocation – how to avoid cost and time overruns – Steps in Project Appraisal Process – Project Control Process – Control Issues – Project Audits – the Project Audit Process – project closure – team, team member and project manager evaluations.		7

UNIT V	Project Managing Versus Leading of Project, Qualities of Project Manager and Managing Project Teams, Team Building Models and Performance Teams and Team Pitfalls.

Managing versus leading a project - managing project stakeholders – social network building (Including management by wandering around) – qualities of an effective project manager – managing project teams – Five Stage Team Development Model – Situational factors affecting team development – project team pitfalls.	7
Revision and Test	**10**
TOTAL HOURS	**45**

Suggested list of Students Activity,

Project Simulation and Role-Playing:

- Activity: Participate in simulated project scenarios where students take on different roles within a project team (e.g., project manager, team member, stakeholder).
- Purpose: This helps students understand the dynamics of project management, including leadership, communication, and team collaboration.

Case Study Analysis:

- Activity: Analyze real-world case studies of successful and failed projects.
- Purpose: This activity enables students to apply theoretical knowledge to practical situations, identify best practices, and learn from the challenges and solutions implemented in real projects.

Project Plan Development:

- Activity: Develop a comprehensive project plan for a hypothetical or real project, including scope, schedule, budget, risk management, and quality management plans.
- Purpose: This allows students to practice creating detailed and structured project plans, honing their skills in planning and organizing project activities.

Group Project:

- Activity: Work in teams to manage a project from initiation to closure, simulating a real project environment.
- Purpose: Group projects help students learn how to work collaboratively, manage group dynamics, and apply project management tools and techniques in a team setting.

Project Management Software Training:

- Activity: Gain hands-on experience with project management software such as Microsoft Project, Asana, or Trello.
- Purpose: This activity equips students with practical skills in using technology to plan, track, and manage project tasks and resources efficiently.

Text Books for Reference:

1. Clifford F. Gray And Erik W. Larson, Project Management – The Managerial Process, Tata Mcgraw Hill.
2. Dragan Z. Milosevic, Project Management Toolbox: Tools And Techniques For The Practicing Project Manager,
3. Gopalakrishnan, P/ Ramamoorthy, V E, Textbook Of Project Management, Macmillan India. Ltd.
4. Harold Kerzner, Project Management: A Systems Approach To Planning, Scheduling, And Controlling, Eighth Edition, John Wiley & Sons
5. Jason Charvat, Project Management Methodologies: Selecting, Implementing, And Supporting Methodologies And Processes For Projects, John Wiley & Sons
6. Kevin Forsberg, Ph.D, Hal Mooz, Visualizing Project Management: A Model For Business And Technical Success, Second Edition, Pmp And Howard Cotterman, John Wiley & Sons.

Website Links for Reference:

https://youtu.be/pc9nvBsXsuM

NPTEL Courses

https://youtu.be/PqQqTAu_FiM

6000236114	FINANCE FUNDAMENTALS	L	T	P	C
Theory		3	0	0	3

Introduction

This course gives a deep insight into the finance fundamentals such as money management and the process of acquiring needed funds. It also encompasses the oversight, creation, and study of money, banking, credit, investments, assets, liabilities that make up financial systems and improves overall financial literacy.

Course Objectives

The objective of this course is to

1. Identify different ways to save money for future
2. Understand various techniques to raise capital
3. Get acquainted with the essential terminologies used in finance language
4. Get exposed to different types of budgeting
5. Instill the concept of costing and its impact on proftability

Course Outcomes

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

CO1: Manage financial resources effectively to achieve personal goals

CO2: Ensure that the business has enough money to meet its obligations and that it can recover in the future

CO3: Exhibit financial literacy through the usage of different terminologies appropriate to the context

CO4: Differentiate different types of budgeting and allocate the resources

CO5: Apply the idea of marginal costing in decision making

Pre-requisites

Knowledge of basic mathematics

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	-	-	-	2	2
CO2	2	2	1	-	1	3	2
CO3	3	2	3	3	1	3	3
CO4	3	2	2		1	3	2
CO5	3	2	3	3	1	3	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- It is advised that teachers take steps to pique pupils' attention and boost their curiosity to learn.
- Implement task-based learning activities where students work on specific tasks or projects.
- Incorporate technology tools and resources, such as online platforms, interactive multimedia, and virtual communication tools, to enhance engagement and provide additional practice opportunities.
- All demonstrations/Hand-on practices may be followed in the real environment as far as possible.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of one will be considered for the internal assessment of 15 Marks.

CA1and CA2 Assessment test should be conducted for two units as below.

PART A: (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write five questions. Each unit four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination-Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

6000236114	FINANCE FUNDAMENTALS	L	T	P	C
Theory		3	0	0	3

UNIT I	Personal Finance	
Personal Finance – Meaning, Objectives and advantages – Individual Perspective – Family Perspective – Time Value of Money – Personal Savings: Meaning, Different modes of Saving – Bank Deposit, Online Investments, Insurance, Stocks, Gold, Real Estate – Returns Vs Risk – Financial Discipline – Setting Alerts for commitments (With Real time Examples)		7
UNIT II	**Business Funding**	
Sources: Personal Savings – Borrowings - Venture Capital – Venture Capital Process – Commercial Banks – Government Grants and Scheme.		7
UNIT III	**Finance language**	
Capital – Drawing – Income – Expenditure – Revenue Vs Capital Items – Assets – Fixed Assets – Current Assets – Fictitious Assets – Liabilities – Long-term Liabilities – Current Liabilities – Internal Liabilities – External Liabilities – Share holders fund: Equity Share capital, Preference Share Capital, Reserve & Surplus – Borrowings: Debentures, Bank Loan, Other Loan – Depreciation – Reserve Vs Provision.		7
UNIT IV	**Budgeting**	
Budgetary Control – Meaning – Preparation of various budgets – Purchase budget – Sales Budget – Production budget – Cash Budget – Flexible budgets. (With Problems)		7
UNIT V	**Marginal Costing**	
Marginal Costing – Meaning – Marginal Costing Vs Absorption Costing – Concepts of Variable Cost, Fixed Cost and Contribution – PV Ratio – Break Even Point – Margin of Safety – Key Factor – Application of Marginal Costing in decision making – Make or Buy – Shutdown or Continue – Exploring New Markets (With Problems)		7
Revision and Test		**10**
TOTAL HOURS		**45**

Suggested list of Students Activity

Financial Statement Analysis:

- Activity: Analyze and interpret financial statements, including balance sheets, income statements, and cash flow statements of different companies.
- Purpose: This activity helps students understand the financial health and performance of organizations, developing skills in financial analysis and critical thinking.

Investment Portfolio Management:

- Activity: Create and manage a simulated investment portfolio, making decisions on asset allocation, stock selection, and diversification.
- Purpose: This allows students to apply theoretical concepts in a practical setting, learning how to evaluate investment opportunities and manage financial risk.

Case Study Analysis:

- Activity: Examine real-world case studies involving financial decisions made by companies, such as capital budgeting, mergers and acquisitions, and financial restructuring.
- Purpose: Case studies provide insights into the application of finance principles in business scenarios, enhancing problem-solving and decision-making skills.

Financial Modeling:

- Activity: Build financial models using spreadsheets to forecast future financial performance, conduct sensitivity analysis, and evaluate business projects.
- Purpose: Financial modeling is a critical skill in finance, enabling students to project financial outcomes and support strategic decision-making with quantitative analysis.

Classroom Discussions and Debates:

- Activity: Participate in discussions and debates on current financial issues, market trends, and economic policies.
- Purpose: Engaging in discussions helps students stay informed about the latest developments in finance, develop their communication skills, and form well-rounded opinions on financial matters.

Text Books for Reference:

1. Banking Theory, Law & Practice - Dr.L.Natarajan, Margham Publications.
2. Corporate Accounting by T.S.Reddy and Dr.A.Murthy, Margham Publications.
3. Management Accounting by T.S.Reddy and Dr.Y.Hariprasd Reddy, Margham Publications.
4. Cost Accounting by T.S.Reddy and Dr.Y.Hariprasd Reddy, Margham Publications.

1052236115	5G TECHNOLOGY	L	T	P	C
Theory		3	0	0	3

Introduction:

This course provides an in-depth understanding of 5G technology, covering foundational concepts, essential radio access technologies, core network architecture, protocols and standards, and emerging technologies in wireless communication.

Course Objectives:

The objective of this course is to enable the students to

- Understand the fundamental principles and evolution of wireless communication systems, including the transition from previous generations to 5G.
- Identify and explain the key features, requirements, and use cases of 5G networks in various industries and applications.
- Analyze the architecture and components of 5G networks, including radio access technologies, core network elements, and network slicing.
- Develop proficiency in radio access technologies such as OFDM, MIMO.
- Explore emerging technologies and applications in 5G, such as IoT, edge computing, and AI integration, and assess their impact on future communication systems.
- Gain hands-on experience in implementing and troubleshooting 5G networks through practical exercises and simulations.
- Understand the regulatory and standardization processes governing 5G deployment, ensuring compliance and interoperability with global standards.
- Analyze security protocols and mechanisms implemented in 5G networks to ensure data confidentiality, integrity, and availability.
- Develop critical thinking and problem-solving skills to address challenges and optimize performance in 5G network design, deployment, and management.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Understanding 5G principles, features, and applications.

CO2: Proficiency in 5G radio access technologies.

CO3: Mastery of 5G core network architecture and protocols.

CO4: Knowledge of 5G protocol stack and interworking mechanisms.

CO5: Exploring emerging technologies and applications in 5G networks.

.

Pre-requisites:

- Basic understanding of telecommunications and networking principles.
- Proficiency in mathematics, including algebra and trigonometry.
- Knowledge of computer architecture and programming concepts.
- Familiarity with wireless communication technologies and laboratory equipment.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	1	1	-	-	-	-
CO2	2	2	1	2	-	-	1
CO3	1	1	2	2	-	-	1
CO4	2	1	1	2	-	-	1
CO5	2	1	1	1	2	-	1

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

Real-world Applications: Integrate real-world examples and applications of digital logic design, such as binary arithmetic in computer architecture, digital communication systems, and control systems. Showing practical applications helps students understand the relevance of the subject.

Interactive Lectures: Conduct interactive lectures with demonstrations, multimedia presentations, and interactive whiteboards to illustrate abstract concepts effectively. Encourage student participation through discussions, questions, and problem-solving exercises.

Use of Visual Aids: Utilize visual aids such as diagrams, charts, and animations to clarify complex concepts like Boolean algebra, logic gates, and sequential logic circuits. Visual representations help reinforce learning and improve comprehension.

Flipped Classroom Approach: Implement a flipped classroom model where students review lecture

materials and resources independently before class and use class time for hands-on activities, problem-solving, and discussions. This approach encourages active learning and fosters deeper understanding.

Formative Assessment: Use formative assessment techniques such as quizzes, concept mapping, and in-class exercises to gauge student understanding and provide timely feedback. Adjust teaching strategies based on assessment results to address areas of difficulty.

Self-directed Learning Resources: Provide self-directed learning resources such as textbooks, online tutorials, and supplementary materials to accommodate diverse learning styles and allow students to explore topics at their own pace.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of one will be considered for the internal assessment of 15 Marks.

CA1and CA2 Assessment test should be conducted for two units as below.

PART A: (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write five questions. Each unit four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination-Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1052236115	5G TECHNOLOGY	L	T	P	C
Theory		3	-	-	3

Unit I	Introduction to 5G Technology :	
	Overview of wireless communication systems - Evolution from 1G to 5G - Key features and requirements of 5G networks - Comparison between 4G and 5G technologies - network latency and its importance in 5G - 5G spectrum bands and frequency ranges-Basics of network coverage and capacity in 5G - 5G enabled devices and their functionalities - role of AI and ML in enhancing 5G capabilities - network slicing and its benefits in 5G deployment - 5G architecture and network elements	9
Unit II	**Radio Access Technologies in 5G :**	
	Introduction to radio access technologies (RATs) and their role in wireless communication - multiple access techniques (FDMA, TDMA, CDMA) and their evolution in 5G - orthogonal frequency-division multiplexing (OFDM) and its significance in 5G - multiple-input multiple-output (MIMO) and its application - beam forming techniques - small cell deployment - heterogeneous network (HetNet) architecture .	9
Unit III	**Core Network in 5G:**	
	Evolution of core network architecture from 4G to 5G (e.g., LTE to NGC) - Network slicing and virtualization in 5G core - Service-based architecture (SBA) and control plane/user plane separation (CUPS) - Network functions virtualization (NFV) and software-defined networking (SDN) - Edge computing and mobile edge computing (MEC) in 5G networks	9
Unit IV	**5G Protocols and Standards :**	
	Overview of 5G protocol stack (PHY, MAC, RLC, PDCP, RRC, etc.) - 3GPP standardization process and release versions - NR (New Radio) air interface protocol architecture - Signalling procedures and message flows in 5G networks - Interworking and coexistence with legacy networks (e.g., LTE, Wi-Fi).	9

Unit V	Emerging Technologies and Applications in 5G :	
	Internet of Things (IoT) and machine-to-machine (M2M) communications in 5G - Vehicle-to-everything (V2X) communication and smart transportation systems - Augmented reality (AR), virtual reality (VR), and immersive multimedia applications. Network security and privacy considerations in 5G networks - Future trends and challenges in 5G technology development.	9
	TOTAL PERIODS	45

Suggested List of Students Activity:

The following student activities or similar activities can be assigned for assessing IA marks

- Students are tasked with conducting research on the evolution of wireless communication systems, spanning from the first-generation (1G) to the fifth-generation (5G) networks. They gather information on the technological advancements, key milestones, and the impact of each generation on society and industries
- Using simulation software such as OPNET or NS-3, students simulate a 5G network deployment scenario. They configure parameters such as base stations, user equipment, and traffic patterns to model realistic network conditions.
- Students analyze a real-world case study of a 5G network deployment project. They examine the challenges faced by the network operators, the design decisions made during the deployment process, and the outcomes achieved.
- Students conduct an in-depth analysis of the signalling protocols used in 5G networks. They examine protocols such as the Radio Resource Control (RRC) protocol, Session Management (SM) protocol, and User Plane Protocol (UPP), studying their functionalities, message formats, and interactions.
- Each student selects an emerging technology relevant to 5G, such as Internet of Things (IoT), edge computing, or network slicing. They research the technology's principles, applications, and potential impact on 5G networks
- In the laboratory, students perform hands-on experiments related to radio access technologies or core network components. For example, students may configure and test a small-scale OFDM-MIMO system to understand its performance characteristics.

- Students collaborate in groups to design a 5G network architecture tailored to a specific use case or scenario. Each group conducts comprehensive research on network requirements, technology options, and deployment considerations. They develop a detailed network design proposal, considering factors such as coverage, capacity, scalability, and cost-effectiveness. Finally, groups present their design proposals to the class, showcasing their understanding of 5G network planning and their ability to address environmental and sustainability concerns.

Text Books for Reference:

- Afif Osseiran, Jose F Monserrat, Patrick Marsch, 5G Mobile and Wireless Communications Technology, 1st Edition, Cambridge University Press, 2016
- Erik Dahlman, 5G NR: The Next Generation Wireless Access Technology , 1st Edition, Elsevier, 2016.
- Jonathan Rodriguez , Fundamentals of 5G Mobile Networks, 1st Edition, Wiley, 2015
- HarriHolma, AnttiToskala, Takehiro Nakamura, "5G Technology 3GPP NEW RADIO", John Wiley & Sons, 1/e, 2020.

Website Links for Reference:

NPTEL :https://nptel.ac.in/courses/108/105/108105134/

Udemy: https://www.udemy.com/course/5g-mobile-networksmodern-wireless-communication-technology/

1052236116	DEVOPS	L	T	P	C
Theory		3	0	0	3

Introduction

The DevOps is the combination of two words, one is Development and other is Operations. It is a culture to promote the development and operation process collectively. The DevOps course will help to learn DevOps basics and provide depth knowledge of various DevOps tools such as Git, Maven, Ansible, Jenkins.

Course Objectives

The objective of this course is to enable the student to

- To understand basics of Devops.
- To illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems.
- To understand the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment).
- To understand the version control tools like Git.
- To understand about configuration management using Ansible

Course Outcomes

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

CO1: Understand basics of Devops.

CO2: Perform continuous integration and continuous testing and Continuous deployment using Jenkins by building and automating test case using Maven.

CO3: Ability to perform automated continuous deployment.

CO4: Understand different actions performed through version control tools like Git.

CO5: Ability to do configuration management using Ansible.

Pre-requisites

Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	3	-	-	-
CO2	3	3	3	3	-	-	-
CO3	3	3	3	3	-	-	-
CO4	3	3	2	3	-	-	-
CO5	3	3	3	3	-	-	-

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable, real-life examples and engineering applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice-activity strategy throughout the course to ensure outcome-driven learning and employability.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activities in a simulated environment, transitioning to real-world scenarios when possible.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of one will be considered for the internal assessment of 15 Marks.

CA1and CA2 Assessment test should be conducted for two units as below.

PART A: (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write five questions. Each unit four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination-Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1052206116	DEVOPS	L	T	P	C
Theory		3	0	0	3

Unit I	**INTRODUCTION TO DEVOPS**	
Introduction to Devops – History of Devops – Devops Definition – Devops Main Objectives – Devops and Software Development Life Cycle – Waterfall Model – Agile Model.		8
Unit II	**COMPILE AND BUILD USING MAVEN**	
Introduction - Installation of Maven – Maven Build Requirements - Maven POM Builds (pom.xml), Maven Build lifecycle - Maven repositories(local, global) , Maven create and build Artifacts, Maven Dependencies – Maven Plugins.		10
Unit III	**CONTINUOUS INTEGRATION USING JENKINS**	
Introduction to Jenkins – Continuous Integration with Jenkins – Jenkins Management – Scheduling build jobs - Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace Management.		10
Unit IV	**VERSION CONTROL USING GIT**	
GIT Features – 3 – Tree Architecture – GIT Clone/Commit/Push – GIT Hub Projects – GIT Rebase & Merge – GIT Stash, Reset, Checkout – GIT Clone, Fetch,Pull.		10
Unit V	**CONFIGURATION MANAGEMENT USING ANSIBLE**	
Introduction to Ansible, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles.		7
TOTAL PERIODS		**45**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based on the course.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.

Text Books for Reference:

1. Jennifer Davis, Ryn Daniels, “Effective DevOps”, 1st edition, O’Reilly, 2017.

2. David Johnson, “Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps”, Second Edition, CreateSpace Independent Publishing Platform, 2016.
3. Mariot Tsitoara, “Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer”, Second Edition, Apress, 2019.

Website Links for Reference:

1. https://www.jenkins.io/doc/tutorials/
2. https://maven.apache.org/index.html

ELECTIVE IV

1058236231	FOUNDATIONS OF DATA SCIENCE	L	T	P	C
Practicum		2	0	2	3

Introduction:

Foundations of data science encompass the fundamental principles and concepts that serve as the building blocks for understanding and practicing data science. It provides a solid framework for aspiring data scientists to excel in the field. This course serves as a foundation for students to acquire necessary knowledge and practical exposure towards data science. It dwells into the basics of python libraries for data processing, modelling and visualization.

Course Objectives:

- Understand data science process and basics of NumPy library.
- Describe the relationships between data using Pandas library.
- Import data from different file formats using Pandas library.
- Utilize Python libraries for data wrangling.
- Interpret data using visualization libraries in Python.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Outline data science process and perform array operations using NumPy library.

CO2: Sketch the importance of Pandas library.

CO3: Use Pandas library to read data from different file formats.

CO4: Illustrate Python libraries for data wrangling.

CO5: Apply visualization Libraries in Python to interpret and explore data.

Pre-requisites:

Basics of Python

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	1	2	-	1	2
CO2	2	2	1	1	-	1	2
CO3	2	2	1	2	-	1	2
CO4	3	2	1	2	-	1	2
CO5	2	2	1	2	1	1	1

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

Programming Skills: Teach programming languages commonly used in data science, such as Python and R. Cover basics like data types, control structures, functions, and libraries/packages relevant to data manipulation and analysis.

Capstone Projects and Real-world Applications: Encourage students to work on capstone projects where they can apply their skills to real-world datasets and problems. This provides hands-on experience and helps to reinforce concepts learned throughout the course.

Continuous Learning and Professional Development: Emphasize the importance of continuous learning in the rapidly evolving field of data science. Encourage students to explore advanced topics, participate in online courses, attend workshops, and engage with the data science community.

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written Test Theory (Any Two Units)	Written Test Theory (Another Two Units)	Practical Test (All Exercises)	Written Test (Complete Theory Portions)	Written Examination (Complete Theory Portions)
Duration	2	2	3	3 Hours	3 Hours
Exam Marks	50	50	100	100	100
Converted to	10	10	15	15	60
Marks	10		15	15	60
Tentative Schedule	6th Week	12th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** Assessment written test should be conducted for 50 Marks. The marks scored will be converted to 10 Marks for each test. Best of one will be considered for the internal assessment of 10 Marks.

  CA1 and CA2, Assessment written test should be conducted for two units as below.

  PART A: (5 X 10 Marks = 50 Marks).

  Eight questions will be asked, students should write Five questions.

  Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded will be converted to 15 Marks for the internal mark.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. Each exercise/experiment should be evaluated for 10 Marks. The total marks awarded should be converted to 30 Marks for the practical test as per the scheme of evaluation as below.

The details of the documents to be prepared as per the instruction below.

The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification

SCHEME OF EVALUATION - Practical Test

Sl.No.	Description	Marks
A	Aim (05) ,Program (30)	35
B	Execution	20
C	Output	10
D	Practical document (All Practicals)	30
E	Viva Voce	05
Total		100

CA4: Model examination should be conducted for complete theory portions as per the end semester question pattern. The marks awarded should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination- Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1058236231	FOUNDATIONS OF DATA SCIENCE	L	T	P	C
Practicum		2	0	2	3

UNIT 1	INTRODUCTION TO DATA SCIENCE AND NUMPY BASICS	
Introduction to Data Science Data Science: Benefits and Uses – Facets of Data – Data Science Process: Overview – Defining research goals – Retrieving data – Cleansing, integrating and transforming data – Exploratory data analysis – Build the model – Presenting findings and building applications		6
NumPy Basics Basics of NumPy Arrays: Creating ndarrays – NumPy Array Attributes – Array Indexing – Array Slicing – Reshaping of Arrays – Array Concatenation and Splitting – Aggregation		6
Practical Exercises 1. Creating a NumPy Array 2. Indexing and Slicing of NumPy Array 3. Shape and Reshaping of NumPy Array		4
UNIT II	**DATA MANIPULATION WITH PANDAS**	
Introduction to Pandas Data Structure: Series – DataFrame – Index – Data Selection in Series – Data Selection in DataFrame – Summarizing and computing descriptive statistics – Handling Missing Data – Filtering out missing data		6
Practical Exercises 1. Perform following operations using pandas 2. Use dataset from UCI of your choice and perform descriptive statistics		4
UNIT III	**DATA LOADING, STORAGE AND FILE FORMATS**	
Reading and Writing Data in Text Format – Reading TextFiles in Pieces – Writing Data Out to Text Format – Manually Working with Delimited Formats – JSON Data – XML and HTML: Web Scraping – Binary Data Formats – Using HDF5 Format – Reading Microsoft Excel Files – Interacting with Databases – Storing and Loading Data in MongoDB		6
Practical Exercises 1. Read the following file formats using pandas 2. Demonstrate web scraping using python 3. Importing data from database and performing various queries		4

4. Store and load data in MongoDB	
UNIT IV	**DATA WRANGLING**
Combining and Merging Data Sets – Database style DataFrame Merges – Merging on Index – Concatenating Along an Axis – Combining Data with Overlap – Reshaping and Pivoting – Reshaping with Hierarchical Indexing – Data Transformation – Removing Duplicates – Replacing Values	6
Practical Exercises 1. Perform data wrangling for fraud detection. 2. Perform data wrangling for customer behavior analysis.	6
UNIT V	**DATA PLOTTING AND VISUALIZATION**
A Brief matplotlib API Primer: Figures and Subplots - Colors, Markers, and Line Styles - Ticks, Labels, and Legends - Annotations and Drawing on a Subplot - Saving Plots to File - Plotting Functions in pandas: Line Plots - Bar Plots - Histograms and Density Plots - Scatter Plots	6
Practical Exercises 1. Perform visualizations using matplotlib	6
Total	**60**

Suggested List of Students Activity:

1. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the data set from UCI.
2. Apply and explore various plotting functions on UCI data sets.

Text and Reference Books:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016.
2. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016.
3. Wes McKinney, “Python for Data Analysis”, O’REILLY, ISBN:978-1-449-31979-3, 1st edition, October 2012.
4. Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green Tea Press,2014.
5. Joel Grus, “Data Science from Scratch: First Principles with Python”, O’Reilly Media, 2015.
6. Matt Harrison, “Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization , O'Reilly, 2016.

Web-based/Online Resources:

1. https://www.analyticsvidhya.com/blog/2020/04/the-ultimate-numpy-tutorial-for-data-science-beginners/
2. https://www.w3schools.com/python/numpy/default.asp
3. https://www.w3schools.com/python/pandas/default.asp
4. https://www.analyticsvidhya.com/blog/2021/08/lets-understand-all-about-data-wrangling/

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

1. Windows 10 or higher operating system / Linux Ubuntu 20 or higher
2. Python 3.9 or later, Anaconda Distribution
3. Numpy, pandas, scipy, seaborn, statmodels, plotly

1058236232	ARTIFICIAL INTELLIGENCE	L	T	P	C
Practicum		2	0	2	3

Introduction:

Artificial Intelligence (AI) is a rapidly evolving field that encompasses various techniques and methodologies aimed at creating intelligent systems capable of performing tasks that typically require human intelligence. This course will provide a solid foundation to understand AI and its potential impact on various industries and everyday life.

Course Objectives:

The main objectives of this course are to:

- Learn the basic AI approaches
- Develop problem solving agents
- Perform logical reasoning

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Explain intelligent agent frameworks
CO2: Apply problem solving techniques
CO3: Apply game theory
CO4: Apply CSP techniques
CO5: Perform logical reasoning

Pre-requisites:

- Possession of soft skills like problem-solving, critical thinking, and time management.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2			1	1
CO2	3	2	2	1		1	3
CO3	3	2	2	1		1	2
CO4	3	2	2	1		1	3
CO5	3	2	2	1		1	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- Teachers must take steps to gain pupils' attention and boost their learning confidence by using multiple teaching aids.
- Teachers should provide examples from daily life, realistic situations, and real world engineering and technological applications.
- Plan demonstrations to make subject exciting and to foster scientific mindset.
- Theory-demonstrate-practice-activity strategy may be used to ensure that the learning outcome is achieved.

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written Test Theory (Any Two Units)	Written Test Theory (Another Two Units)	Practical Test (All Exercises)	Written Test (Complete Theory Portions)	Written Examination (Complete Theory Portions)
Duration	2	2	3	3 Hours	3 Hours
Exam Marks	50	50	100	100	100
Converted to	10	10	15	15	60
Marks	10		15	15	60
Tentative Schedule	6th Week	12th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** Assessment written test should be conducted for 50 Marks. The marks scored will be converted to 10 Marks for each test. Best of one will be considered for the internal assessment of 10 Marks.

  CA1 and CA2, Assessment written test should be conducted for two units as below.

  PART A: (5 X 10 Marks = 50 Marks).

  Eight questions will be asked, students should write Five questions.

  Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded will be converted to 15 Marks for the internal mark.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. Each exercise/experiment should be evaluated for 10 Marks. The total marks awarded should be converted to 30 Marks for the practical test as per the scheme of evaluation as below.

The details of the documents to be prepared as per the instruction below.

The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification

SCHEME OF EVALUATION - Practical Test

Sl.No.	Description	Marks
A	Aim (05) ,Program (30)	35
B	Execution	20
C	Output	10
D	Practical document (All Practicals)	30
E	Viva Voce	05
Total		100

CA4: Model examination should be conducted for complete theory portions as per the end semester question pattern. The marks awarded should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination- Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1058236232	ARTIFICIAL INTELLIGENCE	L	T	P	C
Practicum		2	0	2	3

Unit I	INTELLIGENT AGENTS	
Introduction to AI - Agents and Environments - concept of rationality - nature of environments - structure of agents - Agent programs - Simple reflex agents - Model-based reflex agents - Goal-based agents - Utility-based agents - Learning agents - How the components of agent programs work		9
Practical: 1. Write a Program to Implement Breadth First Search using Python. 2. Write a Program to Implement Depth First Search using Python.		3
Unit II	**PROBLEM SOLVING**	
Problem-Solving Agents - Problem types - search algorithms – uninformed search strategies - informed search strategies - Heuristic Functions - Local search and optimization problems - Search in Partially Observable Environments.		11
Practical: 3. Write a Program to Implement Tic-Tac-Toe game using Python. 4. Write a Program to Implement 8-Puzzle problem using Python.		3
Unit III	**GAME PLAYING**	
Game theory – optimal decisions in games – alpha-beta search – monte-carlo tree search – stochastic games – partially observable games.		8
Practical: 5. Write a Program to Implement Water-Jug problem using Python. 6. Write a Program to Implement Travelling Salesman Problem using Python		3
Unit IV	**CONSTRAINT SATISFACTION PROBLEMS**	
Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP.		8
Practical: 7. Write a Program to Implement Tower of Hanoi using Python. 8. Write a Program to Implement Monkey Banana Problem using Python.		3
Unit V	**LOGICAL REASONING**	

Knowledge-based agents – propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic. First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining – resolution.	9
Practical: 9. Write a Program to Implement Alpha-Beta Pruning using Python. 10. Write a Program to Implement 8-Queens Problem using Python.	3
TOTAL HOURS	**60**

Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments based on AI
- Periodic class quizzes conducted on a weekly/fortnightly basis to reinforce the basic AI concepts
- Micro project that shall be an extension of any concepts in AI that can be applied to real-world environment
- Nudge students to use generative AI tools like ChatGPT, Gemini AI, etc.,

Text and Reference Books:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, Fourth Edition, Pearson Education, 2021.
2. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education,2007
3. Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2008
4. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006
5. Deepak Khemani, “Artificial Intelligence”, Tata McGraw Hill Education, 2013.

Web-based/Online Resources:

https://nptel.ac.in/courses/106105078

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

1. Windows 10 or higher operating system / Linux Ubuntu 20 or higher
2. Python 3.9

1058236233	VIRTUAL REALITY AND AUGMENTED REALITY	L	T	P	C
Practicum		2	0	2	3

Introduction:

This course is designed to give historical and modern overviews and perspectives on virtual reality. It describes the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.

Course Objectives:

1. Learn the fundamental Computer Vision, Computer Graphics and Human-Computer interaction Techniques related to VR/AR.
2. Review the Geometric Modelling Techniques.
3. Review the Virtual Environment.
4. Discuss and Examine VR/AR Technologies
5. Use of various types of Hardware and Software in Virtual Reality systems
6. Simulate and Apply Virtual/Augmented Reality to varieties of Applications

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Understand the fundamental Computer Vision, Computer Graphics and Human-Computer interaction Techniques related to VR/AR.

CO2: Understand the physical principles of VR.

CO3: Explain the concepts of motion and tracking in VR systems.

CO4: Create a comfortable, high-performance VR application using Unity.

CO5: Understand the system of human vision and its implication on perception and rendering.

Pre-requisites:

Knowledge on Engineering Graphics.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	3	1	1	2
CO2	3	2	3	3	1	1	2
CO3	3	3	3	3	1	3	2
CO4	3	3	3	3	2	3	2
CO5	3	3	3	3	2	3	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- **Engage and Motivate:** Instructors should actively engage students to boost their learning confidence.
- **Real-World Relevance:** Incorporate relatable, real-life examples and engineering applications to help students understand and appreciate course concepts.
- **Interactive Learning:** Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- **Application-Based Learning:** Employ a theory-demonstrate-practice-activity strategy throughout the course to ensure outcome-driven learning and employability.
- **Encourage Critical Analysis:** Foster an environment where students can honestly assess experiment outcomes and analyse potential sources of error in case of discrepancies.

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written Test Theory (Any Two Units)	Written Test Theory (Another Two Units)	Practical Test (All Exercises)	Written Test (Complete Theory Portions)	Written Examination (Complete Theory Portions)
Duration	2	2	3	3 Hours	3 Hours
Exam Marks	50	50	100	100	100
Converted to	10	10	15	15	60
Marks	10		15	15	60
Tentative Schedule	6th Week	12th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** Assessment written test should be conducted for 50 Marks. The marks scored will be converted to 10 Marks for each test. Best of one will be considered for the internal assessment of 10 Marks.

  CA1 and CA2, Assessment written test should be conducted for two units as below.

  PART A: (5 X 10 Marks = 50 Marks).

  Eight questions will be asked, students should write Five questions.

  Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded will be converted to 15 Marks for the internal mark.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. Each exercise/experiment should be evaluated for 10 Marks. The total marks awarded should be converted to 30 Marks for the practical test as per the scheme of evaluation as below.

  The details of the documents to be prepared as per the instruction below.

  The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The

detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification

SCHEME OF EVALUATION - Practical Test

Sl.No.	Description	Marks
A	Aim (05) ,Program (30)	35
B	Execution	20
C	Output	10
D	Practical document (All Practicals)	30
E	Viva Voce	05
Total		100

CA4: Model examination should be conducted for complete theory portions as per the end semester question pattern. The marks awarded should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination- Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1058236233	VIRTUAL REALITY AND AUGMENTED REALITY	L	T	P	C
Practicum		2	0	2	3

Unit I	INTRODUCTION TO VIRTUAL REALITY (VR)	
Theory: **Introduction :** Defining Virtual Reality, History of VR, Key Elements of Virtual Reality. **Virtual Environment:** Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, **Benefits :** benefits of virtual reality, Historical development of VR, Scientific Landmark.		3 3 3
Practical: Installation of Unity and Visual Studio, setting up Unity for VR development, understanding documentation of the same.		3
Unit II	**COMPUTER GRAPHICS AND GEOMETRIC MODELLING**	
Theory: **Fundamentals of VR World:** The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, Color theory. **Modelling:** Conversion From 2D to 3D, 3D space curves, 3D boundary representation, Simple 3D modelling, 3D clipping, Illumination models, Reflection models, Shading algorithms. **Geometrical Transformations:** Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection.		3 3 3
Practical: Demonstration of the working of HTC Vive, Google Cardboard, Google Daydream and Samsung gear VR.		3
Unit III	**VIRTUAL ENVIRONMENT**	
Theory: **Input/Output Devices:** Input (Tracker, Sensor, Digital Gloves, Movement Capture, Video-based Input, 3D Menus & 3D Scanner, etc.), Output (Visual/Auditory/Haptic Devices). **Generic VR system:** Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems, Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system.		3 4 4

Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.	
Practical: Develop a scene in Unity that includes: i. a cube, plane and sphere, apply transformations on the 3 game objects. ii. add a video and audio source.	3
Unit IV	**AUGMENTED REALITY (AR)**
Theory: **Fundamentals of Augmented Reality :** Taxonomy, Technology and Features of Augmented Reality, AR Vs VR. **Callenges :** Challenges with AR, AR systems and functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality. **Enhancing Environment:** Enhancing interactivity in AR Environments, Evaluating AR systems.	2 3 2
Practical: Develop a scene in Unity that includes a sphere and plane. Apply Rigid body component, material and Box collider to the game Objects.	3
Unit V	**DEVELOPMENT TOOLS AND FRAMEWORKS**
Theory: **Human factors:** Introduction, the eye, the ear, the somatic senses **Hardware:** Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems **Software:** Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML	3 3 3
Practical: Create an immersive environment (living room/ battlefield/ tennis court) with only static game objects. 3D game objects can be created using Blender or use available 3D models.	3
TOTAL HOURS	**60**

Suggested List of Students Activity:

1. Presentation/Seminars by students on recent technological developments based on the course.
2. Project based Learning in emerging application.
3. Periodic class/online quizzes conducted based on the course.

4. Blended learning activities to explore the recent trends and developments in the field.
5. Assignments on different types of learnings.
6. Tutorials on solving problems.
7. Flipped classroom activities to explore application areas.

Text and Reference Books:

1. Coiffet, P., Burdea, G. C., "Virtual Reality Technology," Wiley-IEEE Press, 2003.
2. Schmalstieg, D., Höllerer, T., "Augmented Reality: Principles & Practice," Pearson, 2016.
3. Norman, K., Kirakowski, J., " Wiley Handbook of Human Computer Interaction," Wiley-Blackwell, 2018.
4. LaViola Jr., J. J., Kruijff, E., McMahan, R. P., Bowman, D. A., Poupyrev, I., "3D User Interfaces: Theory and Practice," Pearson, 2017.
5. Fowler, A., "Beginning iOS AR Game Development: Developing Augmented Reality Apps with Unity and C#," Apress, 2019.
6. Hassanien, A. E., Gupta, D., Khanna, A., Slowik, A., "Virtual and Augmented Reality for Automobile Industry: Innovation Vision and Applications," Springer, 2022.

Web-based/Online Resources:

1.Manivannan, M., (2018), "Virtual Reality Engineering," IIT Madras, https://nptel.ac.in/courses/121106013
2. Misra, S., (2019), "Industry 4.0: Augmented Reality and Virtual Reality," IIT Kharagpur, https://www.youtube.com/watch?v=zLMgdYI82IE
3. Dube, A., (2020), "Augmented Reality - Fundamentals and Development," NPTEL Special Lecture Series, https://www.youtube.com/watch?v=MGuSTAqlZ9Q
4. http://cambum.net/course-2.htm

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

1. Operating System recommended :- 64-bit Windows OS
2. Programming tools recommended: - Unity, C#, Blender, VRTK.
3. VR Devices: HTC Vive, Google Cardboard, Google Daydream and Samsung gear VR.

1058236234	OPEN SOURCE TECHNOLOGIES	L	T	P	C
Practicum		2	0	2	3

Introduction:

Open source technologies refer to software or projects where the source code is made freely available for anyone to use, modify, and distribute. This collaborative approach to software development fosters innovation, community engagement, and transparency. Some popular open source technologies include Linux operating system, Apache web server, MySQL database, and programming languages like Python and Java. For students, open source technologies offer several benefits such as cost effective learning, real world experience, customization and flexibility, community support, portfolio building. Overall, open source technologies offer diploma students a valuable opportunity to gain hands-on experience, expand their technical skills, and prepare for careers in software development and related fields.

.

Course Objectives:

- Understand the principles and philosophy of open source software.
- Explore the features and benefits of PHP as an open source programming language.
- Develop proficiency in writing PHP scripts for web development projects.
- Develop proficiency in writing SQL queries.
- Understand the fundamentals of the Python programming language and its role in open source development and also learn to write python scripts for various tasks.
- Explore various open source technologies used in web development, including web servers, frameworks, and content management systems.
- Understand the basics of the Perl programming language and its applications in open source development and also learn to write Perl scripts.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Understand the fundamentals of Open Source Software and writing scripts on Open Source Programming language PHP.

CO2: understand the features, advantages of open source database MySQL and can able to write and execute queries in that.

CO3: Understand the basics of the Python programming and the role of it in open source

development and be able to write python scripts for various tasks.

CO4: Understand various open source technologies in web development.

CO5: Understand the basics of Perl and can able to write Perl scripts.

Pre-requisites:

Knowledge of basic Computer Science concepts and basic programming skills.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2			1	3
CO2	3	2	2			1	3
CO3	3	2	2	2		2	3
CO4	3	2	2	3		2	3
CO5	3	3	3			3	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- Teachers must take steps to gain pupils' attention and boost their learning confidence by using multiple teaching aids.
- Teachers should provide examples from daily life, realistic situations, and real world engineering and technological applications.
- Plan demonstrations to make subject exciting and to foster scientific mind set.
- Theory-demonstrate-practice-activity strategy may be used to ensure that the learning outcome is achieved.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written Test Theory (Any Two Units)	Written Test Theory (Another Two Units)	Practical Test (All Exercises)	Written Test (Complete Theory Portions)	Written Examination (Complete Theory Portions)
Duration	2	2	3	3 Hours	3 Hours
Exam Marks	50	50	100	100	100
Converted to	10	10	15	15	60
Marks	10		15	15	60
Tentative Schedule	6th Week	12th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** Assessment written test should be conducted for 50 Marks. The marks scored will be converted to 10 Marks for each test. Best of one will be considered for the internal assessment of 10 Marks.

  CA1 and CA2, Assessment written test should be conducted for two units as below.

  PART A: (5 X 10 Marks = 50 Marks).

  Eight questions will be asked, students should write Five questions.

  Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded will be converted to 15 Marks for the internal mark.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. Each exercise/experiment should be evaluated for 10 Marks. The total marks awarded should be converted to 30 Marks for the practical test as per the scheme of evaluation as below.

The details of the documents to be prepared as per the instruction below.

The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification

SCHEME OF EVALUATION - Practical Test

Sl.No.	Description	Marks
A	Aim (05) ,Program (30)	35
B	Execution	20
C	Output	10
D	Practical document (All Practicals)	30
E	Viva Voce	05
Total		100

CA4: Model examination should be conducted for complete theory portions as per the end semester question pattern. The marks awarded should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination- Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1058236234	OPEN SOURCE TECHNOLOGIES	L	T	P	C
Practicum		2	0	2	3

Unit I	OVERVIEW OF OPEN SOURCE SOFTWARE AND OPEN SOURCE PROGRAMMING LANGUAGE – PHP	
Theory: Need of Open Sources – Advantages of Open Sources – FOSS – FOSS usage – Application of Open Sources - What is PHP? - Basic Syntax of PHP - programming in web environment - Common PHP Script Elements - Using Variables - Constants – Data types - Operators ; Statements - Working With Arrays –Using Functions – OOP - String Manipulation and Regular Expression-File and Directory Handling - Including Files - File Access Working With Forms -Processing Forms -Form Validation		6
Practical: 1. Create a basic form using PHP that allows users to input their name and age, and then displays a greeting along with their age. 2. Create a web page and execute a PHP file on submission of the HTML form and display the information using PHP.		3
Unit II	**OPEN SOURCE DATABASE**	
Theory: MySQL : History, features, and advantages- Basic SQL Commands: Creating and dropping databases and tables, Inserting, updating, and deleting data, Retrieving data using SELECT statement, Filtering data with WHERE clause, Sorting data with ORDER BY clause, Working with multiple tables: JOINS, Aggregation functions: SUM, AVG, COUNT, MIN, MAX, Grouping data with GROUP BY clause, Modifying table structure: ALTER TABLE statement, Transactions in MySQL: Begin, commit, rollback		6

Practical: 1. Create a database named "StudentManagementSystem" with tables for student details, courses, and enrolments. Implement SQL commands to: Insert sample data into the tables, Retrieve information about students enrolled in a specific course, Update student details such as contact information and Delete records of students who have dropped out of the course. 2. Expand the existing database schema to include tables for faculty and assignments. Write SQL queries to: Calculate the average score for each assignment, Retrieve the highest-scoring student in each course and Identify courses with low enrolment.	3
Unit III	**PYTHON**
Theory: Basic features of Python- Installing and Running in windows/Linux - Basic syntax and data types - Conditional statements (if, elif, else)- Looping constructs (for, while), Iteration and iteration control statements, Lists, tuples, and dictionaries, sequences, Defining and calling functions, Function parameters and return values, Opening, reading, and writing files, File modes and handling exceptions	6
Practical: 1. Write a Python program that prompts the user to input their age. Based on the provided age, the program should output one of the following messages: 'You are a child', 'You are a teenager', 'You are an adult', or 'You are a senior citizen'. Utilize conditional statements (if-elif-else) to determine which message to display 2. Design a Python program to find the factorial of a given number using a while loop. Prompt the user to input a positive integer and then use a while loop to calculate and display its factorial. Ensure proper error handling for non-positive integer inputs.	3
Unit IV	**Open Source Technologies and Web Servers**
Theory: significance of open source software in web development-Benefits of using open source web servers and tools-Introduction to Apache HTTP Server and Nginx-Installation and configuration of Apache and Nginx- Overview of popular open source text editors (e.g., Visual Studio Code, Atom)- Introduction to Git and GitHub/GitLab-Basic Git commands and workflows-Overview of open source CMS platforms (e.g., WordPress, Joomla, Drupal)	6

Practical: 1. Create a simple website using any open source text editors and CMS platforms.	3
Unit V	**Perl Programming**
Theory: Overview of Perl programming language-Perl syntax and script structure-Scalars, arrays, and hashes in Perl-Operators and expressions in Perl-Conditional statements (if, elsif, else)- Loops (for, foreach, while, do-while)- Control flow statements (next, last, redo)	6
Practical: 1. Write a Perl program which prompts the user to enter two numbers and performs basic arithmetic operations (addition, subtraction, multiplication, and division) on those numbers and prints out the results of each operation. 2. Write a Perl program that reads a sentence from the user and reverses the order of words in the sentence. Your program should use loops to achieve this.	3
TOTAL HOURS	**45**

Suggested List of Students Activity:

- Task: Students explore popular open source projects on platforms like GitHub and GitLab.
- Task: Students select an open source project and make a contribution, such as fixing a bug, adding documentation, or implementing a new feature.
- Task: Students select an open source project they find interesting and prepare a presentation discussing its features, development process, community involvement, and future directions.

Text and Reference Books:

1. Raymond, Eric S. The Cathedral & the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary. Sebastopol, CA: O'Reilly Media, 1999.
2. Fogel, Karl, and Moshe Bar. Producing Open Source Software: How to Run a Successful Free Software Project. Sebastopol, CA: O'Reilly Media, 2005.
3. Lutz, Mark. Learning Python. O'Reilly Media, 2013.
4. DuBois, Paul. MySQL Cookbook: Solutions for Database Developers and Administrators. Sebastopol, CA: O'Reilly Media, 2014.

5. Schwartz, Randal L., brian d foy, and Tom Phoenix. Learning Perl. Sebastopol, CA: O'Reilly Media, 2016.

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

Hardware Requirements

- Desktop Computers – 30 Nos
- Laser printer - 1 No.
- Processor: Intel Core i5 or equivalent
- Memory: 4 GB RAM
- Storage: 35 GB available space

Software Requirements

- XAMPP server
- Any text editor
- Apache Web Server, Tomcat
- PHP
- MySQL
- Python 3.4+ installed from https://python.org
- PERL

1058236235	MOBILE APPLICATION DEVELOPMENT FOR IOT	L	T	P	C
Practicum		2	0	2	3

Introduction:

The Internet of Things (IoT), is fast emerging as a concept that will immensely impact the way we live our lives as well as the way we work. IoT is a system of interrelated computing devices, people, mechanical and digital machines etc. that are marked by unique identifiers and have the ability to transfer data over a network. The use of IoT is changing business administration, expanding the productivity of the value chain, which ultimately prompts to the formation of new business models and markets. The development of the applications of the internet of things in mobile apps provides the controller of smart gadgets, such as wearables (wristwatches, eyeglasses), sensors, medical devices, and much more.

Course Objectives:

- Learn about Mobile App Development.
- Learn about Fundamentals of Android and Android application development.
- To Know the concept of IoT and its Level.
- To Study about various sensors and Data processing in IoT.
- To Know the concept of Raspberry Pi and ThingSpeak.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: To Create Mobile app using Android Studio development environment.

CO2: To Develop an Android application using Android Development Tool

CO3: To implement IoT Applications with Arduino

CO4: To Implement Sensor Applications using Arduino.

CO5: To Build simple IoT systems using Raspberry Pi and ThingSpeak.

Pre-requisites:

Knowledge of IOT and Mobile App Development.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	3	2	1	2
CO2	3	2	3	3	2	1	2
CO3	3	3	3	3	2	3	2
CO4	3	3	3	3	2	3	2
CO5	3	3	3	3	2	3	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- **Engage and Motivate:** Instructors should actively engage students to boost their learning confidence.
- **Real-World Relevance:** Incorporate relatable, real-life examples and engineering applications to help students understand and appreciate course concepts.
- **Interactive Learning:** Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- **Application-Based Learning:** Employ a theory-demonstrate-practice-activity strategy throughout the course to ensure outcome-driven learning and employability.
- **Encourage Critical Analysis:** Foster an environment where students can honestly assess experiment outcomes and analyse potential sources of error in case of discrepancies.

Assessment Methodology

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written Test Theory (Any Two Units)	Written Test Theory (Another Two Units)	Practical Test (All Exercises)	Written Test (Complete Theory Portions)	Written Examination (Complete Theory Portions)
Duration	2	2	3	3 Hours	3 Hours
Exam Marks	50	50	100	100	100
Converted to	10	10	15	15	60
Marks	10		15	15	60
Tentative Schedule	6th Week	12th Week	15th Week	16th Week	

Note:

- **CA1 and CA2:** Assessment written test should be conducted for 50 Marks. The marks scored will be converted to 10 Marks for each test. Best of one will be considered for the internal assessment of 10 Marks.

  CA1 and CA2, Assessment written test should be conducted for two units as below.

  PART A: (5 X 10 Marks = 50 Marks).

  Eight questions will be asked, students should write Five questions.

  Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded will be converted to 15 Marks for the internal mark.

  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. Each exercise/experiment should be evaluated for 10 Marks. The total marks awarded should be converted to 30 Marks for the practical test as per the scheme of evaluation as below.

The details of the documents to be prepared as per the instruction below.

The exercise should be completed on the day of practice. The same shall be evaluated for 10 marks on the day or the next day of practice before commencement of next exercise. The detailed date of the practices and its evaluations should be maintained in the log book and should be submitted for the verification

SCHEME OF EVALUATION - Practical Test

Sl.No.	Description	Marks
A	Aim (05) ,Program (30)	35
B	Execution	20
C	Output	10
D	Practical document (All Practicals)	30
E	Viva Voce	05
Total		100

CA4: Model examination should be conducted for complete theory portions as per the end semester question pattern. The marks awarded should be converted to 15 marks for the internal assessment.

Question Pattern: Model Examination and End Semester Examination- Theory Exam

Answer ten questions by selecting two questions from each unit. Each question carries 10 marks each. (5 X 20 Marks = 100 Marks)

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

1058236235	MOBILE APPLICATION DEVELOPMENT FOR IOT	L	T	P	C
PRACTICUM		2	0	2	3

Unit I	IoT MOBILE APPS	
Theory: **Introduction to Mobile APP:** Need of Mobile App- Different ways to develop Mobile apps- 1st Party Native App Development-Progressive web Application-Cross-Platform Application. **Trends in Mobile App:** IoT Mobile App Development Trends In 2020 - Role of Mobile Apps in revolutionizing the world of IoT - UX / UI design for IoT Mobile apps. **Challenges of design for IoT:** Challenges of UX/UI design for IoT applications - Practice tips on design for IoT mobile apps IoT App Design Solutions.		3 3 3
Practical: Create the "Hello World" app using Android Studio development environment and an emulator (virtual device) to run your app on your mobile device.		3
Unit II	**TECHNOLOGY I ANDROID**	
Theory: **Fundamentals of Android:** Introducing Android- Android application fundamentals - Managing lifecycle and state **Android architecture:** Introduction Establishing the development environment Android architecture -Activities and views Interacting with UI -Persisting data using SQLite Packaging **Deployment of Mobile Applications:** Deployment Interaction with server-side applications Using Google Maps- GPS and Wifi Integration with social media applications.		2 3 4
Practical: Develop an Android application using controls like Button, TextView, EditText for designing a calculator having basic functionality like Addition, Subtraction, Multiplication, and Division using Android Development Tool.		3
Unit III	**Introduction to IoT**	

Theory: **Basics of IOT:** Introduction to IoT- Key Components of IOT - Working with IoT Devices- Characteristics of IoT - Modern Applications- Advantages and Disadvantages of IoT. **IoT-An Architectural Overview**: Building an architecture - Main design principles and needed capabilities- An IoT architecture outline, standards considerations. **Technology Basics:** M2M and IoT Technology Fundamentals- Devices and gateways - Local and wide area networking- Data management - Business processes in IoT- Everything as a Service (XaaS) - M2M and IoT Analytics - Knowledge Management.	3 3 3
Practical: To implement LED Blink and LED Pattern to form traffic light design With Arduino.	3
Unit IV	**SENSOR FOR MOBILE HANDHELD DEVICES and SENSOR DATA PROCESSING**
Theory: **Sensing devices and its Uses:** Temperature sensors, Proximity sensor, IR sensors, Image sensors, Motion detection sensors, Accelerometer sensors, Gyroscope sensors, Optical sensors. **Data Processing:** Sensor Data-Gathering and Data-Dissemination Mechanisms- Sensor Database system architecture. **IOT Levels and Deployment templates:** IOT Level-1- IOT Level-2- IOT Level-3-IoT Level-4 - IOT Level-5- IOT Level-6.	3 3 3
Practical: To implement and monitor the LM35 Temperature Sensor, Ultrasonic Distance Measurement and IR Sensor Analog Input With Arduino.	3
Unit V	**PROGRAMMING FRAMEWORKS FOR INTERNET OF THINGS**
Theory: **IoT Programming Approaches:** Node-Centric Programming - Database approach - Model-Driven Development. **IoT Programming Frameworks:** Android Things - ThingSpeak - IoTivity - Node-RED. **Exemplary Device:** Raspberry Pi - About the Board - Linux on Raspberry Pi-Raspberry Pi Interfaces- Other IOT devices.	3 3 3
Practical: Using ThinkSpeak Cloud Reading Temperature Sensor Monitoring with NodeMCU /Raspberry Pi.	3
TOTAL HOURS	**60**

Suggested List of Students Activity:

1. Presentation/Seminars by students on recent technological developments based on the course.
2. Project based Learning in emerging application.
3. Periodic class/online quizzes conducted based on the course.
4. Blended learning activities to explore the recent trends and developments in the field.
5. Assignments on different types of learnings.

Text and Reference Books:

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.
2. Charlie Collins, Michael Galpin and Matthias Kappler,"Android in Practice", dream Tech, 2012.
3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things,"ISBN 978 -3-642-19156-5 e-ISBN 978-3- 642-19157-2, Springer
4. Lea, Perry. Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security, 1st edition, Packt Publishing Ltd, 2018.

Web-based/Online Resources:

1. https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/.
2. https://www.javatpoint.com/iot-internet-of-things.
3. https://www.researchgate.net/publication/254004298_Towards_application_development_for_the_internet_of_things.
4. https://ieeexplore.ieee.org/abstract/document/9117528.

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

SOFTWARE REQUIREMENTS:

1. Android Studio / Netbeans /Eclipse - Android ATD
2. Android SDK - JDK 6.0 or above
3. Android Studio development environment and an emulator (virtual device)

HARDWARE REQUIREMENTS:

1. Desktop Computers with minimum 4 GB RAM -30 Nos.
2. Arduino kit - 10 Numbers.

3. Node MCU / Raspberry Pi - 10 Numbers.
4. LED Blub – 10 Numbers 5V DC Relay - 10 Numbers .
5. Mini Bread Board - 10 Numbers.
6. 16x2 LCD Display IR Sensors-10 Numbers.
7. LM35 Temperature Sensor- 10 Numbers and Connecting Wires.

1052236351	INTERNSHIP	Periods	C
PROJECT		540	12

Introduction

Internships in educational institutions are designed to provide students with practical experience in their field of study and to bridge the gap between academic knowledge and professional practice.

Objectives

After completing Internship, Interns will be able to,

- Apply the theoretical knowledge and skill during performance of the tasks assigned in internship.
- Demonstrate soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship.
- Document the Use case on the assigned Task.
- Enable interns to apply theoretical knowledge gained in the classroom to real-world practical applications.
- Provide hands-on experience in the industrial practices.
- Develop essential skills such as communication, organization, teamwork, and problem-solving.
- Enhance specific skills related to the intern's area of focus.
- Offer a realistic understanding of the daily operations and responsibilities.
- Provide opportunities to work under the guidance of experienced supervisors and administrators.
- Allow interns to explore different career paths.
- Help interns make informed decisions about their future career goals based on first hand experience.
- Facilitate the establishment of professional relationships with supervisor, administrators, and other professionals in the field.
- Provide access to a network of contacts that can be beneficial for future job opportunities and professional growth.
- Foster personal growth by challenging interns to step out of their comfort zones and take on new responsibilities.

- Build confidence and self-efficacy through successful completion of internship tasks and projects.
- Give insight into the policies, regulations, and administrative practices.
- Allow interns to observe and understand the implementation of standards and policies in practice.
- Provide opportunities for constructive feedback from supervisors and mentors, aiding in the intern's professional development.
- Enable self-assessment and reflection on strengths, areas for improvement, and career aspirations.
- Encourage sensitivity to the needs and backgrounds of different groups, promoting inclusive and equitable industrial practices.

Course Outcomes

CO 1: Demonstrate improved skills.

CO 2: Exhibit increased professional behavior.

CO 3: Apply theoretical knowledge and principles in real-world practices.

CO 4: Develop and utilize assessment tools to evaluate the learning and practices.

CO 5: Engage in reflective practice to continually improve their learning and professional growth.

Facilitating the Interns by an Internship Provider.

- Orient intern in the new workplace. Give interns an overview of the organization, Explain the intern's duties and introduce him or her to co-workers.
- Develop an internship job description with clear deliverables and timeline.
- Allow the interns in meetings and provide information, resources, and opportunities for professional development.
- The interns have never done this kind of work before, they want to know that their work is measuring up to organizational expectations, hence provide professional guidance and mentoring to the intern.
- Daily progress report of Intern is to be evaluated by industry supervisor. Examine what the intern has produced and make suggestions. Weekly supervision meetings can help to monitor the intern's work.

Duties Responsibilities of the Faculty Mentor

- To facilitate the placement of students for the internship
- To liaison between the college and the internship provider

- To assist the Industrial Training Supervisor during assessment

Instructions to the Interns

- Students shall report to the internship provider on the 1st day as per the internship schedule.
- Intern is expected to learn about the organization, its structure, product range, market performance, working philosophy etc.
- The interns shall work on live projects assigned by the internship provider.
- The Intern shall record all the activities in the daily log book and get the signature of the concerned training supervisor.
- Intern shall have 100% attendance during internship programme. In case of unavoidable circumstances students may avail leave with prior permission from the concerned training supervisor of the respective internship provider. However, the maximum leave permitted during internship shall be as per company norms where they are working and intern shall report the leave sanctioned details to their college faculty mentor.
- The interns shall abide all the Rules and Regulations of internship provider
- Intern shall follow all the safety Regulations of internship provider.
- On completion of the internship, the intern shall report to the college and submit the internship certificate mentioning duration of internship, evaluation of interns by internship provider, Student's Diary and Comprehensive Training Report.

Attendance Certification

Every month students have to get their attendance certified by the industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution supervisor. Regularity in attendance and submission of report will be duly considered while awarding the Internal Assessment mark.

Training Reports

The students have to prepare two types of reports: Weekly report in the form of diary to be submitted to the concerned staff in-charge of the institution. This will be reviewed while awarding Internal

Industrial Training Diary

Students are required to maintain the record of day-to-day work done. Such a record is called Industrial training Diary. Students have to write this report regularly. All days for the week should be accounted for clearly giving attendance particulars (Presence, absence, Leave, Holidays etc.). The concern of the Industrial supervisor is to periodically check these progress reports.

Comprehensive Training Report

In addition to the diary, students are required to submit a comprehensive report on training with details of the organisation where the training was undergone after attestation by the supervisors. The comprehensive report should incorporate study of plant/product/process/construction along with intensive in-depth study on any one of the topics such as processes, methods, tooling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of Industrial training.

Any data, drawings etc. should be incorporated with the consent of the Organisation.

Scheme of Evaluation

Internal Assessment

Students should be assessed for 50 Marks by industry supervisor and polytechnic faculty mentor during 3rd Month and 5th Month. The total marks (50 + 50) scored shall be converted to 40 marks for the Internal Assessment.

Sl. No.	Description	Marks
A	Punctuality and regularity. (Attendance)	10
B	Level / proficiency of practical skills acquired. Initiative in learning / working at site	10
C	Ability to solve practical problems. Sense of responsibility	10
D	Self expression / communication skills. Interpersonal skills / Human Relation.	10
E	Report and Presentation.	10
Total		50

End Semester Examination - Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Board of Examinations after the completion of internship period (June - May). The marks scored will be converted to 60 marks for the End Semester Examination.

Sl. No.	Description	Marks
A	Daily Activity Report.	20
B	Comprehensive report on Internship, Relevant Internship Certificate from the concerned department.	30
C	Presentation by the student at the end of the Internship.	30
D	Viva Voce	20
Total		100

1052236353	FELLOWSHIP	Periods	C
PROJECT		540	12

Introduction

The Fellowship in the Diploma in Engineering program is designed to provide aspiring engineers with a comprehensive educational experience that combines theoretical knowledge with practical skills. This fellowship aims to cultivate a new generation of proficient and innovative engineers who are equipped to meet the challenges of a rapidly evolving technological landscape.

Participants in this fellowship will benefit from a robust curriculum that covers core engineering principles, advanced technical training, and hands-on projects. The program emphasizes interdisciplinary learning, encouraging fellows to explore various branches of engineering, from mechanical and civil to electrical, electronics & communication and computer engineering. This approach ensures that graduates possess a versatile skill set, ready to adapt to diverse career opportunities in the engineering sector.

In addition to academics, the fellowship offers numerous opportunities for professional development. Fellows will engage with industry experts through seminars, workshops, and internships, gaining valuable insights into real-world applications of their studies. Collaborative projects and research initiatives foster a culture of innovation, critical thinking, and problem-solving, essential attributes for any successful engineer.

By offering this fellowship, participants become part of a vibrant community of learners and professionals dedicated to advancing the field of engineering. The program is committed to supporting the growth and development of each fellow, providing them with the tools and resources needed to excel both academically and professionally.

The Fellowship in the Diploma in Engineering is more than just an educational endeavor; it is a transformative journey that equips aspiring engineers with the knowledge, skills, and experiences necessary to make significant contributions to society and the engineering profession.

Objectives

After completing students will be able to,

- Provide fellows with a solid foundation in core engineering principles and advanced technical knowledge across various engineering disciplines.
- Equip fellows with hands-on experience through laboratory work, projects, and internships, ensuring they can apply theoretical knowledge to real-world scenarios.
- Promote interdisciplinary understanding by encouraging exploration and integration of different engineering fields, fostering versatility and adaptability in fellows.

- Encourage innovation and creativity through research projects and collaborative initiatives, enabling fellows to develop new solutions to engineering challenges.
- Facilitate professional growth through workshops, seminars, and interactions with industry experts, preparing fellows for successful careers in engineering.
- Develop critical thinking and problem-solving skills, essential for tackling complex engineering problems and making informed decisions.
- Strengthen connections between academia and industry by providing opportunities for internships, industry visits, and guest lectures from professionals.
- Foster leadership qualities and teamwork skills through group projects and collaborative activities, preparing fellows for leadership roles in their future careers.
- Instill a sense of ethical responsibility and awareness of the social impact of engineering practices, encouraging fellows to contribute positively to society.
- Promote a culture of lifelong learning, encouraging fellows to continually update their knowledge and skills in response to technological advancements and industry trends.
- Prepare fellows to work in a global engineering environment by exposing them to international best practices, standards, and cross-cultural experiences.

Course Outcomes

CO 1: Demonstrate a strong understanding of core engineering principles and possess the technical skills necessary to design, analyze, and implement engineering solutions across various disciplines.

CO 2: Apply theoretical knowledge to practical scenarios, effectively solving engineering problems through hands-on projects, laboratory work, and internships.

CO 3: Exhibit the ability to conduct research, develop innovative solutions, and contribute to advancements in engineering through critical thinking and creative approaches to complex challenges.

CO 4:Understand and adhere to professional and ethical standards in engineering practice, demonstrating responsibility, integrity, and a commitment to sustainable and socially responsible engineering.

CO 5: Enhance strong communication skills, both written and verbal, and be capable of working effectively in teams, demonstrating leadership and collaborative abilities in diverse and multidisciplinary environments.

Important points to consider to select the fellowship project.

Selecting the right fellowship project is crucial for maximizing the educational and professional benefits of a Diploma in Engineering program.

- **Relevance to Future Plans**: Choose a project that aligns with your long-term career aspirations and interests. This alignment will ensure that the skills and knowledge you gain will be directly applicable to your desired career path.
- **Industry Relevance**: Consider the current and future relevance of the project within the industry. Opt for projects that address contemporary challenges or emerging trends in engineering.
- **Access to Facilities**: Ensure that the necessary facilities, equipment, and materials are available to successfully complete the project. Lack of resources can hinder the progress and quality of your work.
- **Mentorship and Guidance**: Select a project that offers strong mentorship and support from experienced faculty members or industry professionals. Effective guidance is crucial for navigating complex problems and achieving project objectives.
- **Project Scope**: Assess the scope of the project to ensure it is neither too broad nor too narrow. A well-defined project scope helps in setting clear objectives and achievable milestones.
- **Feasibility**: Evaluate the feasibility of completing the project within the given timeframe and with the available resources. Consider potential challenges and ensure you have a realistic plan to address them.
- **Technical Skills**: Choose a project that allows you to develop and enhance important technical skills relevant to your field of study. Practical experience in using specific tools, technologies, or methodologies can be highly beneficial.
- **Soft Skills**: Consider projects that also offer opportunities to develop soft skills such as teamwork, communication, problem-solving, and project management.
- **Innovative Thinking**: Select a project that encourages creativity and innovative problem-solving. Projects that push the boundaries of traditional engineering approaches can be particularly rewarding.
- **Societal Impact**: Consider the potential impact of your project on society or the engineering community. Projects that address significant challenges or contribute to social good can be highly fulfilling and make a meaningful difference.

Guidelines to select Fellowship

- Ensure the program is accredited by a recognized accrediting body and has a strong reputation for quality education in engineering.
- Ensure it covers core engineering principles that align with your interests and career goals.

- Investigate the qualifications and experience of the faculty mentor. Look for programs with faculty who have strong academic backgrounds, industry experience, and active involvement in research.
- Check if the program provides adequate hands-on training opportunities, such as laboratory work, workshops, and access to modern engineering facilities and equipment.
- Assess the program's connections with industry. Strong partnerships with companies can lead to valuable internship opportunities, industry projects, and exposure to real-world engineering challenges.
- Explore the availability of research opportunities. Participation in research projects can enhance your learning experience and open doors to innovative career paths.
- Look for programs that offer professional development resources, such as workshops, seminars, and networking events with industry professionals and alumni.
- Ensure the program provides robust support services, including academic advising, career counseling, mentorship programs, and assistance with job placement after graduation.
- Consider the cost of the program and available financial aid options, such as scholarships, grants, and fellowships. Evaluate the return on investment in terms of career prospects and potential earnings.
- Research the success of the program's alumni. High employment rates and successful careers of past graduates can indicate the program's effectiveness in preparing students for the engineering field.

Duties Responsibilities of the Faculty Mentor

Each student should have a faculty mentor for the Institute.

- Get the approval from the Chairman Board of Examinations with the recommendations of the HOD/Principal for the topics.
- Provide comprehensive academic advising to help fellows select appropriate specializations, and research projects that align with their interests and career goals.
- Guide fellows through their research projects, offering expertise and feedback to ensure rigorous methodology, innovative approaches, and meaningful contributions to the field.
- Assist fellows in developing technical and professional skills through hands-on projects, laboratory work, and practical applications of theoretical knowledge.
- Offer career advice and support, helping fellows explore potential career paths, prepare for job searches, and connect with industry professionals and opportunities.
- Provide personal mentorship, fostering a supportive relationship that encourages growth, resilience, and a positive academic experience.

- Facilitate connections between fellows and industry professionals, alumni, and other relevant networks to enhance their professional opportunities and industry exposure.
- Ensure fellows have access to necessary resources, including research materials, lab equipment, software, and academic literature.
- Regularly monitor and evaluate the progress of fellows, providing constructive feedback and guidance to help them stay on track and achieve their goals.
- Instill and uphold high ethical and professional standards, encouraging fellows to practice integrity and responsibility in their work.
- Assist with administrative tasks related to the fellowship program, such as preparing progress reports, writing recommendation letters, and facilitating grant applications.
- Organize and participate in workshops, seminars, and other educational events that enhance the learning experience and professional development of fellows.
- Address any issues or conflicts that arise, providing mediation and support to ensure a positive and productive academic environment.

Instructions to the Fellowship Scholar

- Regularly meet with your faculty mentor for guidance on academic progress, research projects, and career planning. Be proactive in seeking advice and support from your mentor.
- Develop strong organizational skills. Use planners, calendars, and task management tools to keep track of assignments, project deadlines, and study schedules. Prioritize tasks to manage your time efficiently.
- Take advantage of opportunities to participate in research projects and hands-on activities. These experiences are crucial for applying your theoretical knowledge and gaining practical skills.
- Focus on improving essential professional skills such as communication, teamwork, problem-solving, and leadership. Participate in workshops and seminars that enhance these competencies.
- Actively seek networking opportunities through industry events, seminars, and meetings. Establish connections with peers, alumni, and professionals in your field to build a strong professional network.
- Seek internships, co-op programs, or part-time jobs related to your field of study. Real-world experience is invaluable for understanding industry practices and enhancing your employability.

- Uphold high ethical standards in all your academic and professional activities. Practice integrity, honesty, and responsibility. Adhere to the ethical guidelines and standards set by your institution and the engineering profession.
- Adopt a mindset of lifelong learning. Stay updated with the latest developments and trends in engineering by reading industry journals, attending conferences, and taking additional courses.

Documents to be submitted by the student to offer fellowship.

- **Completed Application Form**: This is typically the standard form provided by the institution or fellowship program that includes personal information, educational background, and other relevant details.
- **Detailed CV/Resume**: A comprehensive document outlining your educational background, knowledge experience, interest in research experience, publications, presentations, awards, and other relevant achievements if any.
- **Personal Statement**: A document explaining your motivation for applying to the fellowship, your career goals, how the fellowship aligns with those goals, and what you intend to achieve through the program.
- **Recommendation Letters**: Letters from faculty mentor, employer, or professionals who can attest to your academic abilities, professional skills, and suitability for the fellowship.
- **Proposal/Description**: A detailed proposal or description of the fellowship project or study you plan to undertake during the fellowship. This should include objectives, methodology, expected outcomes, and significance of the project.
- **Enrollment Verification**: Documentation verifying your current acceptance status in the academic institution or industry where the fellowship will be conducted.
- **Funding Information**: Details about any other sources of funding or financial aid you are receiving, if applicable. Some fellowships may also require a budget proposal for the intended use of the fellowship funds.
- **Samples of Work**: Copies of the relevant work that demonstrates your capabilities and accomplishments in your field.
- **Endorsement Letter**: A letter from your current academic institution endorsing your application for the fellowship, if required.
- **Ethical Approval Documents**: If your research involves human subjects or animals, you may need to submit proof of ethical approval from the relevant ethics committee.
- **Additional Documents**: Any other documents requested by the fellowship program required by the institution.

Attendance Certification

Every month students have to get their attendance certified by the supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the faculty mentor. Regularity in attendance and submission of report will be duly considered while awarding the Internal Assessment mark.

Rubrics for Fellowship.

Sl. No.	Topics	Description
1	Alignment with Objectives	Assess how well the project aligns with the stated objectives and requirements. Determine if the student has addressed the key aspects outlined in the project guidelines.
2	Depth of Research:	Evaluate the depth and thoroughness of the literature review. Assess the student's ability to identify and address gaps in existing research.
3	Clarity of Objectives:	Check if the student has clearly defined and articulated the objectives of the project. Ensure that the objectives are specific, measurable, achievable, relevant, and time-bound (SMART).
4	Methodology and Data Collection:	Evaluate the appropriateness and justification of the research methodology. Assess the methods used for data collection and their relevance to the research questions.
5	Analysis and Interpretation:	Examine the quality of data analysis techniques used. Assess the student's ability to interpret results and draw meaningful conclusions.
6	Project Management:	Evaluate the project management aspects, including adherence to timelines and milestones.Assess the student's ability to plan and execute the project effectively.

7	Documentation and Reporting:	Check the quality of documentation, including code, experimental details, and any other relevant materials. Evaluate the clarity, structure, and coherence of the final report.
8	Originality and Creativity:	Assess the level of originality and creativity demonstrated in the project.Determine if the student has brought a unique perspective or solution to the research problem.
9	Critical Thinking:	Evaluate the student's critical thinking skills in analyzing information and forming conclusions.Assess the ability to evaluate alternative solutions and make informed decisions.
10	Problem-Solving Skills:	Evaluate the student's ability to identify and solve problems encountered during the project. Assess adaptability and resilience in the face of challenges.

INTERNAL MARKS - 40 Marks

As per the rubrics each topic should be considered for the Review 1 and Review 2. Equal weightage should be given for all the topics. It should be assessed by a faculty mentor and the industrial professional or research guide.

Review 1 shall be conducted after 8th week and Review 2 shall be conducted after 14th week in the semester. Average marks scored in the reviews shall be considered for the internal assessment of 40 Marks.

Scheme of Evaluation

PART	DESCRIPTION	MARKS
A	Assessment as per the rubrics.	30
B	Attendance	10
Total		**40**

END SEMESTER EXAMINATION - Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Board of Examinations after the completion of fellowship. The marks scored will be converted to 60 marks for the End Semester Examination.

Sl. No.	Description	Marks
A	Daily Activity Report.	20
B	Comprehensive report of the Fellowship Work.	30
C	Presentation by the student.	30
D	Viva Voce	20
Total		100

1052236374	IN HOUSE PROJECT	Periods	C
PROJECT		540	12

Introduction

Every student must do one major project in the Final year of their program. Students can do their major project in Industry or R&D Lab or in-house or a combination of any two for the partial fulfillment for the award of Diploma in Engineering.

For the project works, the Department will constitute a three-member faculty committee to monitor the progress of the project and conduct reviews regularly.

If the projects are done in-house, the students must obtain the bonafide certificate for project work from the Project supervisor and Head of the Department, at the end of the semester. Students who have not obtained the bonafide certificate are not permitted to appear for the Project Viva Voce examination.

For the projects carried out in Industry, the students must submit a separate certificate from Industry apart from the regular bonafide certificate mentioned above. For Industry related projects there must be one internal faculty advisor / Supervisor from Industry (External), this is in addition to the regular faculty supervision.

The final examination for project work will be evaluated based on the final report submitted by the project group **of not exceeding four students**, and the viva voce by an external examiner.

Objectives

Academic project work plays a crucial role in the education of Diploma in Engineering students, as it helps them apply theoretical knowledge to practical situations and prepares them for real-world engineering challenges.

- **Integration of Knowledge**: Consolidate and integrate theoretical knowledge acquired in coursework to solve practical engineering problems.
- **Skill Development**: Enhance technical skills related to the specific field of engineering through hands-on experience and application.
- **Problem-Solving Abilities**: Develop critical thinking and problem-solving abilities by addressing complex engineering issues within a defined scope.
- **Project Management**: Gain experience in project planning, execution, and management, including setting objectives, timelines, and resource allocation.
- **Teamwork and Collaboration**: Foster teamwork and collaboration by working in multidisciplinary teams to achieve project goals and objectives.

- **Research Skills**: Acquire research skills by conducting literature reviews, gathering relevant data, and applying research methodologies to investigate engineering problems.
- **Innovation and Creativity**: Encourage innovation and creativity in proposing and developing engineering solutions that may be novel or improve upon existing methods.
- **Communication Skills**: Improve communication skills, both oral and written, by presenting project findings, writing technical reports, and effectively conveying ideas to stakeholders.
- **Ethical Considerations**: Consider ethical implications related to engineering practices, including safety, environmental impact, and societal concerns.
- **Professional Development**: Prepare for future professional roles by demonstrating professionalism, initiative, and responsibility throughout the project lifecycle.

Course Outcomes

CO 1: Demonstrate the ability to apply theoretical concepts and principles learned in coursework to solve practical engineering problems encountered during the project.

CO 2: Develop and enhance technical skills specific to the field of engineering relevant to the project, such as design, analysis, simulation, construction, testing, and implementation.

CO 3: Apply critical thinking and problem-solving skills to identify, analyze, and propose solutions to engineering challenges encountered throughout the project lifecycle.

CO 4: Acquire project management skills by effectively planning, organizing, and executing project tasks within defined timelines and resource constraints.

CO 5: Improve communication skills through the preparation and delivery of project reports, presentations, and documentation that effectively convey technical information to stakeholders.

Important points to consider to select the In-house project.

- Selecting a project work in Diploma Engineering is a significant decision that can greatly influence your learning experience and future career prospects.
- Choose a project that aligns with your career aspirations and interests within the field of engineering. Consider how the project can contribute to your professional development and future opportunities.
- Ensure the project aligns with your coursework and specialization within the Diploma program. It should complement and build upon the knowledge and skills you have acquired in your studies.

- Evaluate the scope of the project to ensure it is manageable within the given timeframe, resources, and constraints. Avoid projects that are overly ambitious or impractical to complete effectively.
- Assess the availability of resources needed to conduct the project, such as equipment, materials, laboratory facilities, and access to relevant software or tools. Lack of resources can hinder project progress.
- Select a project that genuinely interests and motivates you. A project that captures your curiosity and passion will keep you engaged and committed throughout the project duration.
- Consider the availability and expertise of faculty advisors or industry mentors who can provide guidance and support throughout the project. Effective mentorship is crucial for success.
- Clearly define the learning objectives and expected outcomes of the project. Ensure that the project will help you achieve specific learning goals related to technical skills, problem-solving, and professional development.
- Look for opportunities to propose innovative solutions or explore new methodologies within your project. Projects that encourage creativity can set you apart and enhance your learning experience.
- Consider ethical implications related to the project, such as safety protocols, environmental impact, and compliance with ethical guidelines in research and engineering practices.
- Evaluate whether the project offers opportunities for collaboration with peers, experts from other disciplines, or industry partners. Interdisciplinary projects can broaden your perspective and enhance your teamwork skills.
- Consider the potential impact of your project on society or the engineering community. Projects that address significant challenges or contribute to social good can be highly fulfilling and make a meaningful difference.

By carefully considering these points, Diploma Engineering students can make informed decisions when selecting project work that not only enhances their academic learning but also prepares them for successful careers in engineering.

Duties Responsibilities of the internal faculty advisor.

Each group should have an internal faculty advisor assigned by the HOD/Principal.

- The in-house project should be approved by the project monitoring committee constituted by the Chairman Board of Examinations.
- The in-house project should be selected in the fifth semester itself. Each in-house project shall have a maximum of four students in the project group.

- Provide comprehensive academic advising to help in the selection of appropriate in-house project that align with their interests and career goals.
- Offer expertise and feedback to ensure rigorous methodology, innovative approaches, and meaningful contributions to the field.
- Assist in developing technical and professional skills through hands-on projects, laboratory work, and practical applications of theoretical knowledge.
- Provide personal mentorship, fostering a supportive relationship that encourages growth, resilience, and a positive academic experience.
- Facilitate connections between students and industry professionals, alumni, and other relevant networks to enhance their professional opportunities and industry exposure.
- Ensure students have access to necessary resources, including research materials, lab equipment, software, and academic literature.
- Regularly monitor and evaluate the progress of the in-house project, providing constructive feedback and guidance to help them stay on track and achieve their goals.
- Instill and uphold high ethical and professional standards, encouraging students to practice integrity and responsibility in their work.
- Assist in preparing progress reports, writing recommendation letters, and facilitating grant applications.
- Organize and participate in workshops, seminars, and other educational events that enhance the learning experience and professional development .
- Address any issues or conflicts that arise, providing mediation and support to ensure a positive and productive academic environment.

Instructions to the students.

- Regularly meet with your internal faculty advisor for guidance on academic progress, research projects, and career planning. Be proactive in seeking advice and support from your faculty advisor.
- Use planners, calendars, and task management tools to keep track of assignments, project deadlines, and study schedules. Prioritize tasks to manage your time efficiently.
- Take advantage of opportunities to participate in in-house projects and hands-on activities. These experiences are crucial for applying your theoretical knowledge and gaining practical skills.
- Focus on improving essential professional skills such as communication, teamwork, problem-solving, and leadership. Participate in workshops and seminars that enhance these competencies.

- Actively seek networking opportunities through industry events, seminars, and meetings. Establish connections with peers, alumni, and professionals in your field to build a strong professional network.
- Seek internships, co-op programs, or part-time jobs related to your field of study. Real-world experience is invaluable for understanding industry practices and enhancing your employability.
- Uphold high ethical standards in all your academic and professional activities. Practice integrity, honesty, and responsibility. Adhere to the ethical guidelines and standards set by your institution and the engineering profession.
- Adopt a mindset of lifelong learning. Stay updated with the latest developments and trends in engineering by reading industry journals, attending conferences, and taking additional courses.

Documents to be submitted by the student for an in-house project.

Submit a printed report of your in-house project work along with the fabrication model / analysis report for the End Semester Examination.

Rubrics for In-House Project Work

Sl. No.	Topics	Description
1	Objectives	Clearly defined and specific objectives outlined. Objectives align with the project's scope and purpose.
2	Literature Review	Thorough review of relevant literature. Identification of gaps and justification for the project's contribution.
3	Research Design and Methodology	Clear explanation of the research design. Appropriateness and justification of chosen research methods.
4	Project Management	Adherence to project timeline and milestones. Effective organization and planning evident in the project execution.
5	Documentation	Comprehensive documentation of project details. Clarity and completeness in recording methods, results, and challenges.
6	Presentation Skills	Clear and articulate communication of project findings. Effective use of visuals, if applicable.
7	Analysis and Interpretation	In-depth analysis of data. Clear interpretation of results in the context of research questions.

8	Problem-Solving	Demonstrated ability to identify and address challenges encountered during the project. Innovative solutions considered where applicable.
9	Professionalism and Compliance	Adherence to ethical standards in research. Compliance with project guidelines and requirements.
10	Quality of Work	Overall quality and contribution of the project to the field. Demonstrated effort to produce high-quality work.

SCHEME OF EVALUATION

The mark allocation for Internal and End Semester Viva Voce are as below.

Internal Mark Split (40 Marks)*		
Review 1 (10 Marks)	Review 2 (15 Marks)	Review 3 (15 marks)
Committee: 5 Marks. Supervisor: 5 Marks	Committee: 7.5 Marks Supervisor: 7.5 Marks	Committee: 7.5 Marks Supervisor: 7.5 Marks

Note: * The rubrics should be followed for the evaluation of the internal marks during reviews.

END SEMESTER EXAMINATION - Project Exam

The performance of each student in the project group would be evaluated in a viva voce examination conducted by a committee consisting of an external examiner and the Department project supervisor and an internal examiner.

End Semester (100)#			
Record (20 Marks)	Presentation (20 Marks)	Viva Voce (20 Marks)	Model / Analysis Report (40 Marks)
External: 10 Internal: 5 Supervisor: 5	External: 10 Internal: 5 Supervisor: 5	External: 10 Internal: 5 Supervisor: 5	External: 20 Internal: 10 Supervisor: 10

 # The marks scored will be converted to 60 Marks.

Students who are unable to complete the project work at the end of the semester can apply for an extension to the Head of the Department, with the recommendation from the project guide for

a period of a maximum of two months. For those students who extend the project work for two months, Viva Voce will be carried out and results will be declared separately. If the project report is not submitted even beyond the extended time, then students are not eligible to appear for Project Viva Voce Examination.