SYLLABUS

FOR

DIPLOMA IN

COMPUTER ENGINEERING

(DIPLOMA COURSES IN ENGINEERING / TECHNOLOGY)

C23 REGULATION

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE

(AUTONOMOUS), MADURAI – 625 011

Regulation 2023

Program Structure

Diploma in Computer Engineering

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 behaviour that students acquire through the program.

The POs essentially indicate what the students can do from subject-wise 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	625	20
Semester VI	3	660	18
		Total Credits	**120**

Semester iii

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	52310	Digital Logic Design	3-0-0	45	3	Theory
2	Program Core	Practicum	52320	RDBMS	3-0-2	75	4	Theory
3	Program Core	Practical/Lab	52330	Digital Logic Design Lab	0-0-4	60	2	Practical
4	Program Core	Practicum	52340	C Programming	1-0-4	75	3	Practical
5	Program Core	Practicum	52350	Web Designing	1-0-4	75	3	Practical
6	Program Core	Practicum	52360	Operating Systems	1-0-2	45	2	Practical
7	Open Elective	Advanced Skill Certification	52370	Advanced Skills Certification - 3	1-0-3	60	2	NA
8	Humanities &Social Science	Integrated Learning Experience	52380	Growth Lab	0-0-2	30	0	NA
9	Audit Course	Integrated Learning Experience	52390	Induction Program II	·	16	0	·
10	Audit Course	Integrated Learning Experience	523A0	I&E/ Club Activity/ Community Initiatives	·	15	0	·
11	Audit Course	Integrated Learning Experience	523B0	Shop floor Immersion	·	8	0	·
12	Audit Course	Integrated Learning Experience	523C0	Student-Led Initiative	·	23	0	·
13	Audit Course	Integrated Learning Experience	523D0	Emerging Technology Seminars	·	8	0	·
14	Audit Course	Integrated Learning Experience	523E0	Health & Wellness	·	30	1	·
					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	52410	Computer Networks and Security	3-0-0	45	3	Theory
2	Program Core	Practicum	52420	Data Structures Using Python	3-0-2	75	4	Theory
3	Program Core	Practicum	52430	Java Programming	2-0-4	90	4	Practical
4	Program Core	Practicum	52440	Python Programming	1-0-4	75	3	Practical
5	Program Core	Practicum	52450	E-Publishing Tools	1-0-4	75	3	Practical
6	Program Core	Project	52460	Scripting Languages	0-0-6	90	3	Practical
7	Open Elective	Advanced Skill Certification	52470	Advanced Skills Certification - 4	1-0-3	60	2	NA
8	Audit Course	Integrated Learning Experience	52480	I&E/ Club Activity/ Community Initiatives		15	0	
9	Audit Course	Integrated Learning Experience	52490	Shop floor Immersion	·	08	0	·
10	Audit Course	Integrated Learning Experience	524A0	Student-Led Initiative	·	16	0	·
11	Audit Course	Integrated Learning Experience	524B0	Emerging Technology Seminars	·	08	0	·
12	Audit Course	Integrated Learning Experience	524C0	Health & Wellness	·	15	0	·
13	Audit Course	Integrated Learning Experience	524D0	Special Interest Groups (Placement Training)	·	08	0	·
					Test and Revisions	45		
					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	Practicum	52510	Cloud Computing	2-0-2	60	3	Theory
2	Program Elective	Theory		Elective-1	3-0-0	45	3	Theory
3	Program Core	Practical/Lab	52530	Internet of Things & Digital Twins	0-0-4	60	2	Practical
4	Program Core	Practicum	52540	Computer Hardware and Networking	1-0-4	75	3	Practical
5	Program Elective	Practicum		Elective-2	1-0-4	75	3	Practical
6	Humanities & Social Science	Practicum	52560	Innovation and Startup	1-0-2	45	2	Project
7	Project / Internship	Project/Internship	52570	Industrial Training * [Summer Vacation - 90 Hours]		·	2	Project
8	Open Elective	Advanced Skill Certification	52580	Advanced Skills Certification - 5	1-0-3	60	2	NA
9	Audit Course	Integrated Learning Experience	52590	I&E/ Club Activity/ Community Initiatives		15	0	
10	Audit Course	Integrated Learning Experience	525A0	Shop floor Immersion	·	8	0	·
11	Audit Course	Integrated Learning Experience	525B0	Student-Led Initiative	·	24	0	·
12	Audit Course	Integrated Learning Experience	525C0	Emerging Technology Seminars	·	8	0	·
13	Audit Course	Integrated Learning Experience	525D0	Health & Wellness	·	30	0	·
14	Audit Course	Integrated Learning Experience	525E0	Special Interest Groups	·	30	0	·
					Test and Revisions	**75**		
					Library	**15**		
					Total Periods	**625**	**20**	

Elective 1

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Elective	Theory	52521	Machine Learning	3-0-0	45	3	Theory
2	Program Elective	Theory	52522	Data Warehousing and Data Mining	3-0-0	45	3	Theory
3	Program Elective	Theory	52523	Ethical Hacking	3-0-0	45	3	Theory
4	Program Elective	Theory	52524	Agile Product Development	3-0-0	45	3	Theory
5	Program Elective	Theory	52525	Artificial Intelligence	3-0-0	45	3	Theory
6	Program Elective	Theory	52526	Cyber Security	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	52551	Data Analytics	1-0-4	75	3	Practical
2	Program Elective	Practicum	52552	Mobile Computing	1-0-4	75	3	Practical
3	Program Elective	Practicum	52553	Component Based Technologies	1-0-4	75	3	Practical
4	Program Elective	Practicum	52554	Multimedia Systems	1-0-4	75	3	Practical
5	Program Elective	Practicum	52555	Full Stack Developer	1-0-4	75	3	Practical
6	Program Elective	Practicum	52556	Robotic Process Automation	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	Electives-3 (Pathway)	3-0-0	45	3	Theory
2	Open Elective	Practicum	Elective-4 (Specialisation)	1-0-4	75	3	Practical
3	Project / Internship	Project / Internship	In-house Project / Internship / Fellowship	·	540	12	Project
			Total Periods		**660**	**18**	

Elective 3 (Pathway)

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Elective | Higher Education	Theory	52611	Advanced Engineering Mathematics	3-0-0	45	3	Theory
2	Elective | Entrepreneurship	Theory	52612	Entrepreneurship	3-0-0	45	3	Theory
3	Elective | Technocrats	Theory	52613	Project Management	3-0-0	45	3	Theory
4	Elective | Technocrats	Theory	52614	Finance Fundamentals	3-0-0	45	3	Theory
5	Elective | Technologists	Theory	52615	5G Technology	3-0-0	45	3	Theory
6	Elective | Technologists	Theory	52616	DevOps	3-0-0	45	3	Theory

Elective 4 (Specialisation)

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Elective	Practicum	52621	Data Science	1-0-4	75	3	Practical
2	Elective	Practicum	52622	Cloud Platform	1-0-4	75	3	Practical
3	Elective	Practicum	52623	Data Visualization	1-0-4	75	3	Practical
4	Elective	Practicum	52624	Advance DBMS	1-0-4	75	3	Practical
5	Elective	Practicum	52625	Mobile Application Development	1-0-4	75	3	Practical
6	Elective	Practicum	52626	UI & UX Design	1-0-4	75	3	Practical

Project / Internship

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Project / Internship	Project / Internship	52631	Internship	-	540	12	Project
2	Project / Internship	Project / Internship	52632	Fellowship	-	540	12	Project
3	Project / Internship	Project / Internship	52633	In-house Project	-	540	12	Project

SEMESTER 3

52310	DIGITAL LOGIC DESIGN	L	T	P	C
Theory		3	0	0	3

Introduction:

This subject introduces students to the fundamental concepts and techniques for designing and analyzing digital circuits, laying the groundwork for understanding and creating digital technologies.

Course Objectives:

The objective of this course is to enable the students to

- Provide comprehensive understanding of digital systems and their fundamental components, applications.
- Simplify and optimize digital logic circuits while gaining practical insights into its applications through Boolean algebra.
- Learn how to design sequential logic circuits using various components and techniques.
- Learn about digital sensor interfaces and their role in digital systems.
- Understand the principles and operation of various Analog-to-Digital Converters (ADC) and Digital-to-Analog Converters (DAC).
- Gain knowledge of different types of memory and their characteristics.
- Understand Programmable Logic Devices (PLDs) and their applications in digital system design.
- Analyze the societal impact of Digital Integrated Circuits (ICs) and their role invarious industries and technologies.

This initial course offers students a gateway into the realm of digital electronics.

Course Outcomes:

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

CO1: Understanding digital systems fundamentals comprehensively.

CO2: Explore Boolean algebra fundamentals and practical applications.

CO3: Utilize sequential logic principles to create designs.

CO4: Design digital sensor interfaces and ADC/DAC converters.

CO5: Analyze memory and PLDs.

Pre-requisites: Nil

CO/PO Mapping:

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

Case Studies: Present case studies of real-world digital systems, highlighting design challenges, solutions, and outcomes.

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.

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 – Theory

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test	Written test	Quiz MCQ	Model Examination	Written Examination
Portion	Two units	Another Two units	Online / Offline	All units	All units
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: W**ritten 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.
- **CA1 and CA2 Question Pattern:**
  FOUR questions should be asked from each unit. Students shall write any **FIVE** questions out of **EIGHT** questions. Each question carries 10 marks each. (5 X 10 Marks = 50 Marks)
  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 20 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 × 20 Marks = 100 Marks)

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

52310	DIGITAL LOGIC DESIGN	L	T	P	C
Theory		3	0	0	3

Unit I	Foundations of Digital Logic	
Introduction: digital systems and their importance, Number systems: binary, octal, hexadecimal number, binary arithmetic: 1's and 2's complements arithmetic, binary conversion, binary code standards: ASCII, BCD. Logic Gates: AND, OR, NOT, NAND, NOR and Ex-OR operations and logic diagram, realization of gates using universal gates.		9
Unit II	**Combinational Logic Design**	
Basic concepts of Boolean algebra: Laws, theorems, De-Morgan's theorem, Standard representation of logic functions, K-map representation (up to 3 variables), simplification of logic functions using K-map. Applications: Adders, Subtractors, digital comparator, Multiplexer(MUX)/ data selector, De-Multiplexer(D-MUX)/decoder, priority encoder.		9
Unit III	**Sequential Logic Design**	
Flip Flops: SR – JK and D type flip flop, concept of Edge Triggering, applications of flip flops. Registers: shift registers, serial to parallel converter, parallel to serial converter. Counters: Asynchronous up counters, Synchronous down counters, Decade counter.		9
Unit IV	**Digital Interfacing , ADC and DAC**	
(Digital Interfacing: Introduction, sensors and their types, TTL and CMOS interface - switch, LED, relay, motor and solenoid - Concepts only). A/D converters: successive approximation A/D converter, dual slope A/D converter, D/A converters: weighted resistor/converter, R-2RLadder D/A converter.		9
Unit V	**Memories, Programmable Logic Devices**	
Memory: Definition- i) memory read ii) memory write iii) access time iv) memory capacity v) address lines vi) word length, Different types of ROM & RAM, Memory accessing, processing, hierarchy and management, difference between Flash ROM and NVRAM, operation of pen drive, SD card and solid state hard disk. PLDs: Difference between fixed logic and programmable logic, PLA architecture		9
	TOTAL PERIODS	**45**

Suggested List of Students Activity:

The following student activities or similar activities can be assigned

1. Collect the information about the different types of display devices used in digital circuits and carry out a seminar.
2. Prepare a note on E-waste and disposal of PCBs and ICs, carry out a seminar.
3. Organize a series of problem-solving sessions where students work on Boolean algebra problems and logic circuit design tasks. Evaluate students based on their ability to manipulate Boolean expressions, simplify logic circuits, and design practical solutions. Assess their problem-solving skills, logical reasoning, and the correctness of their solutions
4. Provide industrial sensor datasheets or specifications for commonly used sensors in manufacturing processes (e.g., temperature sensors, pressure sensors, proximity sensors).
5. Ask students to design and implement digital sensor interfaces or ADC/DAC circuits to interface with these sensors and provide digital or analog measurements.
6. Provide specifications or requirements for industrial control tasks, such as sequence control, timing control, or data processing tasks. Ask students to design, simulate, and implement the sequential logic circuits using PLC programming software or microcontroller platforms commonly used in industrial automation.
7. Assign a group project where diploma students analyze the memory technologies, programmable logic devices (PLDs), and their societal impact in industrial applications. Focus on memory technologies commonly used in industrial control systems (e.g., EEPROM, flash memory) and PLDs used for logic control and customization in industrial automation.

Execution Notes:

- Maximum of 3 students in each batch for student activity
- Above activities may be distributed among different batches; Any one activity among1 to 5 or any similar activities per batch may be assigned by the teacher based on interest of the students.

Textbook for Reference:

1. M. M. Mano ,"Digital logic and Computer design", , Pearson Education India, 2016.
2. Wakerly, John ”Digital Design Principles and Practices” 5/e, Pearson Education 2018.
3. Sarah Harris and David Harris, “Digital Design and Computer Architecture: ARM Edition, , 2015.
4. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016

Website links for reference:

https://nptel.ac.in/

https://www.nptelvideos.com/course.php?id=562

http://www.vlab.co.in

52320	RDBMS	L	T	P	C
Practicum		3	0	2	4

Introduction

All modern database management systems like SQL, MS SQL Server, IBM DB2, ORACLE, My-SQL, and Microsoft Access are based on RDBMS. It is called Relational Database Management System (RDBMS) because it is based on the relational model introduced by E.F. Codd. A relational database is the most commonly used database. Due toa collection of an organized set of tables, data can be accessed easily in RDBMS.

Course Objectives

The objective of this course is to enable the student to

- To know the fundamentals of DBMS
- To share of data and speedy forming of new applications, restrict repetition or redundancy of data
- To avoid data inconsistencies providing better integrity
- To familiarize all the possible operations of data in the database
- To familiarize programming skills for all the operations in database

Course Outcomes

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

CO1: Describe fundamentals of DBMS, installation and working with admin.

CO2: Apply SQL commands to create, insert, retrieve, update, delete data from the Relational databases.

CO3: Describe MySQL programming constructs, control statements and subprograms.

CO4: Describe how to Tune MySQL performance.

CO5: Apply cursors, triggers and Exception handling concepts.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	3	2	---	---
CO2	3	2	3	2	3	---	---
CO3	2	3	2	2	2	---	---
CO4	2	2	3	3	3	---	---
CO5	3	3	3	2	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 – Practicum (Theory)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	
Mode	Written Test Theory & Practical Test	Written Test Theory & Practical Test	Written Test	Written Examination
Portion	Two Units & Part A / Cycle 1 exercises	Another Two Units & Part B / Cycle 2 exercises	Complete Theory Portions	Complete Theory Portions
Duration	3 periods	3 periods	3 Hours	3 Hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	6th Week	12th Week	16th Week	

Note:

- **CA1 and CA2: The** written & practical test should be conducted as per the portion above and the scheme of evaluation.

  Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	4 Questions will be asked from every unit and students should write any two questions from each unit. The question may have two subdivisions only. (4 Questions × 10 Marks = 40 Marks)	40
2	Aim and Program	10
3	Execution and Output	5
4	Practical Document	5
TOTAL MARKS		60

CA3: Model examination should be conducted for complete theory portions as per the end semester question pattern. The marks awarded should be converted to 10 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 × 20 Marks = 100 Marks)

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

52320	RDBMS	L	T	P	C
Practicum		3	0	2	4

Unit I	RELATIONAL DATA MODEL & MYSQL ADMINISTRATION	
Relational Data Model Introduction to database concepts- CODD's Rules – Components of DBMS – Table Structure – Keys : types of Keys – Data Constraints and types of Constraints -difference between SQL and MySQL **MySQL Installation** Install ,configure and test MySQL server on Microsoft Windows **Working with MySQL Admin** Creating , selecting and describing database – show command – backing up databases		9
Ex No 1: Install, configure and connect to MySQL server and MySQL workbenchin Windows **Ex No 2**: Write a query to create a database, show and backing up databases		6
Unit II	**INTERACTIVE MYSQL**	
Introduction to MYSQL MySQL data types – Data Definition Commands – Data Manipulation Commands – Data Retrieval Commands **MySQL operators and Expressions** Types of operators – Arithmetic, Comparison and Logical Operators – (Pattern Matching- Import and Export Data – Concepts only) **Built – in Functions** Single Row functions – Aggregate functions – conversion functions		9
Ex No 3: create a database named 'college' and create a table for student and employee with the fields as you like. **Ex No 4:** create a table 'student' with marks field for 10 students. Apply built in functions to do calculations.		6
Unit III	**FLOW CONTROL IN MYSQL**	
Flow Control IF(), IF NULL(),CASE ,LOOP,LEAVE ,ITERATE , REPEAT,WHILE **Querying the table**		9

Selecting rows using where, order by, group by and Having clauses - (Sub-queries-correlated sub-queries – Concepts only) **Views** Introduction – Advantages of views – creating , updating and deleting views		
Ex No 5: create a table 'bank' and apply flow control statements to do some transactions **Ex No 6:** create a table ' library' with proper fields and create another table ' library1' and insert rows from library using views		6
UNIT IV	**MYSQL PERORMANCE TUNING**	
Indexes and Sequences Index Types – simple and compound – Sequences : creating , altering and dropping sequences **Joins & Unions** Joins- definition-types of joins : natural join, inner join, self join ,outer join. Uniontypes : union , Union All, Union Distinct- order by and limit handling **User and transaction management (Concepts only)** Creating – deleting – renaming users grant and revoke commands – transaction command : commit , rollback and save points.		9
Ex No 7: create a table named 'student' with sequences **Ex No 8**: create any two tables with common column name and perform join and union		6
UNIT V	**STORED PROGRAM CONCEPTS & DEVELOPMENT**	
MySQL Procedures & Functions Creating –executing and deleting stored procedures – creating – executing and deleting stored functions -advantages **MySQL Trigger & Cursor** Use of trigger – creating trigger – types of triggers Cursor: creation and deletion		9
Ex No 9 : Create a stored procedure to get employee details from employee table **Ex No 10:** Create a program for trigger and cursor		6
TOTAL HOURS		75

Textbook for Reference:

- Adam Aspin, Querying MySQL: Make your MySQL database analytics accessible withSQL operations, data extraction, and custom queries, 1st Edition, BPB Publication ,2022
- Vikram Vaswani, MySQL: The Complete Reference (Osborne Complete ReferenceSeries), 1st edition, McGraw Hill Education,2017
- George Reese, MySQL Pocket Reference, 2nd Edition, O'Reilly Media 2007
- Baron Schwartz, Peter Zaitsev, et al. ,High Performance MySQL: Optimization,Backups, Replication, Third Edition, O'Reilly Media,2012

Website links for reference:

- https://www.w3schools.com/mysql/
- https://www.mysqltutorial.org/
- https://www.javatpoint.com/mysql-tutorial
- https://www.guru99.com/mysql-tutorial.html

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments basedon 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 / Laptop
    - Printer
2. **Software Requirement:**
    - Windows / Linux Operating System
    - https://dev.mysql.com/downloads/installer/

52330	DIGITAL LOGIC DESIGN LAB	L	T	P	C
PRACTICAL		0	0	4	2

Rationale

This course emphasizes practical application alongside theoretical knowledge, covering digital logic devices and circuits, hands-on experiments, understanding IC specifications, and application through simulation exercises and mini-projects, fostering critical thinking and problem-solving abilities.

Course Objectives

The objective of this course is to

1. To familiarize students with digital logic devices and circuits about logic gates
2. To enable students to understand the concepts on decoder and encoder.
3. To provide hands-on experience about the flip flops
4. To introduce students to understand about counters.
5. To develop students' skills in designing and troubleshooting digital circuits through simulation and practical experimentation.

Course Outcomes

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

CO1: Test the truth tables of logic gates. Build combinational logic circuits and validatetheir truth tables

CO2: Construct sequential logic circuits and verify their truth tables. CO3: Construct and verify the truth tables of multiplexer/demuliplexerCO4: Construct and verify the truth tables of decoder/encoder

CO5: Simulate digital logic circuits using any tool.

Pre-requisites

- Students should have knowledge of basic logic gate operations, Boolean algebra, anddigital circuit design principles.

CO/PO Mapping

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

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

Instructional Strategy

- It is advised that teachers make the learning experience more engaging by introducing innovative and interesting ways of teaching. The teachers need to expose the students to material in multiple modes help them learn it faster and retain it longer.
- **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.
- **Hands-on Labs and Simulations:** Provide hands-on experience with logic gates, flip-flops, and other digital components through laboratory sessions. Additionally, utilize digital logic simulation software to allow students to design and simulate circuits, providing a practical understanding of concepts
- **Group Projects:** Assign group projects that require students to design and implement digital circuits to solve specific problems or tasks. This encourages teamwork, enhances problem-solving skills, and reinforces learning through practical application.
- **Guest Lectures and Industry Visits:** Invite guest speakers from industry or academiato share insights into digital logic design applications, emerging technologies, and career opportunities. Organize visits to relevant industries or laboratories to expose students to real-world digital design practices.

Assessment Methodology – Practical

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	
Mode	Practical Test	Practical Test	Practical Document (Record Notebook)	Practical Examination
Portion	Part A / Cycle 1 Exercises	Part B / Cycle 2 Exercises	All Exercises	All Exercises
Duration	3 Periods	3 Periods	Regularly	3 Hours
Exam Marks	60	60	Each Practical 10 Marks	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	15th 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 pattern and the scheme of evaluation.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim & Circuit diagram	30
2	Execution and Result	20
3	Observation Notebook	10
TOTAL		60

The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

- **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.

SCHEME OF EVALUATION

End Semester Examination- Practical Exam

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

52330	DIGITAL LOGIC DESIGN LAB	L	T	P	C
Practical		0	0	4	2

Part - A		
Ex.No	**Name of the Experiment**	
1	Verify the truth tables of any 3 Logic Gates.	30
2	Construct and verify the truth tables of full adder	
3	Construct and verify the truth tables of full subtractor.	
4	Construct and validate the truth table of demultiplexer	
5	Construct and validate the truth table of decoder	
Part - B		
Ex.No	**Name of the Experiment**	
6	Construct and verify the truth tables of 2 bit magnitude comparator.	30
7	Construct and verify the truth tables of JK flip flop.	
8	Construct and verify the performance of decade counter.	
9	Design 4 bit asynchronous up counter using any simulation tool.	
10	Design 4 bit shift register (Serial in Parallel Out) using any simulation tool.	
TOTAL HOURS		**60**

Suggested List of Students Activity

Proposed List of Student Activities for Digital Logic Design:

1. Research and present on the evolution of digital display technologies, including LED, LCD, OLED, and e-paper displays. Discuss their working principles, advantages, and applications in digital circuits.
2. Investigate and compare the specifications, availability, and costs of two different Analog-to-Digital Converter (ADC) and Digital-to-Analog Converter (DAC) ICs. Analyze their features and suitability for various applications.
3. Develop a block diagram approach for constructing a digital clock, frequency counter, or digital voltmeter using digital logic circuits. Estimate the cost of components required for the project and discuss potential challenges and solutions.
4. Explore the environmental impact of electronic waste (E-waste) and the proper disposal methods for printed circuit boards (PCBs) and integrated circuits (ICs). Conduct a seminar to raise awareness about E-waste management practices.
5. Design and simulate the functionality of a simple logic circuit using a modern software tool such as Logisim, Proteus, or LTspice.

Execution Guidelines:

- Limit each batch to a maximum of three students per activity.
- Assign activity No. 5 (logic circuit simulation) as mandatory for all batches.
- Assign any one activity from Nos. 1 to 5 or propose similar activities based on student interest and teacher discretion.

Textbook for Reference:

- R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
- A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016
- Sarah Harris and David Harris, “Digital Design and Computer Architecture: ARMEdition, 2015.

Website links for reference:

- https://nptel.ac.in/
- http://www.vlab.co.in

Equipment / Facilities required to conduct the Practical CourseSoftware Requirement:

- Pspice software : https://www.pspice.com/
- LogiSim software : https://logisim.software.informer.com/2.7/
- Xcircuit Software : http://opencircuitdesign.com/xcircuit/

- Scilab : https://cloud.scilab.in/
- **Proprietor Software :**

  Pspice, Multisim (available student version).
- Ltspice (available freely version).

Hardware Requirement:

- Digital Trainer Kit.
- Logic Gates: Basic logic gate ICs like 7400 (Quad 2-input NAND), 7402 (Quad 2-inputNOR), and 7486 (Quad 2-input XOR).
- Multiplexer/ Demultiplexer , Decoder and Encoder
- Flip flop ICs
- 2-bit magnitude comparator .
- Power Supply (0-30V).
- 5V DC Motor
- Resistors, capacitors, diodes, LEDs.
- Breadboard, power supply, wires, and other necessary components for circuitconstruction and testing.

BOARD PRACTICAL EXAMINATION

PART – A

1. Verify the truth tables of any 3 Logic Gates.
2. Construct and verify the truth tables of full adder
3. Construct and verify the truth tables of full subtractor.
4. Construct and validate the truth table of demultiplexer
5. Construct and validate the truth table of decoder.

PART – B

6. Construct and verify the truth tables of 2 bit magnitude comparator.
7. Construct and verify the truth tables of JK flip flop.
8. Construct and verify the performance of decade counter.
9. Design 4 bit asynchronous up counter using any simulation tool.
10. Design 4 bit shift (Serial in Parallel Out) using any simulation tool.

SCHEME OF VALUATION

Section	Description	Marks
1	Aim (05), Circuit diagram for the experiment from Part-A (30)	35
2	Aim (05), Circuit diagram for the experiment from Part-B (30)	35
3	Execution of any one experiment from Part-A **OR** Part-B	25
4	Viva voce	5
TOTAL MARKS		**100**

52340	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 tosolve 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 applicationdevelopment.
- 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 readabilityand 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 ofdiscrepancies.

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52340	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 directory 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-PointerExpressions – Pointer Arithmetic – Pointer to Pointer - Pointer to an Array.		3

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 toan 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:

- Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2015.
- Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C",First Edition, Oxford University Press, 2009.
- E.Balaguruswamy, "Programming in ANSI C", Tata McGraw-Hill, Third EditionEdition,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 basedon 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<u>PART – A</u>

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 preprocessingdirectory 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.

<u>PART - B</u>

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. andthen 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

52350	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 webpages.
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.

52350	WEB DESIGNING	L	T	P	C
Practicum		1	0	4	3

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52350	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 - Concept only) - background images- Other media tags- <audio>, <video>, <iframe>, (<embed>, <svg>, <canvas> - Concepts only) 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 (Concepts only). CSS background properties- Border properties- margin properties- padding properties- height, width properties- (CSS Text properties- CSS Fonts properties - Concepts only).	**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 mustbe the same. **(Forms & Form validation)**	**6**
Total Periods	**75**

Text Books for Reference:

- Terry Felke-Morris, Web Development and Design Foundations with HTML5, 9thEdition, 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 andto debug and troubleshoot it.

Equipment / Facilities required to conduct the Practical CourseHardware

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 borderstyle. **(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. (Donot 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 theuser in the text box**. (DOM)**

9. Write a JavaScript program to develop a simple calculator (with basic arithmeticoperations like add, subtract, multiply, divide, equal to) by getting two numbers in two textboxes, 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 buttonand perform form validation such as username must not be less than 8 characters, mail idshould 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

52360	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 asan 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 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 shellscript for various problems.

Course Outcomes

After successful completion of this course, the students should be able toCO1: 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 ofdiscrepancies.

52360	OPERATING SYSTEMS	L	T	P	C
Practicum		1	0	2	2

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52360	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 - Concepts only). (Memory Management : swapping, Contiguous memory allocation, paging, Virtual Memory , Page Replacement Algorithms - Concepts only). 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.		15

Ex No 8: Write a shell script using command line arguments and reports on 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 basedon 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 adirectory, 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

SEMESTER 4

52410	COMPUTER NETWORKS AND SECURITY	L	T	P	C
Theory		3	0	0	3

Introduction

The course aims to groom the students to gain concepts, knowledge and skills required to work on Computer Networking and Security industry. Course curriculum has been designed to give overview and use cases of Data Communication, Layered Networks, Inter-networking technology/protocols and Computer Security is covered and this will help to prepare the students to keep pace with computer networking and security industry trends.

Course Objectives

The objective of this course is to enable the student to

- Understand the concept of data communication
- To know the functions and protocols of each layer of OSI and TCP/IP protocolsuite.
- To visualize the end-to-end flow of information.
- Understand the main principles of computer and network security.
- Know different networking devices and their practical usages.
- Know the IP addressing and its mechanisms.
- Identify the attacks and threats.
- Study about Cryptography and different Cryptography Algorithms.

Course Outcomes

After successful completion of this course, the students should be able toCO1:

Remember the fundamentals of Computer Networks.

CO2: Identify core networking and infrastructure components, and the servicesCO3:

Examine the different networking applications

CO4: Understand fundamental properties of computer security, such as

Authentication, Authorization, and Data confidentiality and Integrity.

CO5: Identify the concept of the internet and security issues.

Pre-requisites: Nil

CO/PO Mapping

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

52410	Computer Networks and Security	L	T	P	C
Theory		3	0	0	3

Assessment Methodology – Theory

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test	Written test	Quiz MCQ	Model Examination	Written Examination
Portion	Two units	Another Two units	Online / Offline	All units	All units
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: W**ritten 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.
- **CA1 and CA2 Question Pattern:**
  FOUR questions should be asked from each unit. Students shall write any **FIVE** questions out of **EIGHT** questions. Each question carries 10 marks each. (5 X 10 Marks = 50 Marks)
  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 20 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 × 20 Marks = 100 Marks)

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

52410	COMPUTER NETWORKS AND SECURITY	L	T	P	C
Theory		3	0	0	3

Unit I	DATA COMMUNICATION	
Data Communication: Components of a data communication– Data flow: Simplex - Half duplex - Full duplex .Types of Connections: Point to Point – Multipoint; Topologies: Star, Bus, Ring, Mesh, Hybrid – Advantages and Disadvantages of each topology. Types of Networks: Need of Computer Networks – LAN – MAN – WAN – Internet – Intranet – Internet Service Providers (ISP) – Client-server – Peer to Peer – Wi-Fi – Bluetooth. Network Devices: Switches – Bridges – Routers – Gateways.		09
Unit II	**OSI MODEL AND 802.X PRTOCOLS**	
Network Models: OSI Model – Layered Architecture – Function of Layers – TCP/IP Protocol Suite 802.X Protocols: Concepts and PDU format of CSMA/CD(802.3) – Token ring(802.5) – Ethernet – Types of Ethernet(Fast Ethernet, gigabit Ethernet, High speed Ethernet 10GE to 800GE) – Comparison between 802.3 and 802.5.		09
Unit III	**NETWORK, TRANSPORT AND APPLICATION LAYER PROTOCOLS**	
Network Layer Protocol: IP – Interior Gateway Protocols: ARP, RARP (concepts only) IP Addressing: Dotted Decimal Notation – Subnetting and Supernetting – Ipv4 –Ipv6 Overview of TCP/IP - Transport Layer Protocols: Stop and wait protocol- Connection Oriented and Connectionless Service – Sockets – TCP and UDP Application Layer Protocols: FTP – HTTP – Telnet		09
Unit IV	**NETWORK SECURITY**	
Network Security: Definition – Need of Network Security – Principles of Security – Attacks – Types of Attacks – Criminal Attacks – Legal Attacks – Passive and Active Attacks – Software Supply Chain Attacks . Cryptography: Definition – Symmetric Encryption Principles – Symmetric Block Encryption algorithms – DES - Digest Function – Public key cryptography principles - RSA– Digital Signature (concepts only)		10

Unit V	NETWORK SECURITY APPLICATIONS	
Hackers Techniques: Historical hacking techniques and Open sharing – Bad Passwords – Advanced techniques – Viruses – Worms – Trojan Horses – SPAM Security Mechanisms: Introduction – Types of Firewalls – Packet Filters – Application Gateways – Limitation of Firewalls .Intrusion: Intruders – Intruder detection – Classification of Intruder - Detection Systems – Honeypots		8
	TOTAL PERIODS	**45**

Suggested List of Students Activity

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

Textbook for Reference:

1. Behrouz A. Forouzan, “Data communication and Networking”, Fourth Edition, TataMcGraw-Hill, 2007.
2. Andrew S. Tanenbaum “Computer Networks”, Fifth Edition, Pearson Prentice HallEdition, 2011.
3. William Stallings, “Data and Computer Communications”, Eighth Edition, Pearson Education, 2011.

Web-based/Online Resources

1. https://www.pynetlabs.com/network-devices-and-its-various-types/
2. https://learn.microsoft.com/enus/dotnet/fundamentals/networking/sockets/socket- services
3. https://portswigger.net/research/top-10-web-hacking-techniques-of-2021

52420	DATA STRUCTURES USING PYTHON	L	T	P	C
Practicum		3	0	2	4

Rationale

Data structure is a subject of primary importance in Information and Communication Technology. Knowledge of data structures is essential for implementation of efficient algorithms and program development. Learning data structures with Python offer flexibility and ease of programming with many built in data structures and libraries.

Course Objectives

The objective of this course is to

1. Provide the knowledge of various types of data structures
2. Familiarize with the representation of data structures
3. Use various data structures in organizing data
4. Reinforce theoretical concepts by writing relevant programs
5. Gain knowledge in practical applications of data structures

Course Outcomes

After successful completion of this course, the students should be able toCO1:
Understand the fundamental data structures

CO2: Understand the concepts of linked lists CO3:
Apply the operations of stack and queue

CO4: Illustrate tree structure and apply trees traversal techniquesCO5:
Implement various sorting and searching techniques

Pre-requisites

Knowledge in C and python programming.

CO/PO Mapping

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

Assessment Methodology – Practicum (Theory)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	
Mode	Written Test Theory & Practical Test	Written Test Theory & Practical Test	Written Test	Written Examination
Portion	Two Units & Part A / Cycle 1 exercises	Another Two Units & Part B / Cycle 2 exercises	Complete Theory Portions	Complete Theory Portions
Duration	3 periods	3 periods	3 Hours	3 Hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	6th Week	12th Week	16th Week	

Note:

- **CA1 and CA2: The** written & practical test should be conducted as per the portion above and the scheme of evaluation.

  Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	4 Questions will be asked from every unit and students should write any two questions from each unit. The question may have two subdivisions only. (4 Questions × 10 Marks = 40 Marks)	40
2	Aim and Program	10
3	Execution and Output	5
4	Practical Document	5
TOTAL MARKS		60

CA3: Model examination should be conducted for complete theory portions as per the end semester question pattern. The marks awarded should be converted to 10 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 × 20 Marks = 100 Marks)

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

52420	DATA STRUCTURES USING PYTHON	L	T	P	C
Practicum		3	0	2	4

UNIT I	INTRODUCTION TO DATA STRUCTURES	
Data structures – Introduction, classification of data structures: primitive and non-primitive data structures with python examples – linear and nonlinear data structures with python examples. Operations on data structures. **Abstract data types** - Introduction, abstractions, Abstract data types, example of abstract data type (student, date), Defining the ADT, Using the ADT, Implementing the ADT. **Algorithm Analysis** – space complexity, time complexity, Asymptomatic notations: Big-O notation.		9
Ex.No	Name of the Experiment	
1	Write a program to implement any one python data structure with the following operations A) Create B) Add elements C) Access elements D) Remove elements	2
UNIT II	**LINEAR DATA STRUCTURES - LINKED LISTS**	
Linked List - Terminology: node, address, information, null pointer, empty list, Types – singly linked lists: creating nodes, traversing the nodes, searching for a node, prepending nodes, removing nodes - doubly linked list & circular linked list – organization - operations: traversal, searching, adding nodes, removing nodes (concepts only, no implementations)		8
Ex.No	Name of the Experiment	
2	Write a python program to implement a singly linked list a) create a singly linked list b) add element to singly linked list c) Remove element from singly linked list	4
UNIT III	**LINEAR DATA STRUCTURES – STACK & QUEUE**	
Stacks- Overview of stack, Implementation of stack using python list: push, pop, display. Stack applications: balanced delimiters, evaluating postfix expressions. Recursion - Properties of recursion - Recursive functions: Factorials, Recursive		10

call tree. **Queues-** Overview of queue **-** Implementing the queue and its operations using python list - Applications of queues - Circular queue and Priority queue (concepts only)		
Ex.No	Name of the Experiment	
3	Write a python program to implement stack	8
4	Write a python program to implement queue	
UNIT IV	**NON-LINEAR DATA STRUCTURES - TREES**	
Tree - Terminology: node, edge, parent, children, path, level of a node, depth of a node, height of a tree – Binary tree: full binary tree, complete binary tree – Linear representation of binary tree - binary tree traversals: in-order, pre-order, post-order. Binary Search Tree – Introduction, Creation of a Binary Search tree without duplicate node, Applications.		9
Ex.No	Name of the Experiment	
5	Write the python program for pre-order traversal of a binary tree	4
UNIT V	**SEQUENTIAL STORAGE REPRESENTATION – SORTING & SEARCHING**	
Sorting- Introduction to different sorting techniques - Bubble sort, Insertion sort, Quick sort and Merge Sort. **Searching**- Introduction to different searching techniques - Linear search and Binary search.		9
Ex.No	Name of the Experiment	
6	Write a python program to implement bubble sort	12
7	Write a python program to implement linear search	
8	Write a python program to implement binary search	
TOTAL PERIODS		**75**

Text Book for Reference:

1. Rance D. Necaise, Data Structures and Algorithms using Python, John Wiley, 2011
2. Benjamin Baka, Python Data Structures and Algorithms, Packt Publishing Ltd., 2017
3. Roberto Tamassia, Michael H. Goldwasser, Michael T. Goodrich, Data Structures and Algorithms in Python, 1st Edition, Wiley, 2013

Web-based/Online Resources

1. https://www.pynetlabs.com/network-devices-and-its-various-types/
2. https://learn.microsoft.com/enus/dotnet/fundamentals/networking/sockets/socket- services
3. https://portswigger.net/research/top-10-web-hacking-techniques-of-2021

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments basedon the course
- Periodic class quizzes conducted on a weekly / fortnightly 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 / Laptop
    - Printer
2. **Software Requirement:**
    - Windows / Linux Operating System
    - Python IDLE / Spyder.

52430	JAVA PROGRAMMING	L	T	P	C
Practicum		2	0	4	4

Introduction

Java is a class-based, object-oriented programming language .It is intended to let application developers write once, and run anywhere (WORA), meaning that compiled Java code can run on all platforms that support Java without the need for recompilation. Java is widely used for developing applications for desktop, web, and mobile devices. Java is known for its simplicity, robustness, and security features, making it a popular choice for enterprise-level applications. Students will learn Java tokens, variables, data types, control structures, functions, arrays, strings, object - oriented programming concepts and swing components. Through hands-on students will develop proficiency in writing structured and efficient Java programs to solve a variety of computational problems.

Course Objectives

The objectives of this course are enabling the students

- To understand the concepts of Object Oriented Programming.
- To learn about the control structures, class with attributes and methods used inJava.
- To gain knowledge of arrays and strings.
- To understand the concept of exception handling mechanism.
- To comprehend the basics of swing components and its importance in application development.

Course Outcomes

At the end of the course, students will be able

CO1: Demonstrate knowledge on Java Programming fundamentals.

CO2: Develop programs in Java using control structures, array and string. **CO3:** Demonstrate use of object - oriented programming concepts in Java. **CO4:** Apply programming skills to solve overriding problems using interface.**CO5:** Develop applications using swing components.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	1	1	2
CO2	3	3	3	3	1	1	2
CO3	3	3	3	3	1	2	2
CO4	3	3	3	3	1	2	2
CO5	3	3	3	3	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.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case ofdiscrepancies.

52430	JAVA PROGRAMMING	L	T	P	C
Practicum		2	0	4	4

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52430	JAVA PROGRAMMING	L	T	P	C
Practicum		2	0	4	4

Unit I	INTRODUCTION TO JAVA	
Introduction to OOPS: Paradigms of Programming Languages – Basic concepts of Object-Oriented Programming –Benefits of OOPs –.– Java features – Java Environment – JDK – API. Creating and Executing a Java program – Java Tokens- Java Virtual Machine (JVM) –Command Line Arguments – Constants – Variables – Data types - Scope of variables – Type casting – Operators.		6
Ex No 1: Write a java program to read the temperature in Celsius and convert into Fahrenheit. **Ex No 2**:Write a program to read 2 integers and find the largest number using conditional operator. **Ex No 3**: Write a Java program to implement command line arguments.		12
Unit II	**CONTROL STRUCTURES, ARRAY AND STRING**	
Control structures: Decision making statements - looping statements - branching statement - Arrays: One Dimensional Array –Multidimensional Array – String: String Array – String Methods.		6
Ex No 4: Write a Java program to find the sum and average of your tenth standard marks. **Ex No 5:** Write a Java Program to sort 10 student names in alphabetical order using bubble sort		12
Unit III	**CLASS AND OBJECTS**	
Class and objects: Defining a class – Methods – Creating objects – Accessing class members – Constructors – Method overloading – Static members – Nesting of Methods - Final methods.		6
Ex No 6 : Write a Java program to collect student details using constructors. **Ex No 7:**Write a Java program to calculate area of rectangle, triangle and square using method overloading.		12
UNIT IV	**INHERITANCE AND INTERFACE**	
Inheritance: Defining Inheritance –Types of Inheritances– Overriding Methods – Final Variables and Methods - Abstract Class**- Interfaces:** Defining Interface – Types of Interfaces**.**		6

Ex No 8: Write a Java program to create a class called Shape with methods called getPerimeter() and getArea(). Create a subclass called Circle that overrides the getPerimeter() and getArea() methods to calculate the area and perimeter of a circle. **Ex No 9**: Write a Java program to create an interface Shape with the getArea() method. Create three classes Rectangle, Circle, and Triangle that implement the Shape interface. Implement the getArea() method for each of the three classes.		12
UNIT V	**EXCEPTION HANDLING AND SWING**	
Exception Handling: Basics of Exception Handling – try blocks – throwing an exception – catching an exception – finally statement. Swing Components and Event Handlers: – Event Handlers – Event Listeners –Input Events.		6
Ex No 10: Write a Java program to create a panel with three buttons, labeled Red, Blue and Yellow, so that clicking each button results in the background color changing to the appropriate color.		12
TOTAL PERIODS		**75**

Textbook for Reference:

- E. Balagurusamy, Programming with Java, 5th Edition, TataMc-Graw Hill.
- Sagayaraj, Denis, Karthick and Gajalakshmi, Java Programming for Core andadvanced learners, Universities Press (INDIA) Private Limited, 2018.
- Herbert Schildt, The complete reference Java, TataMc-Graw Hill, 7th Edition.

Website links for reference:

- NPTEL & MOOC courses titled Java: https://nptel.ac.in/courses/106105191/

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments basedon 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 Operating System
    - Net Beans 8.0.2 / 8.2 with JDK.

Board Practical Examination

PART – A

1. Write a Java program to read the temperature in Celsius and convert into Fahrenheit.
2. Write a Java program to read 2 integers and find the largest number usingconditional operator .
3. Write a Java program to implement command line arguments.
4. Write a Java program to find the sum and average of your tenth standard marks.
5. Write a Java Program to sort 10 student names in alphabetical order using bubblesort.
6. Write a Java program to collect student details using constructors.
7. Write a Java program to calculate area of rectangle, triangle and square using method overloading.
8. Write a Java program to create a class called Shape with methods called getPerimeter() and getArea(). Create a subclass called Circle that overrides the getPerimeter() and getArea() methods to calculate the area and perimeter of a circle.
9. Write a Java program to create an interface Shape with the getArea() method. Create three classes Rectangle, Circle, and Triangle that implement the Shape interface. Implement the getArea() method for each of the three classes.
10. Write a Java program to create a panel with three buttons, labeled Red, Blue and Yellow, so that clicking each button results in the background color changing to theappropriate color.

PART – B

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

52440	PYTHON PROGRAMMING	L	T	P	C
Practicum		1	0	4	3

Introduction

Being able to implement the basic logical statements in python and explore python's various data structures and packages which are much useful in the fields of data science, artificial intelligence.

Course Objectives

The objective of this course is to enable the student to

1. To read and write simple python programs.
2. To define strings in python and operations on string.
3. Represent compound data using python lists, tuples, dictionaries.
4. To define and access multi-dimensional arrays using NumPy.
5. To do input/output with files in python.

Course Outcomes

After successful completion of this course, the students should be able toCO1: Demonstrate the installation process of python IDE and modules.

CO2: Implement the decision making and looping statements in python.CO3: Define regular expression for the pattern and verify for the validity.CO4: Create and access string, list, tuple, dictionary and NumPy array.

CO5: Read and write text and csv file using python.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	3	---	---	---
CO2	3	3	3	3	---	---	---
CO3	3	3	3	3	---	---	---
CO4	3	2	3	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.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case ofdiscrepancies.

52440	PYTHON PROGRAMMING	L	T	P	C
Practicum		1	0	4	3

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52440	PYTHON PROGRAMMING	L	T	P	C
Practicum		1	0	4	3

Unit I	INTRODUCTION TO PYTHON	
Installing and running Python in interpreter and Interactive mode, Basic Datatypes in Python: int, float, string. Storing Values in Variables, Basic functions in Python: input (), print (), str (), int (), float (). Decision Making – Simple if, if…else and if … elif statement; Control Statement: while, break, continue, for loop, range ().		4
Ex No 1: Write a python program to read three numbers and print the greatest of three numbers. **Ex No 2**: Write a python program to find the sum of N number using range () function in for loop.		12
Unit II	**STRING, LIST, TUPLE, DICTIONARY**	
Sequence Data types. Operations on sequence data types: Indexing and slicing, concatenation, and replication, in and not in operators to access elements. List: Creation, mutable property, In build methods of List: index (), append (), insert (), sort (), reverse (). Tuple: immutable property, converting types using tuple (), list (). Dictionary Data type: Creation, keys (), values () and items () methods.		4
Ex No 3: Write a python program to demonstrate the string slicing, concatenation, replication and len() method. **Ex No 4:** Write a python program to create a tuple and convert into a list and print the list in sorted order. **Ex No 5:** Write a python program to create a dictionary and check whether a key or value exist in the dictionary.		16
Unit III	**NumPy**	
Install and import NumPy module, Creation of one dimensional, 2D-dimensional NumPy array using array (), Slicing, indexing, NumPy methods: shape (), reshape(), concatenate (), where (). Arithmetic operations in NumPy, Aggregation functions in NumPy.		4
Ex No 6: Write a python program to create one dimensional array and convert into a 2D-dimensional array using reshape(), print the first two columns alone using slicing. **Ex No 7:** Write a python program to create two-dimensional array and search for an element using where () function.		16

Ex No 8: Write a python program to create a 2D-dimensional array and demonstrate aggregation functions sum (), min () and max () in the row and column wise.	
UNIT IV	**FILE HANDLING**
Text file handling: file opening mode, reading from a file: read(), readline(), readlines() and writing into a file: write(), writeline(). Pandas package: install and import pandas, read and write a csv file, pandas methods: head(), describe().	3
Ex No 9: Write a python program to read a text file and write the content in another file. **Ex No 10**: Write a python program to read a csv file using pandas and print the content.	16
TOTAL PERIODS	**75**

Textbook for Reference:

- Al Sweigart, Automate the Boring Stuff with Python, Second Edition, No StarchPress,2019.
- Jake Vanderplas, Python Data Science Handbook, Essential tool for working withdata, First Edition, O'Reilly Media, Inc,2017.
- Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy andIpython, Wes McKinney, Second Edition, O'REILLY, 2017.

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments basedon 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 / Laptop
    - Printer
2. **Software Requirement:**
    - Windows / Linux Operating System
    - Python IDLE /Spyder.

BOARD PRACTICAL EXAMINATION

PART – A

Ex No 1: Write a python program to read three numbers and print the greatest of threenumbers.

Ex No 2: Write a python program to find the sum of N number using range () function in forloop.

Ex No 3: Write a python program to demonstrate the string slicing, concatenation, replicationand len() method.

Ex No 4: Write a python program to create a tuple and convert into a list and print the list insorted order.

Ex No 5: Write a python program to create a dictionary and check whether a key or valueexist in the dictionary.

PART – B

Ex No 6: Write a python program to create one dimensional array and convert into a 2D-dimensional array using reshape (), print the first two columns alone using slicing.

Ex No 7: Write a python program to create two-dimensional array and search for an elementusing where () function.

Ex No 8: Write a python program to create a 2D-dimensional array and demonstrateaggregation functions sum (), min () and max () in the row and column wise.

Ex No 9: Write a python program to read a text file and write the content in another file.

Ex No 10: Write a python program to read **a csv file** using pandas and print the content.

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

52450	E-PUBLISHING TOOLS	L	T	P	C
Practicum		1	0	4	3

Introduction:

This course provides an introductory exploration of e-publishing tools and technologies for creating and distributing digital publications. Students will learn about various e-publishing formats, tools used to create e-books, digital magazines, interactive documents and more. Through hands-on projects and practical exercises, students will gain proficiency in using popular e-publishing software and tools to design, format, and publish digital content for different devices and platforms.

Course Objectives

The objective of this course is to

1. Learn all tools and options in Text editing software.
2. Create Vector drawings using CorelDraw.
3. Learn all tools and options in Bitmapped image editing software.
4. Learn to use Layer masks, filters and blending modes in Adobe Photoshop.
5. Learn to use online publishing software like Canva, Figma.
6. Learn to use character styles, paragraph styles, text effects, frames in any pagelayout software like Adobe Indesign or any other equivalent open source software.

Course Outcomes

After successful completion of this course, the students should be able to CO1:

Create designs like Business Cards, Notebook wrapper and logo.CO2: Create passport size photo by removing background.

CO3: Design a new image by blending two images using layer masking and filters.CO4: Prepare new designs for brochures, calendar and invitations.

CO5: Learn online graphic design platform to design presentations, social mediagraphics, posters, flyers, infographics.

Pre-requisites

Basic Knowledge about computer and multimedia elements.

CO/PO Mapping

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

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

Instructional Strategy:

- It is advised to assign hands-on projects to students create digital publications using e-publishing tools such as Adobe Photoshop, CorelDraw, AdobePageMaker etc. Projects could include designing and formatting interactive documents.
- Conduct of interactive demos to help students learn specific techniques and tools.Provide step-by-step guidance and encourage questions and participation.
- Analysis of real-world examples of successful digital publications and their design, formatting, and distribution strategies.

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52450	E-PUBLISHING TOOLS	L	T	P	C
Practicum		1	0	4	3

Unit I E-PUBLISHING & VECTOR DRAWING APPLICATIONS	
Introduction to E-Publishing- Evolution -Categories of E-Publishing Tools- Text Editors- Word Processors- Vector Drawing Applications- Page Layout Applications- Bitmapped image Applications. Installing vector drawing application - Starting and Opening Drawings - Previewing - Viewing Modes - Saving and Closing Drawings - Workspace - Lines, Shapes, and Outlines- Working with Objects, Symbols, and Layers- Colour, Fills, and Transparencies- Exploring Special Effects- Working with Text- Templates and Styles- Pages and Layout.	**6**
1. Create a business card with a logo using various text styles, rectangle tool,and ellipse tool.	**6**
2. Design a notebook wrapper using fountain filling and pattern filling tools.	**6**
3. Transform one object into another object using a blend tool. (Students can be allowed to use any other open source vector drawing software)	**6**
Unit II PAGE LAYOUT APPLICATIONS	
Getting started with Scribus- Opening, closing and navigating- Text Tools- Shape Tools- Image Frame Tools- Color Management Tools- Master Pages- Layers- Alignment and Distribution Tools- PDF Export Options.	**2**
1. Design an invitation for your college convocation using text tools Shape Tools- Image tables in the page layout software. (Students can be allowed to use any other open source page layout software)	8
Unit III BITMAPPED IMAGE APPLICATIONS	
Installing Image editing application- Opening, moving, editing, saving images- Essential Keyboards Shortcuts- Workspace- panels- Selection tools- Crop and slice tools- Colour selection and measuring tools- Text tools- Navigation tools- Retouching tools- Painting tools- Drawing tools- Customizing Toolbars- Layers - Layer Mask- Blending modes- Filters.	**4**
5.Create a design by using various selection tools, cutting and pasting the images.	**6**

6. Create a passport size photo by removing the background of a photo and change it to blue color.	**6**
7. Change the image looks by applying various filters and blending modes. (any one among Pencil sketch, Water Color, Blurred Background)	**6**
8. Create a design with the use of a layer mask using two images as background and foreground. (Students can be allowed to use any other open source image editing software)	**6**
Unit IV ONLINE GRAPHIC DESIGN (CANVA CONTROLS)	
Introduction to Canva- Templates- Backgrounds- Working with text- Font Styles- Elements- images, icons, or graphs- Shapes- Audio- Video- Animation- Applying Filters and Effects- Save- Download and share.	**3**
9. Design a multipage document like a tri-fold brochure using various elements for the college workshop.	**5**
10.Prepare a stylish calendar sheet by using tables and its formatting tools. (Students can be allowed to use any other open source online graphic design software)	**5**
Total Periods	**75**

Text Books for Reference:

- Gary David Bouton, CorelDraw X7: The Official Guide- 12th Edition, O'Reilly Media,2017.
- Conrad Chavez, Andrew Faulkner, Adobe photoshop classroom in a book, 1st Edition, Pearson,2018.
- Latheefah Raji, Design with Canva: A complete guide on how to use Canva, 1stedition, Independent Publisher, 2021.

Website links for reference:

- https://www.psdstack.com/resources/photoshop-tutorials/
- https://www.vandelaydesign.com/free-CorelDraw-tutorial
- https://www.canva.com/designschool/tutorials/
- https://www.youtube.com/watch?v=uCcPDSE6vLw
- https://www.scribd.com/doc/13080717/CorelDraw-Course-Manual
- Getting Started with Adobe Photoshop (photoshopessentials.com)
- https://www.CorelDraw.com/en/learn/tutorials/
- https://www.CorelDraw.com/en/learn/webinars/

Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments basedon the course
- Periodic class quizzes conducted on a weekly/fortnightly based on the course
- Micro project that shall be an extension of any practical lab exercise to real-world application.

Equipment / Facilities required to conduct the Practical CourseHardware Requirements

Desktop Computers with Internet Connectivity ,Laser
printer ,
Scanner

Software Requirements

Any Open Source Software ,GIMP ,
Scribus , Inkscape ,
Adobe Photoshop ,
CorelDraw

BOARD PRACTICAL EXAMINATIONPART

- A

1. Create a business card with a logo using various text styles, rectangle tool, and ellipsetool.
2. Design a notebook wrapper using fountain filling and pattern filling tools.
3. Transform one object into another object using a blend tool.
4. Design an invitation for your college convocation using text tools Shape Tools- Imagetables in the page layout software.
5. Create a design by using various selection tools, cutting and pasting the images.

PART - B

6. Create a passport size photo by removing the background of a photo and change it toblue color.
7. Change the image looks by applying various filters and blending modes. (any oneamong Pencil sketch, Water Color, Blurred Background)
8. Create a design with the use of a layer mask using two images as background and foreground.
9. Design a multipage document like a tri-fold brochure using various elements for the collegeworkshop.
10. Prepare a stylish calendar sheet by using tables and its formatting tools.

SCHEME OF EVALUATION

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

52460	SCRIPTING LANGUAGES	L	T	P	C
Project		0	0	6	2

Rationale:

The main objective of the course is to introduce the students with the advanced Web-based software development using JavaScript, PHP, and MySQL. The subject will impart knowledge to design visually appealing, dynamic, device-independent, and interactive web- based applications with client-side and server-side scripting. Additionally, this course aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course by undertaking a project. The individual students have different skills, attitudes, and strengths. At the end of this course, the students will learn how to workwith the team and how to prepare the report.

Course Objectives:

- To learn to utilize the PHP statements for Application Development
- To learn to develop web applications using PHP and MysQL
- To design the interactive and dynamic web applications using AJAX,JQUERY and Node.js
- To learn to work in teams and to utilize the knowledge gained into an application suitable for a real practical working environment
- Learn and understand the gap between the technological knowledge acquired and the actual industrial need and to compensate it by acquiring additional knowledge asrequired

Course Outcomes:

At the end of this course, students will be able to:

CO1: Write PHP script to store, access and display the data in the MySQL Database.CO2:
Design the dynamic web pages using AJAX, Jquery and Node.js

CO3: Develop device-independent Web application using Bootstrap

CO4: Identify, discuss and justify the technical aspects of the chosen project with aComprehensive and systematic approach with the team.

CO5: Communicate and report effectively project related activities and findings andreproduce, improve and refine the acquired result

Pre-requisites:- Web Designing Course

CO/PO Mapping

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

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

Instructional Strategy:

- 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.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activities in with built in Models
- Encourage Critical Analysis and Thinking: Foster an environment where students canthink over the real world problem and find the solution for the same also they can honestly assess experiment outcomes and analyze potential sources of error in caseof discrepancies.
- Cooperative & Team-Based Learning: Foster the environment where in the students can work in the team, discuss among the team to find the solution for the real-world problem.

Guidelines for Project Team Formulation

Batch size: Maximum 6 students per batch

Assessment Methodology - Project (Practical)

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Practical Test	Practical Test	Review 1	Review 2	Practical Examination
Portion	PART A Exercises	PART B Exercises	Project	Project	Project
Duration	2 Periods	2 Periods	2 Periods	2 Periods	3 hours
Exam Marks	60	60	50	50	100
Converted to Marks	10	10	15	15	60
Marks	10		15	15	60
Internal Marks	40				
Tentative Schedule	7th Week	10th Week	11th Week	15th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per theportions 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 assessmentof 10 Marks.

  Practical documents should be maintained for every exercise / experimentimmediately 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 and CA 4:** Two reviews should be conducted, each for 50 Marks. The marks awarded should be converted to 15 Marks for the internal assessment.

  The sum of both the review marks is considered for CA3. Proper records should be maintained for the two Project Reviews. Each review is evaluated as per the following guidelines:

Details of Mark allocation	Max. Marks
Presentation	20
Implementation	20
Viva Voce	10
Total	50

END SEMESTER PRACTICAL EXAMINATION:

SCHEME OF VALUATION		
S. NO	**ALLOCATION**	**MARKS**
1	Implementation / Demo	50
2	Report	30
3	Viva Voce	20
4	Total	100

52460	SCRIPTING LANGUAGES	L	T	P	C
Project		0	0	6	2

Unit I	PHP INTRODUCTION	
Theory: Introduction to Server Side Scripting - PHP: PHP Structure and Syntax - Integrating HTML with PHP - if Statements - if and else – switch case - for loop –for each loop- Strings – Arrays - HTML Form Elements Processing in PHP - Passing Variables between Pages.		8
Practice Experiments: **Ex No 1:** Write PHP code to implement any five string and array functions **Ex No 2:**Design the HTML form to collect student biodata and SSLC Mark, Process the collected data in the PHP and Find Total and Average for Mark.		

Unit II	PHP PRGRAMMING AND MYSQL PHP	
Theory: Sessions and Cookies- Page redirection- Connecting to the MySQL Server – Insert, Edit, Update, Delete and Querying the Database from PHP		8
Practice Experiments: **Ex No 3:**Develop the simple application which display result of the student by getting register number as user input(assume student marks are already available in the database) **Ex No 4:** Develop the simple login page, which validates the username, and password (assume username, password and student_name are stored in the database). If username and password are correct, the page should redirect to Welcome.phpfile and display the student_name in that page. If username or password is incorrect page should remain in login page itself.		

Unit III	AJAX AND JQUERY	
Theory: Introduction to AJAX -The XMLHttpRequest Object - JSON - Introduction to jQuery - jQuery Events – jQuery Effects - AJAX and JQuery.		8
Practice Experiments: **Ex No 5:**Write the code to disable right-click option in the webpage using the jQuery **Ex No 6:** Develop the simple application which display details of the collegeby getting college code as input using AJAX without reloading the page (assume college details like code, name, courses_offered, address, hostel facility,etc., are already available in the database)		

Unit IV	WEB APPLICATIONS FRAMEWORKS	
Theory: Bootstrap 5.0: Cards – Nav Bar- Form elements- Node.js : Introduction – NPM-Node js Modules-upload files- Send an Email – Events-Node.js and Mysql-introduction to Django		8
Practice Experiments: **Ex No 7:**Develop the Node.js code to upload the file to server **Ex No 8:**Develop the Node.js code to send an email		
	Project Development & Report Preparation	58
	TOTAL PERIODS	**90**

Suggested List of Project (Not limited to this list):

1. College Management Software
2. Livestock Management software
3. Online Student Attendance and Biodata Management Software
4. Online Employee Management Software
5. Online Event Management Software
6. Online Transport Management Software
7. Online Library Management Software
8. Online Blood Bank
9. Online Shopping / Billing Software
10. Online Book / Music Store

Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments inWeb development.
- online quizzes
- Project Development

Textbook for Reference:

- Thomas Powell, Fritz Schneider “Java Script: The Complete Reference”, Third Edition, Tata McGras-Hill, July 2017.
- Timothy Boronczyk, Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, Michael K. Glass “Beginning PHP6, Apache, MySQL, Web Development”, John Wiley & Sons Ltd, 2009.
- SandroPasquali, Kevin Faaborg “Mastering Node.js” Second Edition, PacktPublishing, 2017.

Equipment / Facilities required conducting the Practical Course / ProjectHardware Required.

1. Desktop / Laptop Computers.

Software Required.

1. Apache / Httpd / Wamp/ Xamp Webserver
2. MySQL
3. Any Web browser

SEMESTER 5

52510	CLOUD COMPUTING	L	T	P	C
Practicum		2	0	2	3

Rationale

This course will introduce the emerging technology cloud computing. The advantages of cloud services and cloud applications will give the students the much neededexposure to the current trend.

Course Objectives

The objective of this course is to

1. Introduce the concept of virtualization.
2. Outline the concepts of cloud computing.
3. Summarize the different types of web services and cloud service providers.
4. Elaborate the security issues in cloud.
5. Present the cloud applications.

Course Outcomes

After successful completion of this course, the students should be able toCO1: Understand the concept of virtualization.

CO2: Differentiate various cloud services.

CO3: Explore the different cloud service providers.

CO4: Understand the security issues with cloud and security policies.CO5: Comprehend the various cloud applications.

Pre-requisites

The student should have taken up Computer Networks and Security The student should have the basic Knowledge about network protocols.

CO/PO Mapping

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

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

Instructional Strategy

- The teacher can use experiential learning as an instructional strategy both in andoutside the classroom.
- It may be necessary for the teacher to pre-teach the skills and processes necessaryto achieve the intended learning outcomes.
- The teacher needs to encourage students to share their thoughts so that the entireclass can benefit from individual insights.
- Teachers can encourage divergent thinking by asking students to transform ateacher guided image into several others of their own creation.

Assessment Methodology – Practicum (Theory)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	
Mode	Written Test Theory & Practical Test	Written Test Theory & Practical Test	Written Test	Written Examination
Portion	Two Units & Part A / Cycle 1 exercises	Another Two Units & Part B / Cycle 2 exercises	Complete Theory Portions	Complete Theory Portions
Duration	3 periods	3 periods	3 Hours	3 Hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	6th Week	12th Week	16th Week	

Note:

- **CA1 and CA2: The** written & practical test should be conducted as per the portion above and the scheme of evaluation.

  Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	4 Questions will be asked from every unit and students should write any two questions from each unit. The question may have two subdivisions only. (4 Questions × 10 Marks = 40 Marks)	40
2	Aim and Program	10
3	Execution and Output	5
4	Practical Document	5
TOTAL MARKS		60

CA3: Model examination should be conducted for complete theory portions as per the end semester question pattern. The marks awarded should be converted to 10 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 × 20 Marks = 100 Marks)

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

52510	CLOUD COMPUTING	L	T	P	C
Practicum		2	0	2	3

Unit - 1	CLOUD COMPUTING	
Characteristics of Cloud - Benefits – limitations - Cloud Deployment Models - Cloud service models - Infrastructure as a service(IaaS), Platform as a Service(PaaS), Software as a Service (SaaS), Anything as a Service(XaaS) – SPI Vs. Traditional IT Models – Cloud Data Centers.		6
Ex.No.	Name of the Experiment	
1	Create a professional portfolio using Google Slides.	6
2	Use Google Drive as Storage as a Service to Store, Organize, Share and Collaborate.	
Unit - 2	**VIRTUALIZATION**	
Virtualization, Hypervisors, Types of hypervisors. Virtualization techniques - para virtualization - full virtualization, - hardware assisted virtualization - hybrid virtualization.		6
Ex.No.	Name of the Experiment	
3	Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of existing OS.	6
4	Setting up a Java development Virtual Machine with VirtualBox.	
Unit - 3	**WEB SERVICES AND CLOUD SERVICE PROVIDERS**	
Web Services and its types, Google compute engine, Google App Engine, Amazon - Amazon Elastic Compute Cloud - Amazon Simple DB - Amazon Simple Storage Service (S3) - Amazon Cloud Front.		6
Ex. No.	Name of the Experiment	
5	Install a PaaS Engine (Google App Engine / AWS / Azure or any one PaaS Engine) and create simple web applications using python/java.	6
Unit - 4	**SECURITY IN THE CLOUD**	
Storage Location and Tenancy -Cloud Security Challenges -CSA Reference Model - Security Policies and Implementation – Virtualization Security Management.		6

Ex. No.	Name of the Experiment	
6	Protect Google Sheets and Range with various access permissions.	6
Unit - 5	**CLOUD COMPUTING APPLICATIONS**	
Adobe Creative Cloud Firefly design models– Git Hub repository basics– LinkedIn Benefits– Zoho Work Drive Features – Storage Concept of Google Big table.		6
Ex. No.	Name of the Experiment	
7	Setup a GitHub account and develop a simple python application.	6
8	Create a column family with an age-based garbage-collection policy in Google Bigtable.	
TOTAL PERIODS		**60**

Textbook for Reference:

- Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Mastering Cloud Computing,First Edition, Tata Mcgraw Hill, 2013.
- George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, First Edition, O'Reilly, 2009.
- Ashish Bhatnagar, Shailza Sharma, Cloud Computing, First Edition, S.K. Kataria &Sons, 2019.

Website links for reference:

- https://www.virtualbox.org/
- https://colab.research.google.com/
- https://cloud.google.com/appengine/
- http://www.seanmcilvenna.com/2018/03/26/setting-up-a-java-development-vm- with-virtualbox/
- https://cloud.google.com/bigtable/docs/samples/bigtable-create-family-gc-max-age
- https://www.accenture.com/gb-en/case-studies/about/cloud-security
- https://www.zoho.com/workdrive/features.html

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments basedon the course
- Micro project that shall be an extension of any practical lab exercise to real-world application

52521	MACHINE LEARNING	L	T	P	C
Theory		3	0	0	3

Introduction:

With the increased availability of data from varied sources there has been increasing attention paid to the various data driven disciplines such as analytics and machine learning. Therefore, this course provides an introduction to the field of machine learning, covering fundamental concepts, algorithms, and applications. It provides a set of techniques that can automatically detect patterns in data which can then be utilized for predictions and for developing models.

Course Objectives:

- To learn the basic concepts of machine learning.
- To gain knowledge on supervised learning concepts and their applications.
- To understand unsupervised learning models and their applications.
- To evaluate the algorithms based on corresponding metrics identified
- To learn other learning aspects such as reinforcement learning and other technologies

Course Outcomes:

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

CO1: Explain the basic concepts of machine learning algorithms.**CO2:** Evaluate and compare various machine learning models **CO3:** Design and Develop various supervised learning models.

CO3: Design and Develop various unsupervised learning algorithms

CO5: Apply machine learning techniques to solve 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	2	1	1	1
CO3	3	3	3	3	1	2	2
CO4	3	3	3	3	1	1	2
CO5	3	3	3	3	1	2	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 ofdiscrepancies.

Assessment Methodology – Theory

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test	Written test	Quiz MCQ	Model Examination	Written Examination
Portion	Two units	Another Two units	Online / Offline	All units	All units
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: W**ritten 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.
- **CA1 and CA2 Question Pattern:**

  FOUR questions should be asked from each unit. Students shall write any **FIVE** questions out of **EIGHT** questions. Each question carries 10 marks each. (5 X 10 Marks = 50 Marks)

  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 20 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 × 20 Marks = 100 Marks)

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

52521	MACHINE LEARNING	L	T	P	C
Theory		3	0	0	3

Unit I	INTRODUCTION TO MACHINE LEARNING	
Fundamentals of Machine Learning (ML): Definition and Scope –-Basic Steps in Knowledge Discovery Process - Types- Applications. Data Descriptive Analysis: Mean- Median- Mode -Standard Deviation-Percentile Data. Workflow of Machine Learning Application Development: Data Cleaning, Data Integration, Data Reduction, Data Transformation, Algorithms and Visualizing Results.		9
Unit II	**PREDICTIVE MODELLING**	
Predictive Modelling: Basic Concepts- Needs- Types- Regression: Linear Regression–Logistic Regression-Evaluation Metrics for Regression. Frequent Pattern Mining: Needs-Associations Rules Mining-Algorithms: Apriori Algorithm-Pattern Evaluation Measures.		9
Unit III	**SUPERVISED LEARNING TECHNIQUES**	
Classification: Basic Concepts- Needs- Types - Features, Labels, Training Data, Testing Data, and models. Algorithms: Decision Tree Induction - Naive Bayes classifier – K-Nearest Neighbors'(KNN) - Model Evaluation Metrics. Ensemble Approaches: Voting Classifiers – Bagging and Boosting Sampling Techniques.		9
Unit IV	**UNSUPERVISED LEARNING TECHNIQUES**	
Clustering: Basic Concepts- Needs- Types- Types of Data-Data similarity and Dissimilarity Measures –Partitioning Method: K-Means Algorithms - Hierarchical Method: Agglomerative-Divisive Algorithm. Cluster Analysis: Metrics for Evaluating Clusters.		9
Unit V	**ADVANCED CONCEPTS, TRENDS AND APPLICATIONS**	
Text Mining- Web Mining- Time series Analysis. Case Studies: Market Basket Analysis- Recommendation System- Email Spam and Malware Filtering – Online Fraud Detection – Weather Forecasting- Challenges and Issues in Machine Learning- Tools for Machine Learning.		9
TOTAL PERIODS		**45**

Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments basedon the course.
- Project based Learning in emerging application areas like finance, healthcare etc.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.
- Assignments on different types of learnings
- Tutorials on solving problems using machine learning.
- Flipped classroom activities to explore application areas

Textbook for Reference:

- Ethem Alpaydin, "Introduction to Machine Learning", Fourth Edition, MIT Press ,2020.
- Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques,Morgan,3rd Edition, Kaufmann Publishers, 2011.
- Sebastain Raschka, Vahid Mirjalili, "Python Machine Learning", 3rd Edition, Packtpublishing 2019.

Website links for reference:

- https://www.javatpoint.com/machine-learning
- https://www.kaggle.com/learn/intro-to-machine-learning
- https://nptel.ac.in/courses/106106139
- https://nptel.ac.in/courses/106106236
- https://egyankosh.ac.in/

52522	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 ofdiscrepancies.

Assessment Methodology – Theory

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test	Written test	Quiz MCQ	Model Examination	Written Examination
Portion	Two units	Another Two units	Online / Offline	All units	All units
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: W**ritten 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.
- **CA1 and CA2 Question Pattern:**
  FOUR questions should be asked from each unit. Students shall write any **FIVE** questions out of **EIGHT** questions. Each question carries 10 marks each. (5 X 10 Marks = 50 Marks)
  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 20 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 × 20 Marks = 100 Marks)

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

52522	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 basedon 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, andSolutions,1st Edition IRM Press,2007
- Mehmed Kantardzic ,Data Mining Concepts, Models, Methods, and Algorithms2ndEdition, 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

52523	ETHICAL HACKING	L	T	P	C
Theory		3	0	0	3

Rationale:

Ethical hacking is designed to provide individuals with the knowledge and skills required to understand, identify, and mitigate security vulnerabilities and threats in computer systems, networks, and applications. This course introduces the concepts of Ethical Hacking and gives the learner the opportunity to learn about different tools and techniques in Ethicalhacking and security and to identify and analyze the stages an ethical hacker requires to take in order to compromise a target system as well as will apply preventive, corrective and protective measures to safeguard the system.

Course Objectives:

- Learn the fundamentals of ethical hacking principles, methodologies, and terminology, distinguishing between ethical and malicious hacking practices.
- Learn to identify and assess vulnerabilities and weaknesses in computer systems,networks, and applications through various reconnaissance techniques.
- Explore various hacking tools and techniques used by ethical hackers.
- Learn network scanning and penetration testing to identify security flaws and assessthe effectiveness of defense mechanisms.
- Understand key information security concepts and their relevance to ethical hacking.
- Explore common attack vectors and learn how to defend against them.
- Learn how to secure systems and networks by implementing intrusion detection and prevention systems, firewalls, and encryption.

Course Outcomes:

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

CO1: gain a solid understanding of network basics and basic principles of information security.

CO2: be familiarized with various types of cyber attacks, such as malware, social engineering, and denial-of-service (DoS), as well as common vulnerabilities like SQLinjection and cross-site scripting (XSS).

CO3: identify and assess vulnerabilities in computer systems, networks and applications through reconnaissance techniques, vulnerability scanning, and analysis.

CO4: develop practical skills in exploiting security weaknesses within legal and ethical boundaries.

CO5: develop practical skills in using a variety of tools and techniques employed byethical hackers.

Pre-requisites:

Basic Knowledge of Computers and networking fundamentals

CO/PO Mapping

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

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

Instructional Strategy:

- Provide students with hands-on experience in simulated environments where theycan practice hacking techniques ethically.
- Integrate case studies and real-life scenarios to illustrate ethical dilemmas, ethicalhacking methodologies, and the consequences of unethical behavior.
- Implement regular quizzes, and practical exercises to evaluate students' understanding of ethical hacking concepts, tools and techniques.
- Throughout the course, a theory-demonstrate-practice-activity strategy may be used to ensure that learning is outcome and employability-based.

52523	ETHICAL HACKING	L	T	P	C
Theory		3	0	0	3

Assessment Methodology – Theory

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test	Written test	Quiz MCQ	Model Examination	Written Examination
Portion	Two units	Another Two units	Online / Offline	All units	All units
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: W**ritten 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.
- **CA1 and CA2 Question Pattern:**

  FOUR questions should be asked from each unit. Students shall write any **FIVE** questions out of **EIGHT** questions. Each question carries 10 marks each. (5 X 10 Marks = 50 Marks)

  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 20 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 × 20 Marks = 100 Marks)

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

52523	ETHICAL HACKING	L	T	P	C
Theory		3	0	0	3

Unit I	Introduction to Ethical Hacking	
Introduction to ethical hacking: Types of hacking- advantages, disadvantages and purpose of hacking- Types of hackers- Difference between ethical and non-ethical hacking- Ethical Hacking Terminologies- Tools and Skills- Phases of hacking- Lawsof the Land. Information Security Overview- CIA triad (Confidentiality, Integrity, Availability)- The Indian IT Act 2000 and Amendments to the Indian IT Act(2008).		09
Unit II	**Reconnaissance & Foot printing**	
Reconnaissance: Active Reconnaissance- Passive Reconnaissance- Footprinting: Domain Name Information- Finding IP Address- Finding Hosting Company- IP Address Ranges- History of the Website. Fingerprinting: Banner Grabbing- application fingerprinting, web application scanning, and DNS fingerprinting. DNS Enumeration.		09
Unit III	**Scanning & Sniffing**	
Scanning: port scanning- Ping Sweep-Scanning Networks- Network discovery- Vulnerability scanning Sniffing: Introduction- Wire trapping and its types, packet sniffing-ARP spoofing, DNS spoofing and MAC flooding, active and passive sniffing,wi-fi sniffing- session hijacking- Man-In The Middle attack, sniffing countermeasures, sniffing detection techniques.		07
Unit IV	**Enumeration, Vulnerabiliy Analysis & Malwares**	
Enumeration- System enumeration- User enumeration- Service enumeration- Vulnerability Analysis- Vulnerability assessment- Common vulnerabilities and exposures (CVE)- Risk assessment. TCP/IP Hijacking- EMAIL Hijacking -Password Hacking- Dictionary Attack-Hybrid Dictionary Attack-Brute-Force Attack-Rainbow Tables- System Hacking- Password cracking- Privilege escalation- Maintaining access. Malware Threats: Types of malware (Types of viruses, worms, trojans, etc.)- Anti-malware tools and techniques.		10

Unit V	Social Engineering & Web Application Security	
Social Engineering: Types of social engineering attacks- Prevention and awareness- Denial of Service (DoS) and Distributed Denial of Service (DDoS) Attacks- DoS and DDoS concepts- DoS and DDoS attack techniques- Mitigation strategies- Web Application Security- Common web vulnerabilities -SQL injection- XSS, CSRF- Introduction to Pen Testing: need for pen testing, types and techniques of pen testing, phases of pen testing.		10
	TOTAL PERIODS	45

Text Books for Reference:

- Patrick Engebretson, The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy, 2nd Edition, Syngress, 2013.
- William Stallings, Lawrie Brown, Computer Security Principles and Practice, Fourth Edition, Pearson Education, 2017.
- Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams, Grey Hat Hacking: The Ethical Hacker's Handbook, 3rd Edition, The McGraw-Hill Companies, 2011.

Website Links for Reference:

- https://www.udemy.com/topic/ethical-hacking/free/
- https://nielit.gov.in/gorakhpur/sites/default/files/Gorakhpur/B01_Ethical_Hacking_2 20125.pdf
- https://archive.nptel.ac.in/courses/106/105/106105217/
- https://mu.ac.in/wp-content/uploads/2023/08/TYBSC-CS-Ethical-hacking.pdf
- https://aaplesarkar.maharashtra.gov.in/file/AapleSarkar-CyberSecurityAwarenessGuide.pdf

Suggested List of Students Activity:

- Virtual environments can be set up to practice hacking techniques in a controlled environment and students can be assigned real-world scenarios where they need to perform penetration tests on simulated corporate networks, web applications, or wireless networks.

- Students can be provided with vulnerable systems to exploit. Reverse engineering techniques can be taught to students by providing them with malware samples or binary executables to analyze.

52524	AGILE PRODUCT DEVELOPMENT	L	T	P	C
Theory		3	0	0	3

Introduction:

Agile Product Development is a model in Software Engineering, which deals with reliability and quality assurance of the software under development. It provides framework for development of quality software product. The course covers important aspects of product development such as software lifecycle, requirement analysis and documentation, characteristics of good design, design techniques, testing, softwareimplementation, maintenance etc. This course also provides the students with a theoretical understanding of agile software development practices and how small teamscan apply them to create high-quality software.

Course Objectives:

The student should be made to

- Define Software Engineering and to understand the phases in a software project.
- Understand different software development models.
- Understand the benefits and pitfalls of working in an agile team.
- Understand agile development and testing.
- To learn how the agility is incorporated in Requirement engineering and quality assurance.

Course Outcomes:

On successful completion of this course, the student will be able toCO1:

Explain different software development models

CO2: Interpret the concept of agile software engineering and its advantages in softwaredevelopment.

CO3: Analyze the core practices behind the given agile methodologies.CO4:

Interpret how agility is incorporated in Knowledge Management

CO5: Explain and Make use of various tools available to agile teams to facilitate theproject and to perform quality assurance in agile team

Pre-requisites: Nil

CO/PO Mapping

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

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 ofdiscrepancies.

52524	AGILE PRODUCT DEVELOPMENT	L	T	P	C
Theory		3	0	0	3

Assessment Methodology – Theory

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test	Written test	Quiz MCQ	Model Examination	Written Examination
Portion	Two units	Another Two units	Online / Offline	All units	All units
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: W**ritten 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.
- **CA1 and CA2 Question Pattern:**
  FOUR questions should be asked from each unit. Students shall write any **FIVE** questions out of **EIGHT** questions. Each question carries 10 marks each. (5 X 10 Marks = 50 Marks)
  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 20 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 × 20 Marks = 100 Marks)

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

52524	AGILE PRODUCT DEVELOPMENT	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 –Program versus Software Products- Software Development Life Cycle Models: Introduction –Waterfall Model – Prototyping model – Spiral Model – Iterative Enhancement model – Agile model.		9
Unit II	**AGILE METHODOLOGY**	
Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agile Documentations – Agile Drivers, Capabilities and Values.		9
Unit III	**AGILE PROCESSES**	
Lean Production – SCRUM- Crystal -Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.		9
Unit IV	**AGILITY IN KNOWLEDGE MANAGEMENT**	
Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle: Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Story Card Maturity Model (SMM).		9
Unit V	**AGILITY IN REQUIREMENTS ENGINEERING & QUALITY ASSURANCE**	
Impact of Agile Processes in Requirements Engineering(RE)– Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation –– Requirements Management in Agile Environment- Agile Requirements Prioritization.– Agile Metrics –- Agility in Quality Assurance.		9
	TOTAL PERIO DS	**45**

Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments inSoftware Development.
- Blended learning activities to explore the recent trends and developments in the field.
- Roleplay and case studies

Textbook for Reference:

- Roger S. Pressman, Software Engineering – A Practitioner's Approach, SeventhEdition, McGrawHill International Edition, 2010
- Ken Schawber, Mike Beedle, Agile Software Development with Scrum, InternationalEdition, Pearson.
- Robert C. Martin, Agile Software Development, Principles, Patterns and Practices,First International Edition, Prentice Hall,2014

Website links for reference:

- https://clearbridgemobile.com/complete-guideagile-software-development/
- https://agileken.com/agilefundamentals-ebook/
- https://www.edx.org/course/agile-software-development
- https://dl.ebooksworld.ir/motoman/Pearson.Agile.Software.Development.Principles.Patterns.and.Practices.www.EBooksWorld.ir.pdf
- https://www.coursera.org/learn/agile-software-development

52525	ARTIFICIAL INTELLIGENCE	L	T	P	C
Theory		3	0	0	3

Introduction

Artificial Intelligence has grown to be very popular in today's world. The amount of data that is generated, by both humans and machines, far outpaces humans' ability to absorb, interpret, and make complex decisions based on that data. Artificial intelligence forms the basis for all computer learning and is the future of all complex decision making. Computers are extremely efficient at calculating these combinations and permutations to arrive at the best decision. Artificial intelligence and its logical evolution of machine learningare the foundational future of business decision making.

Course Objectives

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

- Describe and use the basic concepts of intelligent agents.
- Design a knowledge-based system.
- Develop general-purpose problem-solving agents, logical reasoning agents, and agents that reason under uncertainty.
- Identify systems with Artificial Intelligence.
- Choose appropriate algorithms for solving given AI problems.
- Design and implement logical reasoning agents.
- Design and implement agents that can reason under uncertainty.
- Apply Artificial Intelligence techniques for problem solving.

Course Outcomes

After successful completion of this course, the students should be able toCO1: Remember the basic concepts of Artificial intelligence.

CO2: Solve basic AI based problems.

CO3: Define the concept of Artificial Intelligence.

CO4: Apply AI techniques to real-world problems to develop intelligentSystems.

CO5: Select appropriately from a range of techniques when implementing Intelligent systems.

Pre-requisites: Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	1	1	3	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 ofdiscrepancies.

52525	ARTIFICIAL INTELLIGENCE	L	T	P	C
Theory		3	0	0	3

Assessment Methodology – Theory

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test	Written test	Quiz MCQ	Model Examination	Written Examination
Portion	Two units	Another Two units	Online / Offline	All units	All units
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: W**ritten 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.
- **CA1 and CA2 Question Pattern:**
  FOUR questions should be asked from each unit. Students shall write any **FIVE** questions out of **EIGHT** questions. Each question carries 10 marks each. (5 X 10 Marks = 50 Marks)
  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 20 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 × 20 Marks = 100 Marks)

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

52525	ARTIFICIAL INTELLIGENCE	L	T	P	C
Theory		3	0	0	3

Unit I	INTRODUCTION TO ARTIFICIAL INTELLIGENCE 9

Introduction to AI – Definition - Goals of AI – Applications of AI - History of AI -Types of AI – Components of AI - Human vs Machine Intelligence

Agents – Rationality – Structure of Agents - Problem Solving Agents–Types of Agents - Environments-Nature of Environments

Unit II	PROBLEM SOLVING USING SEARCH TEHNIQUES 9

Search Algorithms: Evaluating Search Strategies - Breadth-first search, Uniform cost search, Depth-first search, Bidirectional Search.

Heuristic Search Strategies: Best First Search, Heuristic Search, A* Search

Unit III	KNOWLEDGE REPRESENTATION AND OPTIMIZATION TECHNIQUES 9

Knowledge Representation: Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories

Optimization Algorithms: Hill Climbing, Local Beam Search and Genetic Algorithm

Unit IV	GAME PLAYING AND CONSTRAINT SATISFACTION PROBLEMS 9

Game Theory: The Mini-Max search – Alpha-Beta Search- Introduction to CSPs Constraint Networks - Binary and Non-Binary Constraints –Constraint Propagation –Backtracking Search for CSP–Local Search for CSP–Structure of CSP.

Unit V	INTELLIGENT AGENTS 9

Knowledge-Based Agents –Propositional Logic – Propositional Theorem Proving – Propositional Model Checking – Agents Based on Propositional Logic.

Architecture for Intelligent Agents—Agent communication— Argumentation among Agents.

TOTAL PERIODS	45

Suggested List of Students Activity

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

Textbook for Reference:

- Stuart Russel, Peter Norvig, Artificial intelligence, A modern Approach, 2nd edition ,Prentice Hall,2007
- Rich, Kevin Knight, Shiv Shankar B Nair , Artificial Intelligence, 3rd Edition, , TMH ,2009
- Patterson, Introduction to Artificial Intelligence and Expert Systems, 1st Edition, ,Pearson India, 2015

Website links for reference:

- https://www.ibm.com/blog/the-benefits-of-ai-in-healthcare/
- https://en.wikipedia.org/wiki/Reinforcement_learning
- https://www.javatpoint.com/computer-vision

Suggested List of Students Activity

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

52526	CYBER SECURITY	L	T	P	C
Theory		3	0	0	3

Introduction:

This course provides an overview of cyber security principles, technologies, and practices essential for protecting information and information systems from various cyber threats. Topics include cyber security fundamentals, network security, cyber threats and incident response, web security, and cyber security management.

Course Objectives:

The objective of this course is to enable the students to

1. Understand the fundamental concepts and importance of cyber security.
2. Identify common cyber threats and vulnerabilities.
3. Implement basic security measures to protect networks and systems.
4. Analyze and respond to cyber security incidents.
5. Apply best practices in web security and secure coding.
6. Describe cyber security management principles, frameworks, and compliance requirements.

Course Outcomes

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

CO1: Articulate the fundamental concepts and principles of cyber security.

CO2: Analyze various types of cyber-attacks and apply corresponding countermeasures.

CO3: Apply intrusion detection techniques to effectively detect intrusions.

CO4: Apply intrusion prevention techniques to prevent intrusion.

CO5: Apply a variety of tools and technologies for cyber security to secure digital devices.

Pre-requisites: Computer Networks and Security

CO/PO Mapping:

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

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

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 – Theory

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test	Written test	Quiz MCQ	Model Examination	Written Examination
Portion	Two units	Another Two units	Online / Offline	All units	All units
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: W**ritten 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.
- **CA1 and CA2 Question Pattern:**
  FOUR questions should be asked from each unit. Students shall write any **FIVE** questions out of **EIGHT** questions. Each question carries 10 marks each. (5 X 10 Marks = 50 Marks)
  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 20 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 × 20 Marks = 100 Marks)

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

52526	CYBER SECURITY	L	T	P	C
Theory		3	0	0	3

Unit I	Introduction to Cyber security	
Cyber Security – Information Security and CIA Triad – Reason for Cyber Crime – Need for Cyber Security – Classifications of Cyber Crimes – Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes		9
Unit II	**Cyber Attacks and Countermeasures**	
Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – OWASP – Countermeasures.		9
Unit III	**Intrusion Detection**	
Host based Intrusion Detection – Network based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.		9
Unit IV	**Intrusion Prevention**	
Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.		9
Unit V	**Tools and Technologies for Cyber Security**	
End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third-party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Wi-Fi security, Configuration of basic security policy and permissions.		9
	TOTAL PERIODS	45

Suggested List of Students Activity:

The following student activities or similar activities can be assigned

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

Textbooks:

1. William Stallings, "Cryptography and Network Security - Principles and Practice", Seventh Edition, Pearson Education, 2017.
2. "Network Security Essentials: Applications and Standards" by William Stallings
3. Nina Godbole, Sunit Belapure, “Cyber Security: Understanding Cybercrimes, Computer Forensics and Legal Perspectives”, First Edition, Wiley India, 2011.
4. Conklin, Wm. Arthur, Gregory White, Chuck Cothren, Roger L. Davis, and Dwayne Williams., Principles of Computer Security: CompTIA Security+ and Beyond, 6th ed. New York: McGraw Hill, 2022.

Reference Books:

1. Behrouz A. Ferouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", 3rd Edition, Tata Mc Graw Hill, 2015.
2. Charles Pfleeger, Shari Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, New Delhi, 2015.
3. "OWASP Testing Guide" by OWASP Foundation

52530	INTERNET OF THINGS AND DIGITAL TWINS	L	T	P	C
Practical		0	0	4	2

Rationale

This course will give a hands-on experience to the students in designing anddeveloping Internet of Things applications and models.

Course Objectives

The objective of this course is to

1. Enable the students to understand the basic concepts of Internet of Things.
2. Summarize the functionalities of sensors and actuators.
3. Facilitate the students to design simple IoT concepts.
4. Illustrate the usage of cloud in IoT applications.
5. Introduce digital-twin technology to the students.

Course Outcomes

After successful completion of this course, the students should be able toCO1:

Interface sensors with micro controllers.

CO2: Design Internet of Things models using sensors and actuators.CO3:

Setup a cloud interface to visualize the data.

CO4: Understand the concept of digital twin technology.CO5:

Develop digital twin models using the software.

Pre-requisites

The student should have taken up Computer Networks .

CO/PO Mapping

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

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

Instructional Strategy

- It is advised that teachers make the learning experience more engaging by introducinginnovative and interesting ways of teaching.
- The teachers need to expose the students to material in multiple modes help them learnit faster and retain it longer.
- The teacher can focus the pupils' attention on the relevant facts and introduce scientificprinciples and concepts with the help of demonstration.

52530	INTERNET OF THINGS AND DIGITAL TWINS	L	T	P	C
Practical		0	0	4	2

Assessment Methodology – Practical

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical Test	Practical Test	Practical Document (Record Notebook)	Practical Examination
Portion	Part A / Cycle 1 Exercises	Part B / Cycle 2 Exercises	All Exercises	All Exercises
Duration	3 Periods	3 Periods	Regularly	3 Hours
Exam Marks	60	60	Each Practical 10 Marks	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	15th 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 pattern and the scheme of evaluation.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	Aim & Program	30
2	Execution and Result	20
3	Observation Notebook	10
TOTAL		60

The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

- **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.

SCHEME OF EVALUATION

End Semester Examination- Practical Exam

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

52530	INTERNET OF THINGS AND DIGITAL TWINS	L	T	P	C
Practical		0	0	4	2

Part - A	INTRODUCTION TO INTERNET OF THINGS	
Internet of Things – Sensors – Actuators – Micro Controllers - Introduction to Arduino Board and Arduino IDE – Arduino Programming.		
Ex. No.	Name of the Experiment	
1	Creating different LED patterns and controlling them with push button switches using Arduino.	30
2	Controlling servo motor based on the input from Joystick or PIR or IR sensor using Arduino.	
3	Calculate the distance to an object with the help of ultrasonic sensor and display it on an LCD using Arduino.	
4	Build a basic burglar alert security system with the help of PIR or IR sensor and Buzzer/LED Pattern using Arduino.	
5	Create automated LED light control based on the input from LDR using Arduino.	
Part - B	**CLOUD AND DIGITAL TWINS**	
Thing Speak Cloud – Introduction to Digital Twin Technology - Setting up a cloud account in Thing Speak cloud platform.		
Ex.No	Name of the Experiment	
6	Upload the temperature data from LM35 sensor to ThingSpeak cloud with Node MCU/Raspberry Pi.	30
7	Automatic streetlight simulation with Wokwi and ThingSpeak.	
8	Create your first thing using ditto.	
9	Query an existing thing using ditto.	
10	Connect an Arduino based device to Eclipse ditto.	
TOTAL HOURS		**60**

Suggested List of Students Activity

- Conduct of Ideathon to generate innovative solutions for real life problems.
- Micro project that shall be an extension of any practical lab exercise to real-world application

Textbook for Reference:

- Arsheep Bahga, Vijay Madisetti, Internet of Things - A Hands-On Approach, First Edition, Universities Press, 2015.
- Raj Kamal, Internet of Things, First Edition, McGraw Hill Education, 2017.
- Gopal Chaudhary, Manju Khari, Mohamed Elhoseny,Digital Twin Technology, First Edition,CRC Press, 2022.

Website links for reference:

- Arduino IDE: https://www.arduino.cc/en/IoT/HomePage
- Wokwi Simulator: https://wokwi.com/
- Eclipse Ditto: https://eclipse.dev/ditto/
- Ditto Example: https://github.com/eclipse-ditto/ditto-examples
- Thing Speak Cloud: https://thingspeak.com/

Equipment / Facilities required to conduct the Practical CourseSoftware Requirement:

1. Arduino IDE
2. Wokwi Simulator
3. Eclipse Ditto
4. Thing Speak Cloud

Hardware Requirement:

1. Arduino kit - 10 Numbers
2. Node MCU / Raspberry Pi - 10 Numbers
3. LED Lights – 10 Numbers
4. 330K Resistor - 10 Numbers
5. Push Button - 10 Number
6. Servo Motor 5 V DC - 10 Numbers
7. Joystick - 10 Numbers
8. Ultrasonic Sensor - 10 Numbers
9. 16x2 LCD Display - 10 Numbers
10. PIR Sensor - 10 Numbers

11. Buzzer - 10 Numbers
12. IR Sensor - 10 Numbers
13. LDR - 10 Numbers
14. LM35 Temperature Sensor- 10 Numbers
15. 5V DC Relay - 10 Numbers
16. Mini Bread Board - 10 Numbers
17. Jumper Wires
18. Data Cables - 10 Numbers

BOARD PRACTICAL EXAMINATIONPART - A

1. Creating different LED patterns and controlling them with push button switches usingArduino.
2. Controlling servo motor based on the input from Joystick or PIR or IR sensor usingArduino.
3. Calculate the distance to an object with the help of ultrasonic sensor and display iton an LCD using Arduino.
4. Build a basic burglar alert security system with the help of PIR or IR sensor and Buzzer/LED Pattern using Arduino.
5. Create automated LED light control based on the input from LDR using Arduino.

PART - B

6. Upload the temperature data from LM35 sensor to ThingSpeak cloud with Node MCU/Raspberry Pi.
7. Automatic streetlight simulation with Wokwi and ThingSpeak.
8. Create your first thing using ditto.
9. Query an existing thing using ditto.
10. Connect an Arduino based device to Eclipse ditto.

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

52540	COMPUTER HARDWARE AND NETWORKING	L	T	P	C
Practicum		1	0	4	3

Rationale

The course aims at making the students familiar with various parts of computers andknow the different types of peripherals. They will learn to assemble and repair desktop PC with all its internal components. Students will able to install different types of operating system and all other application software, customization of OS, updating device driver, setting firewall security, junk file removal, data backup and data recovery techniques. The students will learn to setup and configure networking system using various network devices using crimping, punching, setting IP addressing techniques. They are able to share and control resource and internet connection over network. They learn to secure networking system from different types of attacks.

Course Objectives

The objective of this course is to enable the student to

1. Identify the hardware components, assembling a computer, install and configure peripheral device.
2. Install Windows Server OS
3. Do Network Cabling and IP Configuration, Testing
4. Configure DNS Server & AD
5. Configure Web Server, FTP Server, SMTP Server.

Course Outcome

On completion of the following exercises, the students must be able to

CO1: Identify the hardware components, assembling a computer, Install and configurePeripheral device.

CO2: Install Windows Server OS

CO3: Do Network Cabling and IP Configuration, Testing

CO4: Configure DNS Server & AD

CO5: Configure Web Server, FTP Server, SMTP Server.

Pre-requisites: Nil

CO/PO Mapping

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

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

Instructional Strategy

- It is advised that teachers take steps to get pupils' attention and boost their learning confidence.
- To help students learn and appreciate numerous concepts and principles in each area, teachers should provide examples from daily life, realistic situations, and real- world engineering and technological applications.
- The demonstration can make the subject exciting and foster in the students a scientific mindset. Student activities should be planned on all the topics.
- Throughout the course, a theory-demonstrate-practice-activity strategy may be usedto ensure that learning is outcome- and employability-based.
- All demonstrations/Hand-on practices are under a simulated environment (may be followed by a real environment as far as possible).

52540	COMPUTER HARDWARE AND NETWORKING	L	T	P	C
Practicum		1	0	4	3

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52540	COMPUTER HARDWARE AND NETWORKING	L	T	P	C
Practicum		1	0	4	3

Unit I	COMPUTER HARDWARE	
Introduction: Hardware, Software and Firmware. Mother board Components, SMPS: Principles of Operation and block diagram of ATX Power supply, Connector Specifications. Processors, Memory: Introduction-Main Memory, Cache memory Secondary Storage: Hard Disk – SSD- Format, Partition I/O devices and interface Keyboard-Mouse-Printers-Scanner-Displays Graphic Cards		4
Ex.No	Name of the Experiment	
1	Assemble and disassembling a computer & Troubleshooting (Study Experiment). Hard Disk/SSD a) Partition and Format. b) Scan Disk, Disk Cleanup, Disk De-Fragmentation	6
Unit II	**OPERATING SYSTEM & PERIPHERAL DEVICE INSTALLATION**	
Operating System-Server OS Installation, User Creation, Disk Cleaning, Defragmentation .Peripheral device (Scanner, Web cam, and bio-metric) Installation & Updating of Device Driver Software.		2
Ex.No	Name of the Experiment	
2	Install and configure any one device (Printer, Scanner, Web cam, bio-metric device) with system and troubleshoot the problems.	6
3	Windows Server OS installation	6
Unit III	**ADMINISTERING WINDOWS SERVER**	
Active directory- Use of AD-Installation & Configuration of AD, Domain Name Service Use of DNS-Installation & Configuration of DNS. Web Server - Installation& Configuration of IIS web Server –HTTP Protocol Usage. FTP Server - Installation & Configuration of FTP Server-FTP Protocol Usage .SMTP Server - Installation & Configuration of SMTP Server		3

Ex.No	Name of the Experiment	
4	Installation and configuration of DNS Server	6
5	Installation and configuration of DHCP Server	6
6	Installation and Configuration of any one of Service (Telnet, FTP Server, Web Server)	6
Unit IV	**NETWORK DEVICES**	
Network Devices: Cable, Cable Crimping (Cross, Straight Through Cabling), Switch -Features and concepts of Switches – Routers (Wired and Wireless) – Gateways. IP Addressing: Dotted Decimal Notation – Subnetting & Supernetting, Data backup and data recovery, Firewall, VPN		6
Ex.No	Name of the Experiment	
7	Practice the following cabling works in a network. a) Cable Crimping b) Standard Cabling c) Cross Cabling d) Testing the Crimped cable using a Cable tester	6
8	Create a Network topology using any network simulation software.	6
9	IP Configuration & Testing a) Configure Host IP, Subnet Mask and Default Gateway in a system in LAN (TCP/IP Configuration). b) Configure Internet connection and use IPCONFIG, PING /Tracert and Netstat utilities to Debug the Network issues.	6
10.	Data Backup & Network Security a. Create and configure user accounts (Administrative and Standard) in Windows. b. Create automated backups to ensure no data loss & you always have a recent backup c. Create rules on firewall to allow clients to connect to the Server Service	6
	TOTAL PERIODS	**75**

Suggested List of Students Activity

I. PC Assembling, Troubleshooting of Hardware effects using indicators.

ii. OS installation & Configuration in Server and Client

iii. Printer, Scanner, Biometric, Camera Installation and Configuration

iv. Usage of various networking tools

Textbook for Reference:

- D.Balasubramanian ,Computer Installation And Servicing ,Second Edition, Tata Mc-Graw Hill, New Delhi 2010
- Behrouza.Forouzan , Data Communication and Networking, 4th Edition, Tata Mc-GrawHill, New Delhi,2017.
- Andrew S. Tanenbaum, David J. Wetherall ,Computer Networks, Fifth Edition,Pearson,2010

Website links for reference:

- https://epathshala.nic.in/process.php?id=students&type=eTextbooks&ln=en
- https://www.edx.org/learn/computer-hardware
- https://www.simplilearn.com/ccna-200-301-network-fundamentals-course-skillup
- https://rajshaladarpan.nic.in/sd4/home/public2/VocationalSchool/Textbook/

Equipment / Facilities required to conduct the Practical PortionLIST

OF EQUIPMENTS

Hardware Requirements:

Desktop Systems, Laser Printer, Web camera,Biometric

Device, Scanner, Crimping Tool, Screwdriver set,

Network Cables, Switch,

Router, Cable, Cable Tester, RJ45

Software Requirements:

Windows server OS, Oracle Virtual Box, Windows OS(Host System),Simulation

Software (GNS3/ Cisco Packet Tracer)

Board Practical Examination
PART – A

1. Hard Disk/SSD
   a) Partition and Format.
   b) Scan Disk, Disk Cleanup, Disk De-Fragmentation
2. Install and configure any one device (Printer, Scanner, Webcam, Bio-metricdevice) with system and troubleshoot the problems.
3. Server OS installation
4. Installation and configuration of DNS Server
5. Installation and configuration of DHCP Server

PART – B

6. Installation and Configuration of any one of Service (Telnet, FTP Server, Web Server)
7. Practice the following cabling works in a network
   a) Cable Crimping b) Standard Cabling
   c) Cross Cabling d) Testing the Crimped cable using a Cable tester
8. Create a Network topology using any network simulation software. 9.IP Configuration & Testing
   a) Configure Host IP, Subnet Mask and Default Gateway in a system inLAN (TCP/IP Configuration).
   b) Configure Internet connection and use IPCONFIG, PING / Tracert andNetstat utilities to Debug the Network issues.
10. Data Backup & Network Security
    a. Create and configure user accounts (Administrative and Standard) in Windows.
    b. Create automated backups to ensure no data loss & you always have a recent backup
    c. Create rules on firewall to allow clients to connect to the Server Service

SCHEME OF VALUATION		
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

52551	DATA ANALYTICS	L	T	P	C
Practicum		1	0	4	3

Introduction

Being able to do the basics data analysis with Python to build and evaluate data models which includes collecting and importing data, cleaning & preparing data, summarizing & visualization data, building machine learning regression models with python inbuild libraries.**Course Objectives**

The objective of this course is to enable the student to

1. Introduce the data analytics process and its applications.
2. Explore the python's sequence data structures and functional programming for data analytics.
3. Apply the functionality of python's package Pandas to import, clean and analyze data frommultiple sources.
4. Create data visualizations with Python library – pyplot.
5. Model and interpret data using Python library – scikit-learn.

Course Outcomes

After successful completion of this course, the students should be able toCO1:

Demonstrate the process involved in data analytics.

CO2: Experiment the basic data analytics with python's sequence data structures & functional programming.

CO3: Import, clean and analyze data from multiple sources using python library pandaCO4:

Create data visualizations with Python library – pyplot.

CO5: Model and interpret data using Python library – scikit-learn.

Pre-requisites

Python Programming, Data Structures Using Python.

CO/PO Mapping

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

52551	DATA ANALYTICS	L	T	P	C
Practicum		1	0	4	3

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52551	DATA ANALYTICS	L	T	P	C
Practicum		1	0	4	3

Unit I	INTRODUCTION TO DATA ANALYTICS AND PYTHON	
Define Data, Types of Data, Data Analytics, - Data Analysis Vs Data Analytics, Data Analysis Process, Quantitative and Qualitative analysis, Application of Data Analysis: Prediction and recommendation. Python functional programming: map, filter, reduce, lamda, list comprehension.		4
Ex No 1: Write a python program to double the elements in list using map function and to find the sum of elements of a list using reduce functions. **Ex No 2**: Write a python program to filter only even numbers in the list using filter function and to create a list of squares of the elements of using list comprehension.		12
Unit II	**DATA LOADING AND CLEANING**	
Data loading, Panda's data structures: Data Frame- Creating a data frame from dictionary, loading a CSV file into a data frame. Methods of data frame: head (), tail (), shape (), column (), describe (). Data Cleaning: Handling missing data: Filtering out missing data, filling in missing data, Data Transformation: Removing duplicates, Replacing values.		4
Ex No 3: Load a CSV file into a Pandas data frame and print the first five rows, shape of the dataset, and column names and their types. **Ex No 4:** Load a data into a Pandas data frame, list out number of missing values in each column and fill the null values with suitable default value. **Ex No 5:** Load a dataset into a Pandas data frame, find and remove duplicate rows and rename indexes (Column name).		18
Unit III	**DATA ANALYSIS**	
Introduction to static analysis -Basic static analysis using describe function. Correlation Analysis of feature, Introduction to Seaborn, Correlation analysis using Heat map.		3
Ex No 6: Load a dataset into a data frame, drop the non- numeric columns and list out the basic static analysis of each column. **Ex No 7:** Load a dataset into a data frame, find correlation matrix and plot the heat map to find highly correlated feature of the target feature.		12

Unit IV	DATA VISUALIZATION AND PREDICTION.	
Machine Learning Models: Linear Regression-Estimation, Logistic Regression - Classification. Introduction to Modelling Library – Scikit learn: Training Dataset, Testing Dataset, predicting target variable based on feature variable.		4
Ex No 8: Load a pre-cleaned dataset into a data frame, plot the values of feature and target variables using scatterplot to visualize their relation. **Ex No 9:** Visualize a pre-cleaned dataset to detect an outliner and filter out them. **Ex No 10:** Train the sklearn linear model with a pre-cleaned dataset using fit function and predict the target variable.		18
	TOTAL PERIODS	**75**

Suggested List of Students Activity

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

Sample CSV file Source:

1. https://www.kaggle.com/datasets/kunwarakash/chennai-housing-sales-price
2. https://www.kaggle.com/datasets/arshid/iris-flower-dataset
3. https://www.kaggle.com/datasets/ruchi798/housing-prices-in-metropolitan-areas-of- india

Textbook for Reference:

- Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
- Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy,andIPython, O'REILLY 2018, Second Edition.
- Jake Vanderplas, Python Data Science Handbook, Essential tool for working withdata, First Edition, O'Reilly Media, Inc,2017.

Website links for reference:

- https://www.kaggle.com/code/kumudadk/introduction-to-machine-learning#pandas
- https://www.kaggle.com/code/doukanelik/missing-values
- https://www.kaggle.com/code/shtrausslearning/bayesian-regression-house-price-prediction#2-I-DATA-PREPARATION
- https://www.kaggle.com/code/sukethae/housing-prices-prediction-in-hyderabad-india
- https://www.kaggle.com/code/mahnazarjmand/clustring-model-on-iris-dataset/input
- https://www.kaggle.com/code/pythonafroz/titanic-survival-prediction-with-11-algorithm.

Equipment / Facilities required to conduct the Practical Portion

1. Hardware Requirement:

- Desktop Computers / Laptop
- Printer

2. Software Requirement:

- Windows / Linux Operating System
- Python IDLE /Spyder.

BOARD PRACTICAL EXAMINATION

PART – A

Ex No 1: Write a python program to double the elements in list using map function.

Ex No 2: Write a python program to filter only even numbers in the list using filter function. **Ex No 3:** Load a CSV file into a Pandas data frame and print the first five rows, shape of the dataset, and column names and their types.

Ex No 4: Load a data into a Pandas data frame, list out number of missing values in eachcolumn and fill the null values with suitable default value.

Ex No 5: Load a dataset into a Pandas data frame, find and remove duplicate rows andrename indexes (Column name).

PART – B

Ex No 6: Load a dataset into a data frame, drop the non- numeric columns and list out thebasic static analysis of each column.

Ex No 7: Load a dataset into a data frame, find correlation matrix and plot the heat map tofind highly correlated feature of the target feature.

Ex No 8: Load a pre-cleaned dataset into a data frame, plot the values of feature and targetvariables using scatterplot to visualize their relation.

Ex No 9: Visualize a pre-cleaned dataset to detect an outliner and filter out them.

Ex No 10: Train the sklearn linear model with a pre-cleaned dataset using fit function andpredict the target variable.

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

52552	MOBILE COMPUTING	L	T	P	C
Practicum		1	0	4	3

Introduction:

This course introduces computer engineering students to the fundamental principles,theories, and practical aspects of mobile computing. Through a combination of theoretical lectures and hands-on practical exercises, students will gain a comprehensive understanding of mobile computing concepts and technologies.

Course Objectives:

- To learn the basics of wireless communication and cellular networks.
- To study the popular cellular networking technologies.
- To explore various protocols that support mobility at network layer and transportlayer.
  The students should be able to simulate various network topologies with different routing algorithms and they can analyze how each routing algorithm isperforming its job.

Course Outcomes:

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

CO1: To explore various modulation techniques, multiplexing techniques and familiarize with wireless LAN technologies including IEEE 802.11, HIPERLAN, and Bluetooth.

CO2: To understand the evolution and concepts of cellular communication explore the practical issues of mobile computing using network simulation tools.

CO3: To analyse and compare different ad hoc routing protocols.

CO4: To identify the limitations of traditional TCP and understand various TCP improvements and their benefits.

CO5: To understand mobile computing platforms and explore network simulators and programming platforms for mobile applications.

Pre-requisites:

A background in computer networks is required.

CO/PO Mapping

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

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

Instructional Strategy:

- Combination of lectures, practical exercises, and simulations to reinforce theoretical concepts.
- Emphasis on hands-on experience with network simulators and programming platforms to enhance understanding and skills in mobile communication technologies.
- 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 ofdiscrepancies.
- 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.

52552	MOBILE COMPUTING	L	T	P	C
Practicum		1	0	4	3

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52552	MOBILE COMPUTING	L	T	P	C
Practicum		1	0	4	3

UNIT I WIRELESS COMMUNICATION AND WIRELESS NETWORKS	
Challenges of Wireless Transmission - Multi-carrier modulation - Spread Spectrum - Satellite Communication - Broadcast systems - Multiplexing - FDMA, TDMA and CDMA. Duplexing Techniques: FDD, TDD. Wireless LAN – Infrared Vs Radio Transmission – Infrastructure Networks – IEEE 802.11 – HIPERLAN – Bluetooth – Wireless ATM.	5
Practical Exercises * 1. Installation of Network Simulator (Eg.NS2) 2. Implementation of Bluetooth network (transfer a file from one device to another). 3. Implement a basic function of Code Division Multiple Access (CDMA).	18
UNIT II CELLULAR COMMUNICATION	
Cellular Communication – Tessellation, Frequency Reuse and Handoff – Evolution of cellular communication systems: 1G, 2G, 3G, 4G and 5G. Overview of GSM - GPRS Network - UMTS and IMT 2000 - Packet Switching Domain - Core Network - Radio Access Network - LTE - Control Plane - User Plane.	5
Practical Exercises * 4. Simulate authentication and encryption techniques used in GSM and analyze their performance. 5. Illustration of Hidden Terminal Problem using Network Simulator.	12
UNIT III MOBILE NETWORK LAYER	
Mobile IP - Mobility features in IPv6 - Proactive and reactive ad hoc routing protocols - DSDV, DSR and AODV.	5
Practical Exercises * 6. Simulate the Distance Vector Routing Algorithm and Analyze the performance metrics such as throughput, packet drop rate etc. 7. Simulate AODV Protocol.	12
UNIT IV MOBILE TRANSPORT LAYER	
Traditional TCP - Limitations of Traditional TCP - TCP improvements for Wireless Networks – Indirect TCP, Snoop TCP, Mobile TCP – Fast Retransmit/ Fast Recovery – Transmission/ Timeout Freezing – Selective Retransmission – Transaction Oriented TCP.	**5**

Practical Exercises * 8. Create a mobile chatting application using TCP with a mobile client.	**6**
UNIT V MOBILE COMPUTING PLATFORM	
PDA - Device characteristics and Software components - Smart Phone - Convergence of Mobile devices - Network simulators: NS2 – GLOMOSIM – SENSIM – OPNET – Programming Platforms – J2ME – Palm OS - SYMBIAN OS - Overview of other mobile Operating Systems.	**5**
Practical Exercises * 9. Set up a simple mobile network topology using a network simulator. Configure and manage mobile devices within a simulated network environment. 10. Setup & configure Wireless Access Point (AP) using Network Simulator. Analyze the Wi-Fi communication range in the presence of the access point (AP) and the base station (BS).	**12**
	75

Suggested List of Students Activity:

- Group activities challenging Network configuration.
- Performing a survey of popular mobile phones and exploring their configurationand exploring the structure and operation of a cell phone tower.
- Activities, like contest, to develop Mobile application using Network Simulator.

Textbook for Reference:

- J. Schiller, "Mobile Communication", Pearson Education, 2009.
- K. Ashoke Talukder, Roopa Yavagal, "Mobile Computing", Tata McGraw Hill, 2005
- Paul Bedell, "Cellular networks: Design and Operation – A real world Perspective",Outskirts Press, 2014.

Equipment / Facilities required to conduct the Practical Course.Hardware

Requirement:

- Desktop Computers / Laptop
- Printer

Software required:

1. Any Network Simulator

Options

- NS2
- NS3
- OMNeT++ (Objective Modular Network Testbed in C++
- Cisco Packet Tracer
- GNS3 (Graphical Network Simulator-3)

BOARD PRACTICAL EXAMINATION

PART – A

1. Installation of Network Simulator (Eg.NS2)
2. Implementation of Bluetooth network (transfer a file from one device to another).
3. Implement a basic function of Code Division Multiple Access (CDMA).
4. Simulate authentication and encryption techniques used in GSM and analyze their performance.
5. Illustration of Hidden Terminal Problem using Network Simulator.

PART – B

6. Simulate the Distance Vector Routing Algorithm and Analyze the performancemetrics such as throughput, packet drop rate etc.
7. Simulate AODV Protocol.
8. Create a mobile chatting application using TCP with a mobile client.
9. Set up a simple mobile network topology using a network simulator. Configure and manage mobile devices within a simulated network environment.
10. Setup & configure Wireless Access Point (AP) using Network Simulator. Analyze the Wi-Fi communication range in the presence of the access point (AP) and the base station (BS).

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

52553	COMPONENT BASED TECHNOLOGIES	L	T	P	C
Practicum		1	0	4	3

Introduction

NET Framework provides a number of components to create many types of applications including those for consoles, Windows, mobile and the web. This Subject uses the .NET platform as a vehicle to master component-based Technology.

Course Objectives

The objective of this course is to enable the student to

- Develop simple applications using .NET
- Understand the concepts of event handlers,Windows Form Based Application.
- Access SQL database by using ADO.NET
- Create web pages using ASP.NET
- Create Web Service Using ASP.NET
- Develop XML database handling methodologies

Course Outcomes

After successful completion of this course, the students should be able toCO1:
Develop simple applications using .NET
CO2: Understand the concepts of event handlers, Windows Form Based Application.CO3: Access SQL database by using ADO.NET
CO4: Create Web Pages, Web Service Using ASP.NETCO5:
Develop XML database handling methodologies **Pre-requisites: Nil**

CO/PO Mapping

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

52553	COMPONENT BASED TECHNOLOGIES	L	T	P	C
Practicum		1	0	4	3

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52553	COMPONENT BASED TECHNOLOGIES	L	T	P	C
Practicum		1	0	4	3

Unit I	Introduction to C#.NET	
INTRODUCTION TO C#.NET Variables and constants–data types– declaration. Operators– types– precedence –Expressions – Program flow – Decision statements – if ... then, if...then…else, switch… Case, Loop statements– while, do...while, for. Next, for…each. Next,Array, Classes & objects – Creating and using your own classes – Data membersand member methods – Instantiate an object, abstract class – static class Windows programming–Creating windows Forms-Working with Toolbox Controls &Advanced Controls – Events-Menus and Dialog Boxes		5
Exercise 1. Accept a character from console and check the case of the character. 2. Develop a menu-based application to implement a text editor with cut, copy, paste, save and close operations with accessing and shortcut keys.		12
Unit II	**Introduction to ASP.NET**	
Basics of web development with ASP.NET-Introduction to web forms and controls-Creating a simple ASP.NET web application **ASP.NET Web Forms and State Management** Working with web controls and server controls-State management techniques (view state, session, cookies) **Introduction to Web Services in .NET** Basics of web services and their importance-Creating and consuming web services in ASP.NET-SOAP and RESTful web services in .NET		4
Exercise 3. Develop a web application to input data through a web form to a database and validate the data. Use the Required Field Validator and Range Validator Controls. 4. Implement state management techniques such as view state, session, and cookies in an ASP.NET web application. 5. Create a simple SOAP or RESTful web service in ASP.NET and consume it in a client application.		18

Unit III	Introduction to ADO.NET	
Basics of database programming with ADO.NET-Connecting to a database using ADO.NET-Executing SQL queries and retrieving data -Stored Procedure **Advanced ADO.NET Programming** Working with disconnected data-Using Data Sets and Data Adapters-Handling concurrency and transactions in ADO.NET **Data Binding in ASP.NET** Data binding concepts-Binding data to web controls-Displaying database data in ASP.NET web forms		4
Exercise 6. Connect to a database using ADO.NET and retrieve data using SQL queries. 7. Create an ADO.Net application using Stored Procedure 8. Bind data from a database to web controls in an ASP.NET web form.		18
UNIT IV	**Working with XML in .NET**	
Introduction to XML- Construction of an XML document -: XML Serialization in the .NET Framework		2
Exercise 9. Develop a Window application to read an XML document containing subject, mark scored, year of passing into a Dataset 10. Develop a Window application to read students records from Database using ADO.NET and generate XML document containing students' records		12
TOTAL PERIODS		**75**

Suggested List of Students Activity

i. Creation of a Standalone .NET Application

ii. Creation of a Website.

iii. Creating a Web Service.

Textbook for Reference:

- Andrew Stellman , Jennifer Greene, Head First C#: A Learner's Guide to Real-World Programming with C#, XAML, and .NET, Third edition , O'Reilly ,2013
- Imar Spaanjaars , Beginning ASP.NET 4.5.1: in C# and VB, 1st Edition,Wrox,2014
- Tim Patrick, Microsoft ADO.NET 4 Step by Step, 1st Edition Prentice Hall India, 2010

Website links for reference:

- https://www.w3schools.com/asp/
- https://learn.microsoft.com/en-us/dotnet/framework/data/
- https://www.tutorialspoint.com/xml/index.htm
- https://learn.microsoft.com/en-us/sql/
- https://learn.microsoft.com/en-us/dotnet/framework/wcf/

Equipment / Facilities required to conduct the Practical Portion

Hardware Requirement

1. Desktop Computer/Laptop

Software Requirement

1.Microsoft Visual Studio IDE

BOARD PRACTICAL EXAMINATION

PART – A

1. Accept a character from console and check the case of the character.
2. Develop a menu-based application to implement a text editor with cut, copy, paste, saveand close operations with accessing and shortcut keys.
3. Develop a web application to input data through a web form to a database and validatethe data. Use the Required Field Validator and Range Validator Controls.
4. Implement state management techniques such as view state, session, and cookies in anASP.NET web application.
5. Create a simple SOAP or RESTful web service in ASP.NET and consume it in a client application.

PART – B

6. Connect to a database using ADO.NET and retrieve data using SQL queries.
7. Create an ADO.Net application using Stored Procedure
8. Bind data from a database to web controls in an ASP.NET web form.
9. Develop a Window application to read an XML document containing subject, mark scored,year of passing into a Dataset
10. Develop a Window application to read students records from Database using ADO.NETand generate XML document containing students' records

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

52554	MULTIMEDIA SYSTEMS	L	T	P	C
Practicum		1	0	4	3

Rationale

Multimedia application is the combined use of text, images, graphics, animation and video which can be used for business, education and entertainment. This practicum course prepares students to use digital multimedia for communication, creativity, collaboration andcritical thinking. It also enables the students to implement their creativity to produce variety of multimedia objects using different multimedia software tools.

Course Objectives

The objective of this course is to

- Understand the basic concepts of multimedia systems
- Introduce various aspects of multimedia components like Images, audio, video,graphics and animation.
- Gain knowledge on Image, audio and video editing software tools
- Provide hands-on experience through a series of practical skill building tasks and exercises.
- Develop multimedia applications using various tools

Course Outcomes

After successful completion of this course, the students should be able toCO1: Analyze the key components of multimedia systems

CO2: Design an image and edit images using image editing toolsCO3: Apply audio and video editing using different editing tools CO4: Create an animation using animation tools

CO5: Apply acquired knowledge in the relevant field for the good cause

CO/PO Mapping

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

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

Instructional Strategy

- Engage and Motivate: Instructors should actively engage students to boost theirlearning confidence.
- Real-World Relevance: Incorporate relatable, real-life examples and engineeringapplications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities foran engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice-activity strategy throughout the course to ensure outcome-driven learning and employability.
- In addition to traditional lecture method, different types of teaching methods andmedia are to be employed to develop the outcome.
- Guide students to create multimedia objects and applying it in relevant application

52554	MULTIMEDIA SYSTEMS	L	T	P	C
Practicum		1	0	4	3

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52554	MULTIMEDIA SYSTEMS	L	T	P	C
Practicum		1	0	4	3

UNIT I	INTRODUCTION TO MULTIMEDIA	
Definition of Multimedia, Multimedia applications, Multimedia elements, Transition from conventional media to digital media, Delivering of Multimedia product, copy rights.		3
UNIT II	**TEXT**	
Usage of text in multimedia, Fonts and Faces, Hypermedia documents and Hypertext, Hypermedia Structures, Hypertext Tools, Text Editing and Word Processing Tools, OCR Software.		3
Ex.No	Name of the Experiment	
1	Design a poster with different text effects using suitable software	6
UNIT III	**IMAGES**	
Introduction to image, Making Still Images, Image editing tools, Color: Understanding Natural Light and Color, Color models, Color Palettes, Dithering, 2D graphics, Image compression and file formats: GIF, JPEG, JPG, PNG, TIFF, EXIF, PS, PDF.		3
Ex.No	Name of the Experiment	
2	Convert the given image into pencil sketch using suitable photo editing software.	18
3	Create a two or more partial scanned images of large poster/photo. Create a panoramic view of multiple photos by stitching together them using any panorama software.	
4	Using photo editor software and/or GIF creator software create an animation such as a flying balloon.	
UNIT IV	**SOUND**	
Digital Audio, Making Digital Audio Files, MIDI Audio, MIDI vs Digital Audio, Adding Sound to Your Multimedia Project, Audio Recording, Audio file formats, Sound Editing Tools, sound synthesis.		3

Ex.No	Name of the Experiment	
5	Use suitable software to (a) compress / decompress audio files. (b) convert audio to different formats (c) split, join, rip audio.	12
6	Use an audio processing software and perform the audio editing tasks– Import audio, select and edit the sound, create fade-in fade-out effects, label audio segments, use noise remove filter, mix audio, change stereo to mono tracks, export audio to different format and save.	
UNIT V	**VIDEO & ANIMATION**	
Video basics - How video works, Analog Video, Digital Video, Video file formats, Shooting and Editing Video. Principle of animations, animation techniques, animation file formats. Basics of multimedia authoring.		3
Ex.No	Name of the Experiment	
7	Use a video processing software to perform – Trim video clips, crop video, rotate video, join video, add subtitles, edit video dimension, bit rate, frame rate, sample rate, channel, and video/audio quality tasks on a video.	24
8	Create a movie from video clips to demonstrate audio-video mixing, music, video effects, video transitions and titles.	
9	Sketching of cartoon characters using suitable software	
10	Create a 2D animation of an aero plane take off using suitable software.	
TOTAL PERIODS		**75**

Suggested List of Students Activity

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

Textbook for Reference:

- Ze- Nian Li and M.S. Drew, Fundamental of Multimedia, Second Edition, Pearson Education, 2014.
- Tay Vaughan, Multimedia: Making It Work, Ninth Edition, Tata-McGrawHill, 2014.

Website links for reference:

- https://helpx.adobe.com/in/photoshop/using/tools.html

Equipment / Facilities required to conduct the Practical Portion

1. **Hardware Requirement:**
    - Desktop Computers
    - Printer
2. **Software Requirement:**
    1. Windows / Linux Operating System
    2. Software tools: open-source software or commercial software. The following list is a suggestive list of open-source software and their commercial replacement. Experiments may be done using either opens-source or commercial software. open-source software is preferred.

List of Software's

1. 2D Graphics and Animation
    a) Open-Source: OpenToonz, Pencil2D, Blender, Powtoon
    b) Commercial software: Adobe Flash
2. Audio Players
    a) Open-Source: CoolPlayer, MPC-HC, Zing 4g Mp3 Player
    b) Commercial software: Windows Media Player
3. Audio Recorders and Editors
    a) Open-Source: Audacity, Traverso, Qtractor,Frinika
    b) Commercial: Sonar X1, ACID music studio, Adobe Audition
4. Multimedia Players
    a) Open-Source: VLC Media Player, Kodi, Mplayer, MediaPortal
    b) Commercial: Windows Media Player
5. Video Editing
    a) Open-Source: OpenShot,Shotcut, Lightworks, Cinelerra, Kdenlive
    b) Commercial: Adobe Premiere Pro CS6
6. Video File Conversion
    a) Open-Source: DVDStyler, DVD Flick, HandBrake, ffdshow
    b) Commercial: Movavi Video Converter, Zamzar, Windows MovieMaker

BOARD PRACTICAL EXAMINATION

PART - A

1. Design a poster with different text effects using suitable software
2. Convert the given image into pencil sketch using suitable photo editing software.
3. Create a two or more partial scanned images of large poster/photo. Create a panoramic view of multiple photos by stitching together them using any panorama software.
4. Using photo editor software and /or GIF creator software create an animation suchas a flying balloon.
5. Use suitable software to (a) compress / decompress audio files.(b). convert audio to different formats. (c) split, join, rip audio.

PART - B

6. Use an audio processing software and perform the audio editing tasks– Import audio, select and edit the sound, create fade-in fade-out effects, label audio segments, use noise remove filter, mix audio, change stereo to mono tracks, export audio to different format and save.
7. Use a video processing software to perform – Trim video clips, crop video, rotate video, join video, add subtitles, and edit video dimension, bit rate, frame rate, sample rate, channel, and video/audio quality tasks on a video.
8. Create a movie from video clips to demonstrate - audio-video mixing, music, video effects, video transitions, and titles.
9. Sketching of cartoon characters using suitable software
10. Create a 2D animation of an aero plane take off using suitable software.

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

52555	FULL STACK DEVELOPER	L	T	P	C
Practicum		1	0	4	3

Introduction

Being able to understand the full stack development process and develop a completewebsite by using various frontend and backend frameworks.

Course Objectives

The objective of this course is to enable the student to

1. Introduce the basic concepts of Full Stack development.
2. Explore the Frontend frameworks - Bootstrap and AngularJS.
3. Develop a website with front-end development languages and tools such as HTML,CSS, JavaScript, React, and Bootstrap.
4. Create a backend for the website with Django.

Course Outcomes

After successful completion of this course, the students should be able toCO1:

Describe the Web Application Development Ecosystem.

CO2: Develop and host the website in the localhost.

CO3: Experiment the Frontend frameworks –Bootrap, AngularJS, ReactJSCO4:

Development of Database for a website using Django.

CO5: Connect the Front end of database with the backend.

Pre-requisites

Web Designing and Scripting Languages.

CO/PO Mapping

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

52555	FULL STACK DEVELOPER	L	T	P	C
Practicum		1	0	4	3

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52555	FULL STACK DEVELOPER	L	T	P	C
Practicum		1	0	4	3

Unit I	INTRODUCTION TO FULL STACK DEVELOPMENT	
Introduction: Roles and Responsibilities of a full stack developer, Overview of Front -end Technologies: HTML5, CSS and JavaScript, HTML5: Semantic Elements - <article> , <figure>, <footer>, <header>, <main>, <nav>, <section>, Form Creation. JavaScript: Validation of inputs.		3
Ex No: 1 Design a webpage with header, footer and navigation sections using appropriate semantic elements of HTML5. **Ex No: 2** Design a Sign-up page for a website which would accept only numerical values in the phone number field and password of minimum length 8 using HTML5 and JavaScript.		12
Unit II	**FRONT END FRAMEWORK: BOOTSTRAP**	
Introduction of Framework, Download Bootstrap, or Include Bootstrap through CDN links. Bootstrap Classes: Container Classes: .container, .container-fluid. 2.Grid Classes: row, col 3. Navigation Bars: navbar-default, navbar-inverse, Navbar-right. Advanced Plugin: Scrollspy.		4
Ex No: 3 Design a web page to demonstrate the bootstrap container and grid classes. **Ex No: 4** Design a web page with navigation bar using. navbar classes. **Ex No: 5** Design a web page to demonstrate the scroll spy plugin.		18
Unit III	**JAVASCRIPT FRAMEWORK: AngularJS**	
Introduction to AngularJS: AngularJS DOM, AngularJS Events, AngularJS Forms, AngularJS Validation. AngularJS application: Dynamic List Creation: adding elements in the List, removing elements from the List.		4
Ex No: 6 Display a list in a webpage in which list elements can be dynamically added using AngularJS. **Ex No: 7** Display a list in a webpage in which list elements can be dynamically removed using AngularJS.		12
Unit IV	**BACKEND FRAMEWORK DJANGO**	
Introduction to Django Framework Concepts: Virtual Environment, Project, App,		

View, Template, Django Models. SQLite, Model Creation, Insertion, delete and update data in a Model.	4
Ex No 8: Create a Django App to display "Hello World." **Ex No 9:** Create and display a template in Django App. **EX No 10:** Create a Model in a Django app and insert data.	18
TOTAL PERIODS	**75**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments basedon 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:

- Jacob Lett, Bootstrap 4 Quick, First Edition, Bootstrap Creative, 2018.
- Ken Williamson, Learning AngularJS: A Guide to AngularJS Development, FirstEdition, O'Reilly,2015.
- Antonio Mele, Django 3 By Example: Build powerful and reliable Python webapplications from scratch, Third Edition, Packt Publishing Limited,2020.

Website links for reference:

- https://www.w3schools.com/bootstrap/
- https://www.w3schools.com/django/

Equipment / Facilities required to conduct the Practical Portion

1. **Hardware Requirement:**
    - Desktop Computers./ Laptop
    - Printer
2. **Software Requirement:**
    - Windows / Linux Operating System
    - Any Browser – Microsoft Edge/Chrome.
    - Editor – Notepad/ Notepad++
    - Server Software - WSGIServer.
    - Python IDLE /Spyder.

BOARD PRACTICAL EXAMINATION

PART – A

Ex No: 1 Design a webpage with header, footer and navigation sections using appropriatesemantic elements of HTML5.

Ex No: 2 Design a Sign-up page for a website which would accept only numerical values inthe phone number field and password of minimum length 8 using HTML5 and JavaScript. **Ex No: 3** Design a web page to demonstrate the bootstrap container and grid classes.

Ex No: 4 Design a web page with navigation bar using. navbar classes.

Ex No: 5 Design a web page to demonstrate the scroll spy plugin.

PART – B

Ex No: 6 Display a list in a webpage in which list elements can be dynamically added usingAngularJS.

Ex No: 7 Display a list in a webpage in which list elements can be dynamically removedusing AngularJS.

Ex No 8: Create a Django App to display "Hello World."

Ex No 9: Create and display a template in Django App.

EX No 10: Create a Model in a Django app and insert data.

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

52556	ROBOTIC PROCESS AUTOMATION	L	T	P	C
Practicum		1	0	4	3

Introduction

In today's digital landscape, businesses are employing automation more and more toincrease productivity, streamline operations and reduce cost. This technology revolution is being led by Remote Process Automation, or RPA, which offers powerful tools and techniques to automate repetitive tasks and workflows across various industries. This syllabus is designed to provide students with hands-on experience and comprehensive understanding of Remote Process Automation.

Course Objectives

The objective of this course is to enable the student to

- Understand the fundamentals of RPA tools, including their features and user interface.
- Master the concept of variables in UiPath, covering various variable types.
- Gain proficiency in basic programming concepts such as control flow, including if-else statements, loops, and advanced control flow structures, through hands-on experience in UiPath Studio.
- Develop skills in advanced automation techniques including recording, table extraction, selectors, and automation of Excel and PDF files using UiPath.
- Learn how to build and manipulate data tables both statically and dynamically usingUiPath, including techniques such as data scraping for dynamic table creation.

Course Outcomes

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

CO1: Download, install, and activate UiPath Studio, and gain proficiency in using thetool to develop RPA solutions.

CO2: Demonstrate a deep understanding of variables in UiPath, including their typesand management best practices, allowing them to handle data effectively within automation workflows.

CO3: Identify and apply Image, Text, and Data Tables Automation. CO4: Handle User Events and various types of Exceptions effectively.CO5: Deploy and maintain Robots efficiently.

Pre-requisites : Nil

CO/PO Mapping

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

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

Instructional Strategy

- Understanding RPA Concepts: Begin by introducing learners to the basic concepts of RPA, including its definition, benefits, and common use cases across different industries. Explain the difference between attended and unattended automation and introduce key RPA tools and platforms.
- Interactive Learning: Utilize interactive learning methods such as quizzes, polls, and group discussions to reinforce learning and promote engagement.
- Real-world Examples: Incorporate real-world examples and case studies to illustratehow RPA tools are used in various industries and scenarios. Showcasing practical applications will enhance understanding and highlight the relevance of RPA skills in the job market.
- Peer Learning: Encourage participants to exchange ideas, review each other's work, and provide constructive feedback.

52556	ROBOTIC PROCESS AUTOMATION	L	T	P	C
Practicum		1	0	4	3

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52556	ROBOTIC PROCESS AUTOMATION	L	T	P	C
Practicum		1	0	4	3

Unit I	RPA TOOL INTRODUCTION	
Theory Introduction to RPA Tools and User Interface - Overview of popular RPA tools and their features - Understanding the user interface of RPA tools. Variables: Types - Generic Value Variables - Text Variables - True or False Variables - Number Variables - Array Variables - Date and Time Variables - Data Table Variables- Naming Best Practices, and Management. **Practical** 1. Download, Install and Activate Ui-Path Studio. Learn all the basics of RPA (Variables, arguments and Control flow etc.) 2. Write a program to empty the trash folder in Gmail.		15

Unit II	BASIC PROGRAMMING CONCEPTS	
Theory Control flow concepts - If Else Statements - Loops - Advanced Control Flow - Sequences - Flowcharts - Control Flow Activities - The Assign Activity - The Delay Activity - The Do While Activity - The If Activity - The Switch Activity - The While Activity - The For Each Activity - The Break Activity. **Practical** 3. Write a program in UIPath that utilizes the If activity and Switch activity to find the smallest and largest numbers in an array. 4. Write a program in UIPath that utilizes the While activity, Do-While activity, and For-Each activity to increment an integer variable from 5 to 50 in increments of 5.		15

Unit III	ADVANCED AUTOMATION CONCEPTS & TECHNIQUES	
Theory Recording Introduction – App / Web Recording – Table Extraction – Selectors - Excel Automation: Basics, Information Retrieval in Data Tables - Data Manipulation in excel – PDF Automation: Extracting Data from PDF - Extracting a single piece of data - Anchors - Using anchors in PDF. **Practical** 5. Write a program to i) build a data table(static) ii) build a data table using data scraping (Dynamically).		21

6. Write a program to read an Excel file and creating a data table byusing data from the Excel file. 7. Write a program to demonstrate the concept of dynamic elements in UIPath selectors.		
Unit IV	**HANDLING USER EVENTS & EXCEPTION HANDLING**	
Theory Triggers: Monitoring system event triggers - Hotkey trigger - Mouse trigger - System trigger - An example of monitoring email. Exception Handling - Strategies for handling errors and exceptions - Implementing error-catching mechanisms in RPA workflows. **Practical** 8. Write a program to demonstrate email automation. (Note: use triggers and exception handling)		09
Unit V	**DEPLOYING AND MANAGING THE BOT:**	
Theory Orchestrator overview for Automation Developers – Working with Orchestrator Resources. Managing packages - Uploading packages - Deleting packages. **Practical** 9. Create an automation project in UiPath studio and publish and control the same using uipath orchestrator. 10. Write a program to demonstrate manage package, upload package and deleting package for a reusable component.		15
TOTAL HOURS		**75**

Suggested List of Students Activity

- Presentation/Seminars by students to identify and analyze a manual process in abusiness environment suitable for automation.
- Assign bot development projects to students as a group activity to automate specifictasks or processes.
- Blended learning activities to explore advanced RPA techniques and capabilities.

Textbook for Reference:

- Alok Mani Tripathi, “Learning Robotic Process Automation”, Packt Publishing, 2018
- Frank Casale, Rebecca Dilla, Heidi Jaynes, Lauren Livingston, “Introduction to Robotic Process Automation: a Primer”, Institute of Robotic Process Automation, First Edition2015.
- Richard Murdoch, Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant”, Independently Published,First Edition 2018.

Website links for reference:

- https://www.uipath.com/rpa/robotic-process-automation
- https://www.academy.uipath.com

Equipment / Facilities required to conduct the Practical Course

1. Desktop Computers.
2. UIPath Studio.

BOARD PRACTICAL EXAMINATION

PART - A

1. Download, Install and Activate Ui-Path Studio. Learn all the basics of RPA (Variables,arguments and Control flow etc.)
2. Write a program to empty the trash folder in Gmail.
3. Write a program in UIPath that utilizes the If activity and Switch activity to find the smallest and largest numbers in an array.
4. Write a program in UIPath that utilizes the While activity, Do-While activity, and For-Eachactivity to increment an integer variable from 5 to 50 in increments of 5.
5. Write a program to
   i) build a data table(static)
   ii) build a data table using data scraping (Dynamically).

PART - B

6. Write a program to read an Excel file and creating a data table byusing data from the Excel file.
7. Write a program to demonstrate the concept of dynamic elements inUIPath selectors.
8. Write a program to demonstrate email automation. (Note: use triggers and exceptionhandling)
9. Create an automation project in UiPath studio and publish and control the same usinguipath orchestrator.
10. Write a program to demonstrate manage package, upload package and deleting packagefor a reusable component

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

52560	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 withpractical 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 differentfacets 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 toCO1:

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 ofbusiness 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 – Practicum (Project)

	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 externalexaminer 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**

52560	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		9

8. Innovation Marketing 9. E-Commerce success stories (any one) 10.Role of Start-ups in Higher Education 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 whichcovers 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**

52570	INDUSTRIAL TRAINING	SUMMER VACATION	C
Project / Internship			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 areessential 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 solvepractical 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 theirfield of study.
- Supervision and Mentorship: Industry professionals guide and mentor studentsthroughout the training.
- Skill Development Workshops: Sessions on technical skills, software tools, andindustry best practices.

- Assessment and Feedback: Performance evaluations and constructive feedback tohelp students improve.

Benefits for Students

- Enhanced Employability: Practical experience makes students more attractive topotential employers.
- Confidence Building: Working in a real-world setting boosts confidence andprofessional demeanor.
- Clarified Career Goals: Exposure to various roles and responsibilities helps studentsdefine 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 anindustrial setting.

CO 5: Apply theoretical concepts learned in their coursework to practical engineeringtasks 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:

4. Monitoring and Support:
    - Regularly monitor the progress of students during their industrial training. Maintain communication with both students and industry supervisors to trackperformance and address any issues that may arise.
    - Provide ongoing support and guidance to students, offering advice on technical challenges, professional conduct, and workplace etiquette.
5. 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.
6. 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.
7. 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:

8. 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.
9. 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.

10. 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.
11. 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:

4. Learning and Engagement:

- Actively engage in all assigned tasks and projects. Seek opportunities to learnnew skills and technologies relevant to your field of study.
- Take initiative in asking questions, seeking clarification, and participating in discussions with supervisors and colleagues.

5. 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.
6. Professionalism and Communication:
    - Communicate effectively with supervisors, colleagues, and clients asrequired. Practice clear and concise verbal and written communication.
    - Demonstrate professionalism in all interactions, respecting confidentiality,and adhering to company policies and procedures.
7. 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 thatof others around you.

After Completing Industrial Training:

8. 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, andlessons learned during the training period.
9. 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 futurecareer opportunities.
10. 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 arecord 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 ofindustrial 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

SEMESTER VI

52611	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 engineeringproblems.
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 toCO1:
Find eigenvalues and corresponding eigenvectors of a square matrix.
CO2: Apply the knowledge of partial differentiation to evaluate Jacobian and extremities oftwo 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 learningis 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 skillsamong students.
- Support and guide the students for self-study.
- State the need for mathematics with engineering studies and provide real-life examples.

52611	ADVANCED ENGINEERING MATHEMATICS	L	T	P	C
Theory		3	0	0	3

Assessment Methodology – Theory

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test	Written test	Quiz MCQ	Model Examination	Written Examination
Portion	Two units	Another Two units	Online / Offline	All units	All units
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: W**ritten 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.
- **CA1 and CA2 Question Pattern:**
  FOUR questions should be asked from each unit. Students shall write any **FIVE** questions out of **EIGHT** questions. Each question carries 10 marks each. (5 X 10 Marks = 50 Marks)
  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 20 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 × 20 Marks = 100 Marks)

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

52611 Theory	ADVANCED ENGINEERING MATHEMATICS	L	T	P	C
		3	0	0	3

Unit I	**EIGENVALUES AND EIGENVECTORS**	
	Characteristic equation – Eigen-values of and real matrices – Eigen-vectors of 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 and are constants and the auxiliary equation has only real roots) – Complementaryfunction – 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 GeoGebragraphing calculator.
- Demonstrate solenoidal vector field and irrotational vector field using engineering applications.
- Demonstrate the applications of differential equations in solving engineeringproblems.
- 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 Equationsand Applications, Yes Dee Publishing Pvt. Ltd., 2020.
4. Duraipandian, P., & Kayalal Pachaiyappa, Vector Analysis, S Chand and CompanyLimited, 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/

52612	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 jobsand 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 selectionCO3: Familiarization of various financial and non financial schemes

CO4: Acquire various cost components to arrive pricing of the productCO5: 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.

52612	ENTREPRENEURSHIP	L	T	P	C
Theory		3	0	0	3

Assessment Methodology – Theory

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test	Written test	Quiz MCQ	Model Examination	Written Examination
Portion	Two units	Another Two units	Online / Offline	All units	All units
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: W**ritten 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.
- **CA1 and CA2 Question Pattern:**
  FOUR questions should be asked from each unit. Students shall write any **FIVE** questions out of **EIGHT** questions. Each question carries 10 marks each. (5 X 10 Marks = 50 Marks)
  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 20 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 × 20 Marks = 100 Marks)

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

52612	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 Costof 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, suchas 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 PrivateLimited, Third Edition, 2013.
3. R.K. Singal, Entrepreneurship Development & Management, S K Kataria andSons, 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

52613	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. Projectmanagers 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.

52613	PROJECT MANAGEMENT	L	T	P	C
Theory		3	0	0	3

Assessment Methodology – Theory

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test	Written test	Quiz MCQ	Model Examination	Written Examination
Portion	Two units	Another Two units	Online / Offline	All units	All units
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: W**ritten 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.
- **CA1 and CA2 Question Pattern:**

  FOUR questions should be asked from each unit. Students shall write any **FIVE** questions out of **EIGHT** questions. Each question carries 10 marks each. (5 X 10 Marks = 50 Marks)

  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 20 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 × 20 Marks = 100 Marks)

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

52613	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, JohnWiley & Sons.

Website Links for Reference:

https://youtu.be/pc9nvBsXsuM

NPTEL Courses

https://youtu.be/PqQqTAu_FiM

52614	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 itcan 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 resourcesCO5:

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.

52614	FINANCE FUNDAMENTALS	L	T	P	C
Theory		3	0	0	3

Assessment Methodology – Theory

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test	Written test	Quiz MCQ	Model Examination	Written Examination
Portion	Two units	Another Two units	Online / Offline	All units	All units
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: W**ritten 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.
- **CA1 and CA2 Question Pattern:**

  FOUR questions should be asked from each unit. Students shall write any **FIVE** questions out of **EIGHT** questions. Each question carries 10 marks each. (5 X 10 Marks = 50 Marks)

  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 20 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 × 20 Marks = 100 Marks)

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

52614	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 – Conceptsof 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 projectfinancial 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-roundedopinions 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, MarghamPublications.
4. Cost Accounting by T.S.Reddy and Dr.Y.Hariprasd Reddy, Margham Publications.

52615	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 communicationsystems, including the transition from previous generations to 5G.
- Identify and explain the key features, requirements, and use cases of 5G networks invarious 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 networksthrough 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 ensuredata confidentiality, integrity, and availability.
- Develop critical thinking and problem-solving skills to address challenges andoptimize 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.

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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.

52615	5G TECHNOLOGY	L	T	P	C
Theory		3	0	0	3

Assessment Methodology – Theory

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test	Written test	Quiz MCQ	Model Examination	Written Examination
Portion	Two units	Another Two units	Online / Offline	All units	All units
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: W**ritten 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.
- **CA1 and CA2 Question Pattern:**

  FOUR questions should be asked from each unit. Students shall write any **FIVE** questions out of **EIGHT** questions. Each question carries 10 marks each. (5 X 10 Marks = 50 Marks)

  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 20 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 × 20 Marks = 100 Marks)

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

52615	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. Theyexamine 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 andtheir ability to address environmental and sustainability concerns.

Text Books for Reference:

- Afif Osseiran, Jose F Monserrat, Patrick Marsch, 5G Mobile and WirelessCommunications 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/

52616	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 tosolve 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 toCO1:

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.

52616	DEVOPS	L	T	P	C
Theory		3	0	0	3

Assessment Methodology – Theory

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test	Written test	Quiz MCQ	Model Examination	Written Examination
Portion	Two units	Another Two units	Online / Offline	All units	All units
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: W**ritten 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.
- **CA1 and CA2 Question Pattern:**

  FOUR questions should be asked from each unit. Students shall write any **FIVE** questions out of **EIGHT** questions. Each question carries 10 marks each. (5 X 10 Marks = 50 Marks)

  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 20 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 × 20 Marks = 100 Marks)

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

52616	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 developmentsbased on the course.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in thefield.

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 PublishingPlatform, 2016.
3. Mariot Tsitoara, “Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the NewDeveloper”, Second Edition, Apress, 2019.

Website Links for Reference:

1. https://www.jenkins.io/doc/tutorials/
2. https://maven.apache.org/index.html

52621	DATA SCIENCE	L	T	P	C
Practicum		1	0	4	3

Rationale:

Data science is like being a digital detective, utilizing tools and algorithms to unveil hidden patterns in raw data. This course on Data Science equips learners with the ability to understand the process of Data Science, manipulate structured and unstructured data through various tools, algorithms, and software. This course also gives the insights about statistical data analysis and python libraries for data wrangling and data visualization. Data science is often considered as the twenty-first century's most lucrative career pathway this course gains much attention. This course also introduce basic machine learning algorithms.

Course Objectives:

- To learn to describe the data for the data science process.
- To learn to describe the relationship between data.
- To utilize the Python libraries for data wrangling.
- To present and interpret data using visualization libraries in Python
- To know the basic machine learning models

Course Outcomes:

On successful completion of this course, the student will be able toCO1:

Define the data sciences and data science process CO2: Perform statistical calculation on data using python. CO3: Perform wrangling on data with python libraries

CO4: Create effective visualization of given data

CO5: Build data science applications with Support vector machines, Naive Bayes,Decision Trees and with Clustering algorithms.

Pre-requisites:-

Nil

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	-	-	-	1
CO2	3	3	3	2	-	-	2
CO3	3	3	3	3	-	-	2
CO4	3	3	3	3	-	-	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.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activities in with built0in Models in data science
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.

52621	DATA SCIENCE	L	T	P	C
Practicum		1	0	4	3

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52621	DATA SCIENCE	L	T	P	C
Practicum		1	0	4	3

Unit I	INTRODUCTIONTO DATA SCIENCE	
Theory: Data Science: Need, benefits and uses – facets of data -Data Science Process - Basics of Numpy Arrays.		3
Practical: **Ex No 1:** Create a Python List / tuple which stores the details of a student (rollno, name, dept, branch, percentage of mark) in Python and print the values. **Ex No 2**: Create the python list, convert the list and tuple as NumPy array and print its elements. Slice the NumPy array in to 3 slices and print all;		12
Unit II	**DESCRIBING DATA**	
Theory: Statistical Analysis: Mean Median, Mode, Standard Deviation, Range, Percentile. Missing value analysis - Numpy arrays : aggregations –computations on arrays, Introduction to Pandas		3
Practical: **Ex No 3:** Load your class Marklist data from a csv (comma-separated value) file into numpy array. Perform the following operations to inspect your array: Len(), ndim, size, dtype, shape, info(). **Ex No 4::** Load a data into a pandas dataframe and perform following functions on it : min(), max(), cumsum(), mean(), median(), corrcoef(), std().		12
Unit III	**PYTHON LIBRARIES FOR DATA WRANGLING**	
Theory: Data manipulation with Pandas: data indexing and selection –missing data; Data Transformation: Removing duplicates- Replacing values -aggregation and grouping.		3
Practical: **Ex No 5:** Load a data into a pandas data frame, list out number of missing values in each column and fill the missing values with suitable default value. **Ex No 6:** Load two csv file into two data frame(d1,d2), combine both the Data frame and find and remove duplicate rows and rename indexes.		12

Unit IV	DATA VISUALIZATION	
Theory: Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms - Visualization with Seaborn.		3
Practical: Iris Dataset is one of best know datasets in pattern recognition literature. This dataset contains 3 classes of 50 instances each, where each class refers to a type of iris plant. One class is linearly separable from the other 2 the latter are NOT linearly separable from each other. **Attribute Information:** • Sepal Length in cm , Sepal Width in cm • Petal Length in cm, Petal Width in cm **Class:** • Iris Setosa • Iris Versicolour • Iris Virginica **Ex No 7:**Load the Iris dataset, where observations belong to either one of three iris flower classes and visualize the average value for each feature of the Setosa iris class using a barchart with suitable linewidth and color. **Ex No 8:** Load the Iris dataset; plot all the column's relationships using a pairplot for multivariate analysis. Save the plot as JPEG file.		12
Unit V	**Machine Learning Algorithms**	
Theory: Basic Machine Learning Algorithms: Classification: Support vector machines-Naive Bayes- Decision Trees- Clustering- Confusion Matrix.		3
Practical: **Ex.no 9** : Implement the Machine learning model for clustering with Iris dataset and analyse Decision Tree. **Ex.no 10 :** Implement the Machine learning model for clustering with Iris dataset and analyse K-means Clustering.		12
TOTAL PERIODS		**75**

Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments indata science.
- online quizzes
- Blended learning activities to explore the recent trends and developments in thefield.
- Model Development

Textbook for Reference:

- Davy Cielen, Arno D.B. Meysman, Mohamed Ali, Introducing Data Science: Big Data,Machine Learning, and More, Using Python Tools,, Manning Publications, 2016.
- Allen Downey, Think Stats: Exploratory Data Analysis in Python, Second Edition,O'Reilly, 2014.
- Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, andTensorFlow, , Second Edition, O'Reilly Media, 2019.

Website links for reference:

- NPTEL Course on Foundation of Data Science https://onlinecourses.swayam2.ac.in/imb24_mg31/preview
- NPTEL Course on Python for Data Science https://onlinecourses.nptel.ac.in/noc24_cs54/preview
- https://www.kaggle.com/code/doukanelik/missing-values
- https://www.kaggle.com/code/mahnazarjmand/clustring-model-on-iris-dataset/input
- https://www.kaggle.com/datasets/saurabh00007/iriscsv/code
- IBM Data Science Professional Certificate https://www.coursera.org/professional-certificates/ibm-data-science

Equipment / Facilities required to conduct the Practical Course

Hardware Required.

1. Desktop Computers/ Laptop

Software Required.

1. Python /google colab

BOARD PRACTICAL

EXAMINATIONPART - A

Ex No 1: Create a Python List / tuple which stores the details of a student (rollno, name,dept, branch, percentage of mark) in Python and print the values.

Ex No 2: Create the python list, convert the list and tuple as NumPy array and print itselements. Slice the NumPy array in to 3 slices and print all.

Ex No 3: Load your class Marklist data from a csv (comma-separated value) file into numpy array. Perform the following operations to inspect your array: Len(), ndim, size, dtype, shape,info().

Ex No 4:: Load a data into a pandas dataframe and perform following functions on it : min(),max(), cumsum(), mean(), median(), corrcoef(), std().

Ex No 5: Load a data into a pandas data frame, list out number of missing values in each column and fill the missing values with suitable default value.

PART - B

Ex No 6: Load two csv file into two data frame(d1,d2), combine both the Data frame andfind and remove duplicate rows and rename indexes.

Ex No 7: Load the Iris dataset, where observations belong to either one of three iris flower classes and visualize the average value for each feature of the Setosa iris class using abarchart with suitable linewidth and color.

Ex No 8: Load the Iris dataset; plot all the column's relationships using a pairplot formultivariate analysis. Save the plot as JPEG file.

Ex.no 9 : Implement the Machine learning model for clustering with Iris dataset and analyseDecision Tree.

Ex.no 10 : Implement the Machine learning model for clustering with Iris dataset andanalyse K-means Clustering.

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

52622	CLOUD PLATFORM	L	T	P	C
Practicum		1	0	4	3

Rationale

This course gives a comprehensive exposure to various commercial cloud Platforms Google, Amazon and Microsoft and Open source cloud platforms Eucalyptus and OpenStack. The course introduces the latest IoT technologies in Cloud. The focus of this course is to introduce students Machine Learning, a sub-field of Artificial Intelligence, and to Cloud applications of Machine Learning. This helps the students to combine these technologies to produce innovative business solutions.

Course Objectives

The objective of this course is

1. To provide an in-depth and comprehensive knowledge of various commercial and open source cloud platforms.
2. To comprehend and apply the services offered by various cloud platforms practically.
3. To understand and apply the concept of IoT in cloud.
4. To apply Machine learning in cloud.
5. To justify, adopt and combine various cloud technologies, applications, and services to effectively manage their transition into the IT function.

Course Outcomes

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

CO1: Analyze the trade-offs between deploying applications in the cloud and over the local infrastructure.

CO2: Use and Manage Virtual Machines on AWS, Google Cloud and Azure platforms. **CO3:** Understand and apply the spectrum of Cloud computing capabilities to deploy virtual machines on Eucalyptus and Open Stack .

CO4: Learn about using hosting services, storage services, networking services, and machine learning services.

CO5: To Apply IoT in cloud and learn to combine them to cater to the practical needs of next-generation mobile devices and social media users

CO/PO Mapping

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

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

Instructional Strategy

- The teacher can use experiential learning as an instructional strategy both in andoutside the classroom.
- It may be necessary for the teacher to pre-teach the skills and processes necessaryto achieve the intended learning outcomes.
- The teacher needs to encourage students to share their thoughts so that the entireclass can benefit from individual insights.
- Teachers can encourage divergent thinking by asking students to transform ateacher guided image into several others of their own creation.

52622	CLOUD PLATFORM	L	T	P	C
Practicum		1	0	4	3

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52622	CLOUD PLATFORM	L	T	P	C
Practicum		1	0	4	3

Unit - 1	Amazon Web Services (AWS)	
AWS - Introduction - Services-Architecture-AWS Regions - Availability zones-Working with AWS- EC2 Instances -Volumes on EC2 - Elastic Block Store (EBS) - Managing data in AWS S3- AWS VPC- working with Virtual Network -Cloud Watch.		3
Ex.No.	Name of the Experiment	
1	Set up an AWS free tier account , navigate the AWS Management Console and deploying a Virtual Server (EC2 Instance) on AWS.	6
2	Host a Static Website in AWS using Amazon S3	6
Unit - 2	**Google Cloud Platform (GCP)**	
GCP-Introduction -Core Services and Products-GCP Global Infrastructure-Regions and Zones - GCP Security and Compliance-Working with Google compute engine-Managing data in Google Cloud Storage.		3
Ex.No.	Name of the Experiment	
3	Setup a GCP Account and project ,explore the GCP console and resource hierarchy and deploy a Virtual Machine (Compute Engine) on GCP.	6
4	Configure and Manage VPCs and Firewall Rules in GCP.	6
Unit - 3	**Microsoft Azure**	
Microsoft Azure Overview-Services and Solutions- Global Infrastructure and Data Centers-Identity and Access Management -Pricing and Cost Management-Working with Azure Virtual Machines and disks- Managing data in azure storage - Blob Storage -File Storage-Working with Virtual Networks.		3
Ex. No.	Name of the Experiment	
5	Create an Azure account and subscription and explore the Azure portal and resource groups. Deploy Virtual Machines (VMs) on Azure.	6

6	Implement Azure Storage Solutions: Blob Storage and File Storage.	6
Unit - 4	**IoT Cloud**	
IoT and Cloud - Architecture of IoT-Cloud - Local and Global Positioning Systems (GPS) - IoT Interactions with GPS, Clouds, and Smart Machines-Cloud services for IoT- IoT Cloud Platforms - AWS-IoT - Microsoft Azure IoT- Google IoT- Features-Working.		3
Ex. No.	Name of the Experiment	
7	Add a device to Google IoTcore and collect data in IoT core.	12
Unit - 5	**Open source Cloud and Machine learning Framework**	
Open Source Cloud - OpenStack -Introduction-Features- Architecture-Components. Cloud-Based Machine Learning Frameworks - Introduction to machine learning concepts- Azure Machine Learning Workspace - AWS Machine Learning Platform.		3
Ex. No.	Name of the Experiment	
8	Create an instance using OpenStack.	4
9	Create a Virtual Private network using openstack. Associate the instance with the VPN created.	4
10	Use any Cloud based Machine learning framework to predict the employee salary based on experience.	4
TOTAL PERIODS		**75**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developmentsbased on the course
- Micro project that shall be an extension of any practical lab exercise to real-world application

Textbook for Reference:

1. Barrie Sosinsky, Cloud Computing Bible, First Edition, Wiley-India, 2011.
2. Mark Wilkins, Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud , First Edition, Pearson Education., 2019.
3. Praveen Kukreti ,Google Cloud Platform All-In-One Guide: Get Familiar with a Portfolio of Cloud-based Services in GCP, First Edition, BPB Publications,2023.
4. Michael Collier Robin Shahan, Fundamentals of Azure Second Edition , Microsoft Press, 2019.
5. Deepak Kumar Saxena, JitendraKumar Verma , Vicente Gonzalez-Prida Diaz , ViraShendryk , Cloud IoT: Concepts, Paradigms, and Applications, First Edition, Chapman & Hall, 2022.
6. Naresh K. Sehgal , Pramod Gupta ,Introduction to Machine Learning in the Cloud with Python: Concepts and Practices ,First Edition, Cham, Switzerland : Springer 2021.

Website links for reference:

1. https://docs.aws.amazon.com/
2. https://dtcenter.org/sites/default/files/communitycode/nwp_containers/Documentation/AMS_2020/01_intro_to_cloud_and_aws.pdf
3. https://aws.amazon.com/training/classroom/architecting-on-aws/
4. https://www.techrepublic.com/resource-library/ebooks/google-cloud-platform-an-insider-s-guide-free-pdf/https://cloud.google.com/docs

Equipment / Facilities required to conduct the Practical Course

Hardware Required.

1. Desktop Computers / LAPTOP with Internet Facility
2. Printers

BOARD PRACTICAL EXAMINATION

PART – A

Ex No 1: Set up an AWS free tier account, navigate the AWS Management Console anddeploying a Virtual Server (EC2 Instance) on AWS.

Ex No 2: Host a Static Website in AWS using Amazon S3loop.

Ex No 3: Setup a GCP Account and project ,explore the GCP console and resourcehierarchy and deploy a Virtual Machine (Compute Engine) on GCP.

Ex No 4: Configure and Manage VPCs and Firewall Rules in GCP.

Ex No 5: Create an Azure account and subscription and explore the Azure portal andresource groups. Deploy Virtual Machines (VMs) on Azure

PART – B

Ex No 6: Implement Azure Storage Solutions: Blob Storage and File Storage.

Ex No 7: Add a device to Google IoTcore and collect data in oT core.

Ex No 8: Create an instance using OpenStack.

Ex No 9: Create a Virtual Private network using openstack. Associate the instance with theVPN created.

Ex No 10: Use any Cloud based Machine learning framework to predict the employee salarybased on experience.

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

52623	DATA VISUALIZATION	L	T	P	C
Practicum		1	0	4	3

Introduction:

Data visualization is one of the most powerful tools to explore, understand and communicate patterns in quantitative information. Therefore, this course is intended to introduce participants to key principles of analytic design and useful visualization techniques for the exploration and presentation of univariate and multivariate data. This course is highly applied in nature and emphasizes the practical aspects of data visualization in the data sciences. Students will learn how to evaluate data visualizationsbased on principles of data analytic, how to construct compelling visualizations using thefree statistics software(s), and how to explore and present their data with visual methods.

Course Objectives:

- To evaluate data visualizations techniques based on principles of data analytic
- To explore and present their data with visual methods
- To understand which graphical formats are useful for which types of data
- To construct compelling visualizations using the free software
- To know about recent tools and advancements in data visualization

Course Outcomes:

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

CO1: Explain the principles of effective data visualization. CO2: Gain proficiency in using data visualization tools.

CO3: Use techniques for designing and creating various types of visualizations. CO4: Develop critical thinking skills for evaluating and improving visualizations. CO5: Apply data visualization concepts to real-world datasets.

Pre-requisites: Basics of statistics

CO/PO Mapping

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

52623	DATA VISUALIZATION	L	T	P	C
Practicum		1	0	4	3

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52623	DATA VISUALIZATION	L	T	P	C
Practicum		1	0	4	3

Unit I	Introduction to Data Visualization	
Fundamentals of Data Visualization: Importance of Data Visualization - Different Types of Data Visualization- Data Visualization Process/Workflow - Advantages and Disadvantages of Data Visualization – Applications of Data Visualization - Tools and Software for Data Visualization.		3
Ex. No. 1 Installing Python and Exploring Visualization Environment, Importing and Exporting Dataset Ex. No. 2 Explore your dataset using Dataframe, info, shape, head, tail, dtypes, describe, grouping of data in python		12
Unit II	**Data Exploratory Analysis and Data Manipulation**	
Exploratory Data Analysis (EDA): Significance of EDA – Basic Steps: Data Collection- Data Understanding- Data Cleaning-Analyze Relationship -Visualizing Results- Performing EDA Using Python		6
Ex. No. 3 Extract important variables and remove useless variables from the dataset **Ex. No. 4** Identify and fill missing values within the dataset		12
Unit III	**Basic Principles of Visualization and Techniques**	
Basic Statistics behind Data Visualization: Measuring the Central Tendency of Data-Measuring Dispersion of Data- Skewness of Data-Graphic Displays of Basic Statistical Descriptions of Data. Visualizing Relationships: Scatter Plots, Line Charts. Visualizing Distributions: Histograms- Density Plots.		3
Ex. No. 5 Creating Scatter Plot, Bar Chart, Pie Chart, Pair Plot with Matplotlib **Ex. No. 6** Creating Density Plot and Histogram with ggplot		12
UNIT IV	**Advanced Visualization Techniques**	
Visualizing Categorical Data: Bar Chart-Box Plot -Frequency - Violin plot - Regression plot –Interactive Data Visualization: Plotly		3
Ex. No. 7. Plotting data using Heatmaps, Treemaps and Regression plot **Ex. No. 8.** Creating Violin Plot and Boxplot with Seaborn		12

UNIT V	Recent Trends and Ethics in Visualization	
Text Data Visualization - Visualizing Spatial Data–Time Series Data visualization. Common Mistakes in Visualization-Evaluating Visualizations.		3
Ex. No. 9. Visualization of Time Series Data. **Ex. No. 10** Visualization of Spatial Data.		12
TOTAL HOURS		**75**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developmentsbased on the course.
- Programming assignments to demonstrate visualization techniques on variousdomain like finance, healthcare etc.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in thefield.

Textbook for Reference:

1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysiswith Python", First Edition, Packt Publishing, 2020.
2. Kieran Healy, "Data Visualization: A Practical Introduction", First Edition, Princeton University Press, 2019.
3. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques", 3rd Edition, Morgan Kaufmann Publishers, 2011.

Website links for reference:

- https://egyankosh.ac.in/
- https://www.kaggle.com/code/benhamner/python-data-visualizations
- https://www.datacamp.com/tutorial/data-visualisation-tableau
- https://www.geeksforgeeks.org/data-visualization-with-python/
- https://nptel.ac.in/courses/106106212
- https://nptel.ac.in/courses/106107220

Equipment / Facilities required to conduct the Practical Portion

1. **Hardware(s) Requirement**
    - Desktop / Laptop
    - Printer

2. **Software(s) Requirement**

- Windows
- Python /Tableau / R/ Power BI

3. **Data Sources**

- https://archive.ics.uci.edu/ml/index.php
- https://www.kaggle.com
- https://toolbox.google.com
- https://data.gov.in/

Board Practical Examination

PART-A

1. Installing Python and Exploring Visualization Environment, Importing and ExportingDataset
2. Explore your dataset using Dataframe, info, shape, head, tail, dtypes, describe,grouping of data in python
3. Extract important variables and remove useless variables from the dataset
4. Identify and fill missing values within the dataset
5. Creating Scatter Plot, Bar Chart, Pie Chart, Pair Plot with Matplotlib

PART-B

6. Creating Density Plot and Histogram with ggplot
7. Plotting data using Heatmaps, Treemaps and Regression plot
8. Creating Violin Plot and Boxplot with Seaborn
9. Visualization of Time Series Data
10. Visualization of Spatial Data.

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

52624	ADVANCED DBMS	L	T	P	C
Practicum		1	0	4	3

Rationale

Advanced Database management systems contain comprehensive contents on various concepts related to Query optimization and structured , unstructured and semi structured databases. An in-depth knowledge of distributed and parallel databases isimparted during the course of study. The design and querying of spatial and temporal databases along with hands on experience is emphasized. This course includes study of XML database design and querying. Students will get a detailed introduction to the non relational databases like NoSQL and emerging databases like mobile, web and cloud databases. After learning this subject, students will be able to design and use Advanced Database Management Systems as a backend for developing realtime applications.

Course Objectives

The objective of this course is

1. To design conceptual and physical database tuning .
2. To comprehend and apply the concepts of Object, Distributed, Parallel, Spatial Temporal and XML databases.
3. To learn and apply the concepts of Multimedia and NoSql databases.
4. To understand and use the concepts of emerging database technologies like WebMobile and Cloud Databases.

Course Outcomes

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

CO1: Analyze the basics of query optimization techniques and apply it to minimize the cost.CO2: Design a Distributed database system and execute distributed queries.

CO3: Design Spatial and Temporal Database systems and implement it in correspondingapplications.

CO4: Design XML database systems and validate with XML schema

CO5: Apply NoSQL database systems and manipulate the data associated with it. Design adatabase system in Cloud and integrate it with application.

CO/PO Mapping

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

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

Instructional Strategy

- The teacher can use experiential learning as an instructional strategy both in andoutside the classroom.
- It may be necessary for the teacher to pre-teach the skills and processes necessaryto achieve the intended learning outcomes.
- The teacher needs to encourage students to share their thoughts so that the entireclass can benefit from individual insights.
- Teachers can encourage divergent thinking by asking students to transform ateacher guided image into several others of their own creation.

52624	ADVANCED DBMS	L	T	P	C
Practicum		1	0	4	3

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52624	ADVANCED DBMS	L	T	P	C
Practicum		1	0	4	3

Unit - 1	Query Optimization and Object based database Concepts	
Theory: Query optimization –Basic steps in query optimization -Query processing.--Query evaluation plans. Transaction Management concepts - Properties of Transactions.. Object Oriented Database Management System(OODBMS) - The ODMG Data Model - Applications of an OODBMS- Object Relational DBMS- Object-Relational Database Model .		3
Ex.No.	Name of the Experiment	
1	Consider the SQL query select * from employee,department where employee.dept_id = department.dept_id What evaluation plan would a query optimizer likely choose to get the least estimated cost?	4
2	Design an ORDBMS for the following schema of a Library Database: BOOK (Book_id, Title, Publisher_Name, Pub_Year) BOOK_AUTHORS (Book_id, Author_Name, Address) PUBLISHER(Name, Address, Phone) BOOK_COPIES(Book_id, Branch_id, No- of_Copies) BOOK_LENDING (Book_id, Branch_id, Card_No, Date_Out, Due_Date) . Write SQL queries to a) Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch, etc. b) Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017. c) Delete a book in BOOK table. d) Update the contents of other tables to reflect this data manipulation operation.	8

Unit - 2	Distributed and Parallel Databases	
Distributed Database Management System (DDBMS)- Definition- DDBMS Architecture, Distributed database design, Allocation, Fragmentation, Replication, query processing, transaction processing, Parallel Databases-Architecture, Data partitioning strategy, Interquery and Intraquery Parallelism –Parallel query Evaluation.		3
Ex.No.	Name of the Experiment	
3	Consider a schema that contains the following table with the key underlined: Employee (Eno, Ename, Desg, Dno). Assume that we horizontally fragment the table as follows: Employee1(Eno, Ename, Desg, Dno), where 1 <= Dno<=10, Employee2(Eno, Ename, Desg, Dno), where 11 <= Dno<=20, Employee3 (Eno, Ename, Desg, Dno), where 21 <= Dno<=30 .In addition, assume we have 4 sites that contain the following fragments: Site1 has Employee1, Site2 has Employee2, Site3 has Employee2 and Employee3, Site4 has Employee1. Add relations to the database as per your requirements. Perform the following operations: a) Create the above database. b) Insert values into the database. c) Create the specified fragments. d) Implement at least five suitable queries on Employee fragments.	12
Unit - 3	**Spatial Temporal and XML Databases**	
Spatial Databases- Definition, Types of spatial data, Querying- spatial selection, spatial join, and other set operations. Temporal Databases- Introduction, Temporal data models. Semi structured Databases--XML Databases- – XML Hierarchical Data Model - XML Schema - DTD - XPath - XQuery .		3

Ex. No.	Name of the Experiment	
4	Create a spatial database of Tamilnadu and form the following queries a) Show a list of all the names of places adjoining your location..b) List the unique town names in your region. c) Find the restaurants close to your location.. d) Find the distance between any two places in Tamilnadu.	4
5	Create the employees table and form the following SQL queries: a) Find the number of employees hired each year. b) Find the number of employees hired each month. c) Find the number of employees hired each week. d) Find the 3 most recently hired employees and what department they work in.	4
6	Write a DTD for XML documents with student data: name, address and a student_id, one or more subjects (computer science, Mechanical, Electrical, Civil etc). Write an XML document containing student data conforming to the DTD, and check it for validity. a) Write a XQuery which returns The names of all students in ascending order. b) The students who study the same subjects. c) The subjects which are studied by more than 10 students.	4
Unit - 4	**Unstructured and Non-relational Databases**	
Multimedia databases-Multimedia sources, issues and applications. NoSQL databases - CAP Theorem – Sharding- Document based – MongoDB Operation– Insert, Update, Delete, Query, Indexing, Application, Replication, Sharding– Cassandra: Data Model, Key Space, Table Operations, CRUD Operations, CQL Types.		3

Ex. No.	Name of the Experiment	
7	a) Consider a student database consisting of (Register_no, Fname, Lname, Address (Street,City, Pincode), Mobile Nos, Total Marks).	
	as data. Design the database using MongoDB and perform the following operations: i. Create the above student database. ii. Insert values into the above database. iii. Find the Students who have got Total Marks greater than 450. iv. Update the Pincode of the students who belong to a particular City. v. Delete a particular student given the Register No.	6
8	Perform the above operations using Cassandra followed by the following operations: vi Insert additional mobile numbers for a particular student. vii. Delete the street name in the address given a particular city.	6
Unit - 5	**Emerging Databases**	
Web databases -Web search engines, web search architecture Inverted indexes for web search engines, web crawling, web search statistics . Mobile Databases- Concept -Mobile Database Architecture - Modes of Operationsof Mobile Database - Transaction Model in MDS Cloud Databases- Database options in Cloud, Changing role of the DBA in the cloud- Moving your databases to the cloud.		3
Ex. No.	Name of the Experiment	
9	Provision a cloud database using AWS RDS service. Understand the setup process, configurations, and common management tasks.	6
10	Integrate your application with the cloud database. Learn how to establish a connection, perform database operations, and handle responses in your application.	6
TOTAL PERIODS		**75**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developmentsbased on the course
- Micro project that shall be an extension of any practical lab exercise to real-world application

Textbook for Reference:

1. RamezElmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", SeventhEdition, Pearson Education, 2017.
2. Raghu Ramakrishnan, Database Management Systems, ,4th edition, Mcgraw-Hill,2015 .
3. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, Tata McGraw Hill, 2019.

Website links for reference:

1. https://archive.nptel.ac.in/courses/106/105/106105175
2. https://link.springer.com/book/10.1007/3-540-57507-34.

Equipment / Facilities required to conduct the Practical Course

Hardware Required.

1. Desktop Computers/ Laptop
2. Printer

Software Required.

1. Java / Python
2. MySQL, MongoDB, Cassandra

BOARD PRACTICAL EXAMINATION

PART – A

Ex No 1: Consider the SQL query

select * from employee,department where employee.dept_id = department.dept_id What evaluation plan would a query optimizer likely choose to get the least estimated cost?

Ex No 2: Write SQL queries to

a) Retrieve details of all books in the library – id, title, name of publisher, authors, numberof copies in each branch, etc.

b) Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017.

c) Delete a book in BOOK table.

d) Update the contents of other tables to reflect this data manipulation operation.

Ex No 3:

Consider a schema that contains the following table with the key underlined: Employee(Eno, Ename, Desg, Dno). Assume that we horizontally fragment the table as follows:

Employee1(Eno, Ename, Desg, Dno), where 1 <= Dno<=10, Employee2(Eno, Ename, Desg, Dno), where 11 <= Dno<=20, Employee3 (Eno, Ename, Desg, Dno), where 21 <= Dno<=30 .In addition, assume we have 4 sites that contain the following fragments:

Site1 has Employee1, Site2 has Employee2, Site3 has Employee2 and Employee3, Site4 has Employee1. Add relations to the database as per your requirements. Perform the following operations:

a) Create the above database.

b) Insert values into the database.

c) Create the specified fragments. Implement at least five suitable queries onEmployee fragments.

Ex No 4:

Create a spatial database of Tamilnadu and form the following queries

a) Show a list of all the names of places adjoining your location..b) List the unique town names in your region.

c) Find the restaurants close to your location..

d) Find the distance between any two places in Tamilnadu.

Ex No 5:

Create the employees table and form the following SQL queries:

e) Find the number of employees hired each year.

f) Find the number of employees hired each month.

g) Find the number of employees hired each week.

Find the 3 most recently hired employees and what department they work in.

PART – B

Ex No 6:

Write a DTD for XML documents with student data: name, address and a student_id, one ormore subjects (computer science, Mechanical, Electrical, Civil etc). Write an XML document containing student data conforming to the DTD, and check it for validity.

a) Write a XQuery which returns The names of all students in ascending order.

b) The students who study the same subjects.

c) The subjects which are studied by more than 10 students.

Ex No 7:

a) Consider a student database consisting of (Register_no, Fname, Lname, Address

(Street,City, Pincode), Mobile Nos, Total Marks). as data. Design the database usingMongoDB and perform the following operations:

i. Create the above student database.

ii. Insert values into the above database.

iii. Find the Students who have got Total Marks greater than 450.

iv. Update the Pincode of the students who belong to a particular City.

v. Delete a particular student given the Register No.

Ex No 8:

Perform the above operations using Cassandra followed by the following operations:vi Insert additional mobile numbers for a particular student.

vii. Delete the street name in the address given a particular city.

Ex No 9:

Provision a cloud database using AWS RDS service. Configure and setup the commonmanagement tasks.

Ex No 10:

Integrate an application with the cloud database. Establish a connection, perform database operations, and handle responses in your application.

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

52625	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
Practicum		1	0	4	3

Rationale

This course is concerned with the development of applications on mobile and wireless computing platforms. Android will be used as a basis for teaching programming techniques. Students will work at all stages of the software development life-cycle from inception through to implementation and testing.

Course Objectives

The objective of this course is to

- To facilitate students to understand android SDK.
- To help students to gain a basic understanding of Android application development.
- To inculcate working knowledge of Android Studio development tool.
- To test Android applications.
- To deploy Android applications.

Course Outcomes

After successful completion of this course, the students should be able to CO1: Identify various concepts of mobile programming that make it unique fromprogramming for other platform.

CO2: Critique mobile applications on their design pros and cons.

CO3: Utilize rapid prototyping techniques to design and develop sophisticated mobileinterfaces.

CO4: Test Android applications.

CO5: Deploy applications to the Android marketplace for distribution.

Pre-requisites : Nil.

CO/PO Mapping

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

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 learning confidence.
- To help students learn and appreciate numerous concepts and principles in each area, teachers should provide examples from daily life, realistic situations, and real- world engineering and technological applications.
- The demonstration can make the subject exciting and foster in the students a scientific mindset. Student activities should be planned on all the topics.
- Throughout the course, a theory-demonstrate-practice-activity strategy may be used to ensure that learning is outcome- and employability-based.
- Do not let students work on an activity or an experiment with the expected outcome, rather allow students to be honest about whatever the results of the experiment are.If the results are different from the expectations, students should do an analysis where they could be the source of error, if any.

52625	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
Practicum		1	0	4	3

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52625	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
Practicum		1	0	4	3

Unit I	INTRODUCTION TO MOBILE APPLICATION DEVELOPMENT	
THEORY: Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building First Android application,		3
Ex.No	Name of the Experiment	
1	Implement “Hello World” Android example.	12
2	Develop an application that uses GUI components, Font and Colours.	
Unit II	**INTRODUCTION TO ANDRIOD**	
THEORY: Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Android Manifest File and its common settings.		3
Ex.No	Name of the Experiment	
3	Develop an application that uses Layout Managers and event listeners.	12
4	Write an application that draws basic graphical primitives on the screen.	
Unit III	**ANDROID USER INTERFACE DESIGN**	
THEORY: Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts.		3
Ex.No	Name of the Experiment	
5	Develop an application that makes use of Notification Manager.	12
6	Implement an application that writes data to the SD card.	
Unit IV	**TESTING AND MANAGING ANDROID APPLICATIONS**	
THEORY: Testing Android applications, Publishing Android application, Using Android preferences.		3
Ex.No	Name of the Experiment	
7	Develop a native application that uses GPS location information.	12
8	Develop an application for sending & receiving SMS.	

Unit V	ANDROID APIs AND DEPLOYING ANDROID APPLICATION	
THEORY: Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Using Android Networking APIs, Using Android Web and Telephony APIs, Deploying Android Application to the World.		3
Ex.No	Name of the Experiment	
9	Develop an application that makes use of SQLite databases.	12
10	Write an application that creates alarm clock.	
TOTAL PERIODS		**75**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developmentsbased on the course
- Periodic class quizzes conducted on a weekly/fortnightly based on the course
- Micro project that shall be an extension of any practical lab exercise to real-world application

Textbook for Reference:

1. Dawn Griffiths, David Griffiths, "Head First Android Development: ABrain-FriendlyGuide", 1st edition, O'Reilly, 2017.
2. John Horton, Android Programming for Beginners, 2nd edition, Packt Publishing, 2018.
3. Barry Burd, Android Application Development All-in-One For Dummies,2nd edition, For Dummies, 2020.

Website links for reference:

1. https://developer.android.com/get-started/overview
2. https://developer.android.com/courses/

Board Practical Examination

PART-A

1. Implement “Hello World” Android example.
2. Develop an application that uses GUI components, Font and Colours.
3. Develop an application that uses Layout Managers and event listeners.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of Notification Manager.

PART-B

6. Implement an application that writes data to the SD card.
7. Develop a native application that uses GPS location information.
8. Develop an application for sending & receiving SMS.
9. Develop an application that makes use of SQLite databases.
10. Write an application that creates alarm clock.

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

52626	UI AND UX DESIGN	L	T	P	C
Practicum		1	0	4	3

Introduction

User Interface (UI) and User Experience (UX) Design play key roles in the experience users have when interacting with digital products and applications. In this course, student will learn the theory and methodologies behind UI and UX design. Student will learn design their own wireframes and interactive prototypes. Learning UI and UX basics can help to student collaborate better on team projects and create new career opportunities.

Course Objectives

The objectives of this course are enabling the students

- To learn problem solving skills.
- To gain knowledge of UI and UX Design.
- To understand the concept of functions and their role in UX Design.
- To comprehend the basics of interaction structures and its importance in application development.
- To recognize the importance of visual design.

Course Outcomes

At the end of the course, students will be able

CO1: Demonstrate knowledge on UI and UX design concepts.

CO2: Develop and performing a competitive analysis in UX design**.**

CO3: Design user personas using persona UXPressia's online builder tool.

CO4: Develop interaction design and functional layout.

CO5: Creating web and mobile app applications using visual design tools.

Pre-requisites: Nil

CO/PO Mapping

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

52626	UI AND UX DESIGN	L	T	P	C
Practicum		1	0	4	3

Assessment Methodology - Practicum (Practical)

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	PART A / Cycle 1 Exercises & Two units	PART B / Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:**.The practical and written test should be conducted as per the portion above and the scheme of evaluation. Assessment written & Practical test should be conducted for 60 Marks. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
1	2 Questions will be asked from every unit and students should write any one question from each unit. (2 Questions × 10 Marks = 20 Marks)	20
2	Aim (05), Program (15)	20
3	Execution and Output	10
4	Practical Document	10
TOTAL MARKS		60

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 and the scheme of evaluation can be decided by the departments. The marks awarded should be converted to 10 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

52626	UI AND UX DESIGN	L	T	P	C
Practicum		1	0	4	3

Unit I	INTRODUCTION TO UI AND UX DESIGN	
Introduction to UI and UX Design and the Key Methodologies such as Product Design Life Cycle.		3
ExNo1: Identifying interface connectivity and establishing interface connectivity between two different program modules. **ExNo2**: Understand front end and backend interfacing and Implementation of both interfacing.		12
Unit II	**UX DESIGN**	
User Centred Design - Design Thinking - Activity Based Design - Agile Process.		3
Ex No 3: Create and performing a competitive analysis in UX design helps companies identify competitors' strengths and weaknesses relative to their own business, product, and design. **Ex No 4:** Designing a Responsive layout for a societal application		12
Unit III	**USER RESEARCH**	
Stakeholder & User Interviews - Creating Personas - Empathy Mapping -Information Architecture - Building User Journey		3
Ex No 5: Hands on Design Thinking Process for a new product. **Ex No 6:** Conduct end-to-end user research - User research, creating personas, Ideation process (User stories, Scenarios), Flow diagrams, Flow Mapping.		12
UNIT IV	**INTERACTION DESIGN**	
Ideation Methods - Interaction & Prototyping - Paper & Digital Prototyping - Designa Web / Mobile App.		3
Ex No 7: Identifying interaction design and functional layout. practical implementation of interaction design and functional layout. **Ex No 8:** Exploring various UI Interaction Patterns.		12
UNIT V	**VISUAL DESIGN**	
Web & Mobile App Design - Grid Systems - Colors Theory and Palette - Understanding Typography.		3

Ex No 9: Create Social media advertisement using online tools and applications. **Ex No 10**: Design super market special offer sales poster using online tools and applications.	12
TOTAL PERIODS	**75**

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developmentsbased 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 thefield.

Textbook for Reference:

- Tom Green, Joseph Labrecque, A Guide to UX Design and Development: Developer'sJourney Through the UX Process (Design Thinking), First Edition, APress, 2023
- Jon Yablonski, Laws of UX: Using Psychology to Design Better Products & Services,First Edition, O'Reilly, 2020.
- Donald Chesnut, Kevin P. Nichols, UX for Dummies, Frist Edition, Wiley, 2014.

Website links for reference:

- NPTEL User Interface Design: https://archive.nptel.ac.in/courses/124/107/124107008/
- MIT OpenCourseWare: https://ocw.mit.edu/courses/6-831-user-interface-design- and-implementation-spring-2011/pages/lecture-notes/

1. Hardware(s) Requirement:

- Desktop Computer /Laptop
- Printer

2. Software(s) Requirement:

- Windows / Linux Operating System

BOARD PRACTICAL EXAMINATION

PART – A

1. Identifying interface connectivity and establishing interface connectivity between two different program modules.
2. Understand front end and backend interfacing and implementation of both interfacing.
3. Create and performing a competitive analysis in UX design helps companies identify competitors' strengths and weaknesses relative to their own business, product, and design.
4. Designing a Responsive layout for a societal application.
5. Hands on Design Thinking Process for a new product.

PART – B

6. Conduct end-to-end user research - User research, creating personas, Ideation process(User stories, Scenarios), Flow diagrams, Flow Mapping.
7. Identifying interaction design and functional layout. Practical implementation ofinteraction design and functional layout.
8. Exploring various UI Interaction Patterns.
9. Create Social media advertisement using online tools and applications.
10. Design super market special offer sales poster using online tools and applications.

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

52631	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 assignedin internship.
- Demonstrate soft skills such as time management, positive attitude andcommunication 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-worldpractical applications.
- Provide hands-on experience in the industrial practices.
- Develop essential skills such as communication, organization, teamwork, andproblem-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 firsthand 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 zonesand take on new responsibilities.

- Build confidence and self-efficacy through successful completion of internshiptasks and projects.
- Give insight into the policies, regulations, and administrative practices.
- Allow interns to observe and understand the implementation of standards andpolicies 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, andcareer aspirations.
- Encourage sensitivity to the needs and backgrounds of different groups, promotinginclusive 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 andprofessional 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 theinternship 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 diaryto 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 theweek should be accounted for clearly giving attendance particulars (Presence, absence, Leave, Holidays etc.). The concern of the Industrial supervisor is to periodically check theseprogress 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 completedin 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 to60 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

52632	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 advancedtechnical 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 importanttechnical 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 careergoals.
- 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 contributionsto 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 otherrelevant 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 preparingprogress reports, writing recommendation letters, and facilitating grant applications.
- Organize and participate in workshops, seminars, and other educational events thatenhance 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 managementtools to keep track of assignments, project deadlines, and study schedules. Prioritizetasks 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 andtrends in engineering by reading industry journals, attending conferences, and takingadditional 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 forthe 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 theinternal 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

52633	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 ideasto 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 engineeringrelevant 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 Diplomaprogram. 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 goodcan be highly fulfilling and make a meaningful difference.

By carefully considering these points, Diploma Engineering students can make informeddecisions 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 thatenhance 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 andtrends in engineering by reading industry journals, attending conferences, and takingadditional 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 duringreviews

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.