



**GOVERNMENT OF TAMIL NADU
DEPARTMENT OF TECHNICAL EDUCATION**

**Diploma in Engineering and Technology
1055 - Communication and Computer Networking
Regular Curriculum**

Diploma in Communication and Computer Networking

Program Outcomes (PO's)

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

The POs essentially indicate what the students can do from subject-wise 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:

P01: Basic and Discipline-specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and an engineering specialization to solve the engineering problems.

P02: Problem analysis: Identify and analyse well-defined engineering problems using codified standard methods.

P03: 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.

P04: Engineering Tools, Experimentation, and Testing: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

P05: Engineering practices for society, sustainability and environment: Apply appropriate technology in the context of society, sustainability, environment and ethical practices.

P06: 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.

P07: Life-long learning: Ability to analyse 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	21
Semester IV	7	640	20
Semester V	8	640	21
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	1055233110	Analog and Digital Electronics	3-0-0	45	3	Theory
2	Program Core	Theory	1055233210	Computer Architecture	3-0-0	45	3	Theory
3	Program Core	Practical/Lab	1055233320	Analog and Digital Electronics Lab	0-0-4	60	2	Practical
4	Program Core	Practicum	1055233440	C Programming and Data Structures	2-0-4	90	4	Practical
5	Program Core	Practicum	1055233540	Electronics Devices and Circuits	2-0-4	90	4	Practical
6	Program Core	Practicum	1052233640	Operating Systems	1-0-2	45	2	Practical
7	Open Elective	Advanced Skill Certification	1055233760	Advanced Skills Certification - 3	1-0-2	60	2	NA
8	Humanities & Social Science	Integrated Learning Experience	1055233880	Growth Lab	0-0-2	30	0	NA
9	Audit Course	Integrated Learning Experience	1055233881	Induction Program II	-	16	0	-
10	Audit Course	Integrated Learning Experience	1055233882	I&E/ Club Activity/ Community Initiatives	-	15	0	-
11	Audit Course	Integrated Learning Experience	1055233883	Shop floor Immersion	-	8	0	-
12	Audit Course	Integrated Learning Experience	1055233884	Student-Led Initiative	-	23	0	-
13	Audit Course	Integrated Learning Experience	1055233885	Emerging Technology Seminars	-	8	0	-
14	Audit Course	Integrated Learning Experience	1055233886	Health & Wellness	-	30	1	-
	Test & Revisions					60		
	Library					15		
	Total Periods					640	21	

Semester IV

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	1055234110	Principles of Communication Engineering	4-0-0	60	4	Theory
2	Program Core	Theory	1055234210	Computer Networks	3-0-0	45	3	Theory
3	Program Core	Practicum	1052234340	Java Programming	2-0-4	90	4	Practical
4	Program Core	Practicum	1052234440	Python Programming	1-0-4	75	3	Practical
5	Program Core	Practical /Lab	1055234520	Network Lab	0-0-4	60	2	Practical
6	Program Core	Practical /Lab	1055234620	System Administration lab	0-0-4	60	2	Practical
7	Open Elective	Advanced Skill Certification	1055234760	Advanced Skills Certification-4	1-0-2	60	2	NA
8	Audit Course	Integrated Learning Experience	1055234882	I&E/ Club Activity/ Community Initiatives		15	0	
9	Audit Course	Integrated Learning Experience	1055234883	Shop floor Immersion	-	8	0	-
10	Audit Course	Integrated Learning Experience	1055234884	Student-Led Initiative	-	24	0	-
11	Audit Course	Integrated Learning Experience	1055234885	Emerging Technology Seminars	-	8	0	-
12	Audit Course	Integrated Learning Experience	1055234886	Health & Wellness	-	30	0	-
13	Audit Course	Integrated Learning Experience	1055234887	Special Interest Groups (Placement Training)	-	30	0	-
	Test and Revisions					60		
	Library					15		
	Total Periods					640	20	

Semester V

#	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	1055235110	Digital Communication	3-0-0	45	3	Theory
2	Program Elective	Theory		Elective-1	3-0-0	45	3	Theory
3	Program Core	Practicum	1055235340	Advance Computer Networking	1-0-4	75	3	Practical
4	Program Core	Practicum	1055235440	Cloud Computing	2-0-4	90	4	Practical
5	Program Elective	Practicum		Elective-2	1-0-2	45	2	Practical
6	Humanities & Social Science	Practicum	1055235640	Innovation & Startup	1-0-3	60	2	Project
7	Project / Internship	Project/Internship	1055235773	Industrial Training * [Summer Vacation - 90 Hours]		-	2	Project
8	Open Elective	Advanced Skill Certification	1055235860	Advanced Skills Certification - 5	1-0-2	60	2	NA
9	Audit Course	Integrated Learning Experience	1055234882-	I&E/ Club Activity/ Community Initiatives		30	0	
10	Audit Course	Integrated Learning Experience	1055234883	Shop floor Immersion	-	8	0	-
11	Audit Course	Integrated Learning Experience	1055234884	Student-Led Initiative	-	24	0	-
12	Audit Course	Integrated Learning Experience	1055234885-	Emerging Technology Seminars	-	8	0	-
13	Audit Course	Integrated Learning Experience	1055234886-	Health & Wellness	-	30	0	-
14	Audit Course	Integrated Learning Experience	1055234887-	Special Interest Groups	-	30	0	-
	Test and Revisions					75		
	Library					15		
	Total Periods					640	21	

Elective 1

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Elective	Theory	1055235211	Wireless Communication and standards	3-0-0	45	3	Theory
2	Program Elective	Theory	1052235212	Data Warehousing and Data Mining	3-0-0	45	3	Theory
3	Program Elective	Theory	1055235213	Cryptography	3-0-0	45	3	Theory
4	Program Elective	Theory	1055235214	Network Security	3-0-0	45	3	Theory
5	Program Elective	Theory	1052235215	Artificial Intelligence	3-0-0	45	3	Theory
6	Program Elective	Theory	1055235216	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	1055235541	Data Analytics and Data Analysis	1-0-2	45	2	Practical
2	Program Elective	Practicum	1055235542	Cellular Communication and Mobile Computing Platform	1-0-2	45	2	Practical
3	Program Elective	Practicum	1055235543	Microcontroller and its applications	1-0-2	45	2	Practical
4	Program Elective	Practicum	1055235544	Internet of Things	1-0-2	45	2	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	6000236111	Advanced Engineering Mathematics	3-0-0	45	3	Theory
2	Elective Entrepreneurship	Theory	6000236112	Entrepreneurship	3-0-0	45	3	Theory
3	Elective Technocrats	Theory	6000236113	Project Management	3-0-0	45	3	Theory
4	Elective Technocrats	Theory	6000236114	Finance Fundamentals	3-0-0	45	3	Theory
5	Elective Technologists	Theory	1052236115	5G Technology	3-0-0	45	3	Theory
6	Elective Technologists	Theory	1052236116	DevOps	3-0-0	45	3	Theory

Elective 4 (Specialization)

#	Course Category	Course Type	Course Code	Course Title	L-T-P	Period	Credit	End Exam
1	Elective	Practicum	1052236241	Data Science	1-0-4	75	3	Practical
2	Elective	Practicum	1052236242	Cloud Platform	1-0-4	75	3	Practical
3	Elective	Practicum	1052236243	Data Visualization	1-0-4	75	3	Practical
4	Elective	Practicum	1055236244	Fibre Optic Communication	1-0-4	75	3	Practical
5	Elective	Practicum	1052236245	Mobile Application Development	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	1055236351	Internship	-	540	12	Project
2	Project / Internship	Project / Internship	1055236353	Fellowship	-	540	12	Project
3	Project / Internship	Project / Internship	1055236374	In-house Project	-	540	12	Project



SEMESTER 3



1055233110	ANALOG AND DIGITAL ELECTRONICS	L	T	P	C
THEORY		3	0	0	3

Introduction

Analog and Digital Electronics is playing vital role in all engineering applications. The course has been designed to introduce fundamental principles of analog and digital electronics. The students completing this course will understand basic analog and digital electronics including operational amplifiers, analog to digital and digital to conversion techniques, combinational and sequential logic circuits and various special function ICs. The basic concepts studied in this subject will be very useful for understanding of higher level subjects in further study.

Course Objectives

- Understand the basics of Operational amplifier.
- Know the Op-Amp applications.
- Know the concept of A/D and D/A converters.
- Know the applications of Special function ICs.
- Understand various number systems used in digital circuits.
- Learn about logic gates.
- Understand the concept of karnuagh map.
- Understand the various types of flip flops and counters.
- Understand the various types of memories.

Course Outcomes

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

- CO1: Describe the functioning and implementation of Op-Amp in practical applications.
- CO2: Select and use appropriate ADC and DAC for real world applications.
- CO3: Understand the basics of digital circuits and logic circuits
- CO4: Design and implement Combinational and Sequential logic circuits.
- CO5: Understand the working of various types of memories.

Pre-requisites

Knowledge of basic electronics



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	2	2	-	-	2	1
C02	2	1	3	-	-	3	-
C03	3	3	1	-	-	1	2
C04	2	3	2	-	-	2	1
C05	1	2	2	1	-	3	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.
- **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.



1055233110	ANALOG AND DIGITAL ELECTRONICS	L	T	P	C
THEORY		3	0	0	3

Assessment Methodology

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

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

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

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

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

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

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

Question Pattern: Model Examination and End Semester Examination

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

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



1055233110	ANALOG AND DIGITAL ELECTRONICS	L	T	P	C
THEORY		3	0	0	3
Unit I	OPERATIONAL AMPLIFIERS				
Operational Amplifier: Ideal Op-Amp – Block diagram and Characteristics – Op-Amp Parameters – CMRR – Slew rate – Concept of Virtual ground – Equivalent circuit of Op-Amp. Applications of OP-AMP: Inverting Amplifier – Summing Amplifier – Non Inverting Amplifier – Voltage Follower – Comparator – Zero Crossing Detector – Integrator – Differentiator. OP-AMP Specifications: Op-Amp 741 – Pin diagram – Specifications.					9
Unit II	A/D and D/A Converters, Special Function ICs				
A/D Converter Sampling and Quantization – Analog to digital conversion using Parallel comparator method – Successive approximation method – Ramp type method – Dual slope method – Specifications of A/D converter – Examples of A/D converter ICs. D/A Converter Basic concepts – Weighted Resistor D/A converter – R-2R Ladder D/A converter – Specifications of D/A Converter – Examples of D/A converter ICs. Special Function ICs: IC 555 Timer – Pin diagram – Functional block diagram, characteristics and applications. IC 565 PLL – Pin diagram – Functional block diagram – PLL applications. IC 566 VCO – Pin diagram – Functional block diagram – Applications.					9
Unit III	Boolean Algebra and Arithmetic Operations				
Number Systems: Decimal – Binary – Octal – Hexadecimal – BCD – Conversion from one number system to other – Boolean Algebra – Basic Laws – Demorgan's Theorem. Basic Logic Gates and Universal Logic Gates: Not gate – Or gate – And Gate – Nor gate – Nand gate – Exor gate – Exnor gate. Karnaugh Map: K-map – structure for 2, 3 and 4 variables – Pairs – Quads – Octets – Simplification of Boolean expression using karnaugh map (up to 4 variable) Arithmetic Operations: Binary addition – Binary Subtraction – 1's Compliment and 2's Compliment Arithmetic Circuits: Half Adder – Full Adder – Half Subtractor – Full Subtractor					9



Unit IV	Combinational and Sequential Logic Circuits	
Combinational Logic Circuits: Parity Generator and checker – Multiplexer and De-multiplexer – Encoder and Decoder Sequential Logic Circuits: Latches – SR flip flop – JK flip flop – T flip flop – D flip flop Counters – Types – Mod N counter – 4 bit Asynchronous counter – 4 bit synchronous counter. Shift Registers – Types – Serial in Serial out.		9
Unit V	Memories	
Classification of Memories RAM: RAM Organization – Address Lines and Memory Size – Read/write operations – Static RAM – Bipolar RAM cell – Dynamic RAM – SD RAM – DDR RAM. ROM: ROM Organization – Expanding memory – PROM – EPROM – EEPROM – Flash memory – Antifuse Technology.		9
TOTAL PERIODS		45

Suggested List of Students Activity:

- Occasional Flipped classroom exercise for students for development of Presentation skills.
- Student may view video lectures from NPTEL on Analog and Digital Electronics and submit assignments on required topics.
- Presentation/Seminars by students on any recent technological developments based on the course.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.
- Group discussions will allow students to express their opinions on trending topics related to the course.

Text for Reference:

- Ramakant A. Gayakwad, Op-Amps and Linear Integrated Circuits, 4th edition, Pearson Education, 2015.
- Thomas L. Floyd, Digital Fundamentals, 11th edition, Pearson Education, 2015.
- Malvino, Albert Paul, Donald P. Leach, and G. Saha. "Digital Principles and Applications, 8th edition, McGraw Hill Education, 2014.

Web-based/Online Resources:

1. NPTEL - <https://onlinecourses.nptel.ac.in/>
2. Swayam- <https://swayam.gov.in/>



1055233210	COMPUTER ARCHITECTURE	L	T	P	C
THEORY		3	0	0	3

Introduction

Fundamental knowledge of Computer Architecture is essential for all the Engineers. It explores how machines are designed, constructed, and working. Knowing what's inside the computer and how it works will help the students to design, develop, and implement applications better, faster, more efficient, and easier to use. It also helps to know the background of internal communication of computer components and allows the programmers to write the application programs according to the Computer operation.

Course Objectives

The objective of this course is to enable the student to

- Understand the basic structure, operation and blocks of a digital computer.
- Understand the concept of various I/O interfacing, modes of transfer and use of I/O processor.
- Know about memory hierarchies and their operations.
- Learn the basics of microprocessors, parallelism and pipelined execution and also familiarize with the hazards.
- Study the different types of multi-core and multi-processors.

Course Outcomes

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

CO1: State the fundamentals of computers, their operations and analyse the execution of an Instruction.

CO2: Identify the characteristics of various types of I/O communication.

CO3: Understand the characteristics and working of various memory systems.

CO4: Analyze different types of control design and identify hazards

CO5: Analyze and apply the concepts of advanced processors and their architectures.

Pre-requisites:

- Knowledge of Basics of Computer Engineering
- Knowledge of Logic gates and Arithmetic circuits



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	1	3	-	1	1	-
C02	2	3	1	2	-	-	-
C03	2	1	2	3	-	2	2
C04	3	1	2	-	-	2	-
C05	1	-	2	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.
- **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.



1055233210	COMPUTER ARCHITECTURE	L	T	P	C
THEORY		3	0	0	3

Assessment Methodology

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

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

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

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

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

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

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

Question Pattern: Model Examination and End Semester Examination

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

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



1055233210	COMPUTER ARCHITECTURE	L	T	P	C
THEORY		3	0	0	3
Unit I	Fundamentals and Processing Unit				
Fundamentals of Computer					
Functional Units of a Digital Computer– Von Neumann Architecture - Instruction Set Architecture – Styles and features- bus structures.					3
Central processing unit					
Components of CPU- General register organization- memory stack organization - stack limits- Processor Organization - Instruction formats - Addressing modes- Instruction execution (Phases of instruction cycle) - RISC and CISC Architecture, Characteristics.					4
Control unit					
Structure of control unit– Instruction Execution - Fetch cycle, Indirect cycle, Execute cycle, Interrupt cycle, Instruction cycle - Types of control unit – Hardwired, Micro-programmed control					3
Unit II	I/O Organization				
Asynchronous data transfer					
Need for I/O Interface - Strobe control, Handshaking, Asynchronous serial transfer, Asynchronous communication interface.					3
Modes of transfer					
Programmed I/O, Interrupt initiated I/O-vectored interrupt, non-vectored interrupt, Priority interrupt, Interrupt controller, DMA –DMA controller, DMA transfer.					3
I/O Processor					
CPU-IOP communication, Data Communication Processor - Serial and Parallel communication					2
Unit III	Memory Organization				
Memory Organization					
Memory Hierarchy – Characteristics, Design, and Advantages -RAM: SRAM, DRAM – ROM: Types of ROM – Chip Design: RAM, ROM - Memory address map, Memory connection to CPU.					3
Cache Memory					
Need for cache memory - Operational principle – Cache coherence - Different mapping techniques – cache write policies					2
Virtual Memory					
Virtual memory Concept- Address space and Memory Space - Memory table for mapping a virtual address, Address mapping using pages - Page replacement techniques - Segmented-Page mapping.					4
UNIT IV	Microprocessors and Pipelining				
Microprocessor					
Introduction - Block diagram of 8086 - segment registers - flag registers – address - and application of microprocessor.					4



Parallel Processing		
Definition - Types of parallel processing systems (Flynn's Classification)		2
Pipe Lining		
Introduction – Space-time diagram – Types - Instruction pipeline, Arithmetic pipeline – Introduction to Pipeline hazards.		3
UNIT V	Advanced Processors	
Multiprocessors		4
Definition - Shared Memory Multiprocessors – UMA and NUMA – Distributed Memory – Cluster configurations.		
Hardware Multithreading		2
Introduction – Types of Multithreading – Fine-grained, Coarse-grained and Simultaneous Multithreading.		
Multi-Core		3
Introduction – General Multicore Architecture - Intel Multicore (Intel Core i7) - Advantages and disadvantages of multicore processing.		
TOTAL PERIODS		45

Suggested List of Students Activity:

- Presentation / Seminars by students on any recent technological developments based on the course.
- Periodic class/online quizzes on a weekly/fortnightly based on the course.
- Blended learning activities to explore the recent trends and developments in the field.
- Demonstration of Computer components and their placement in a CPU.
- Case study on recent processors and memory devices and their advantages.

Textbooks for Reference:

1. M.Morris Mano, "Computer System Architecture", Revised Third Edition, Prentice –Hall of India Pvt Limited, 2017.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Eighth Edition, Pearson Education, 2011.
3. David A. Patterson, John L. Hennessy, "Computer Organization and Design, the Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020.

Web-based/Online Resources

- <https://archive.nptel.ac.in/courses/106/105/106105163/>
- <https://www.digimat.in/nptel/courses/video/106105163/L01.html>
- <https://www.cse.iitd.ac.in/~srsarangi/archbooksoft.html>
- <https://www.digimat.in/nptel/courses/video/106103180/L01.html>



1055233320	ANALOG AND DIGITAL ELECTRONICS LAB	L	T	P	C
PRACTICAL		0	0	4	2

Introduction

Every Electronic Engineer should have sound knowledge about the ICs used in Electronics Industry. This is vital in R&D Department for Chip level troubleshooting. To meet the industrial needs, diploma holders must be taught about the most fundamental subject, Analog and Digital Electronics Practical. By doing practical experience in this, they will be skilled in handling all types of ICs and able to apply the skill in electronic system design and the designing of PCBs.

Course Objectives

The objective of this course is to

1. Know the Verification of truth table of OR, AND, NOT, NOR, NAND, EX-OR gates
2. Know the verification of Half Adder and Full Adder using IC's.
3. Know the verification of Half Subtractor and Full Subtractor using IC's.
4. Know the Verification of truth table for RS, D, T & JK flip-flop.
5. Know the Verification of Truth Table for Multiplexer/Demultiplexer.
6. Test Inverting Amplifier and Non inverting amplifier using Op-amp.
7. Test Integrator and Differentiator.
8. Test Astable multivibrator using IC 555.
9. Design IC Voltage Regulator Power Supplies using IC 7805, IC 7912.

Course Outcomes

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

- C01: Test the truth tables of logic gates.
- C02: Build combinational logic circuits and validate their truth tables.
- C03: Construct sequential logic circuits and verify their truth tables.
- C04: Analyze, comprehend and design of analog electronic circuits involving OP-AMP
- C05: Analyze, comprehend and design of analog electronic circuits involving timer 555

Pre-requisites

- Students should have knowledge of basic logic gate operations, Boolean algebra, and digital circuit design principles.
- Additionally, having hands-on experience with electronic components, bread boarding would be beneficial.



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
CO1	2	2	2	2	1	1	1
CO2	2	2	1	2	1	1	1
CO3	2	2	1	2	1	1	1
CO4	2	1	2	2	2	2	1
CO5	2	2	2	2	2	2	2

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.
- **Guest Lectures and Industry Visits:** Invite guest speakers from industry or academia to share insights into electronics applications, emerging technologies, and career opportunities. Organize visits to relevant industries or laboratories to expose students to real-world experience.



1055233320	ANALOG AND DIGITAL ELECTRONICS LAB	L	T	P	C
PRACTICAL		0	0	4	2

Assessment Methodology

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

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

SCHEME OF EVALUATION

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



- **CA 3:** Practical document should be maintained for every exercise / experiment immediately after completion of the practice. The same should be evaluated for 10 Marks. The total marks awarded should be converted to 10 Marks for the internal assessment. The practical document should be submitted for the Practical Test and End Semester Examination with a bonafide certificate.

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

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

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

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

SNO	ALLOCATION	MARKS
1	Aim (05) ,Circuit diagram from Part – A (30)	35
2	Aim (05) ,Circuit diagram 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



1055233320		ANALOG AND DIGITAL ELECTRONICS LAB	L	T	P	C
PRACTICAL			0	0	4	2
Part - A	Combinational and Sequential Logic Circuits					
Symbol, truth table and pin diagram of Logic gates ICs, Implementation of Combinational circuits using Logic gates, Flip Flop ICs, Multiplexer and Demultiplexer ICs, precautions of using Digital ICs.						
Ex. No	Name of the Experiment					
1	Verify the truth tables of any 3 gates NOT, AND, OR, NAND, NOR, XOR using IC's.					30
2	Test the performance of Full Adder.					
3	Test the performance of Full Subtractor.					
4	Test the performance of JK flip-flops.					
5	Test the performance of Demultiplexer.					
Part - B	OP-AMP Applications and IC Voltage Regulators					
Constructing Parity Generator and Parity Checker Circuits using Logic Gates – Implementation of OP-AMP applications using IC 741 – Designing Astable Multivibrator circuit using IC 555 - Testing IC voltage regulators.						
Ex. No	Name of the Experiment					
6	Test the performance of 3-bit Parity Generator and 4-bit Parity Checker using basic logic gates with an even parity bit.					30
7	Test the performance of Inverting Amplifier and Non inverting Amplifier using Op-amp IC 741.					
8	Test the performance of Integrator and Differentiator using Op-amp IC 741.					
9	Test the performance of Astable multivibrator using IC 555.					
10	Test the performance of IC Voltage Regulator Power supplies using IC 7805, IC 7912.					
TOTAL PERIODS						60



Suggested List of Students Activity

1. Actively involve themselves in designing logic circuits as a team/individual.
2. Investigate and compare the specifications, availability, and costs of two different topologies and also analyze their features and suitability for various networks.
3. Presentation/Seminars by students on any recent technological developments based on the course.
4. Participate in group discussion about the issues faced in creating Logic circuits using various logic gates

Text Book for Reference

- Ramakant A. Gayakwad, Op-Amps and Linear Integrated Circuits, 4th edition, Pearson Education, 2015.
- Thomas L. Floyd, Digital Fundamentals, 11th edition, Pearson Education, 2015.
- Malvino, Albert Paul, Donald P. Leach, and G. Saha. "Digital Principles and Applications, 8th edition, McGraw Hill Education, 2014.

Web-based/Online Resources

- <https://onlinecourses.nptel.ac.in/>
- <https://www.edx.org/>
- <https://swayam.gov.in/>
- <https://www.circuitlogix.com>
- <http://www.vlab.co.in>
- <http://www.allaboutcircuits.com>

Equipment / Facilities required to conduct the Practical Course

Hardware Requirement:

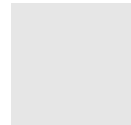
- Digital Trainer Kit.
- Logic Gates: Basic logic gate ICs like 7400, 7402, 7404, 7408, 7432 and 7486.
- Flip-flops: Flip-flop ICs like 7474 (D flip-flop), 7476 (JK flip-flop), and 7473 (Dual JK flip-flop).
- Multiplexer and Demultiplexer: IC 4051
- Op-amp: IC 741.
- Timer IC: IC 555.
- 1MHz, Oscilloscope



- Power Supply (0-30V).
- Signal Generator.
- Regulator ICs: IC 7805, IC 7912.
- Resistors, capacitors, diodes, LEDs.
- Breadboard, power supply, wires, and other necessary components for circuit construction and testing.

BOARD PRACTICAL EXAMINATION

PART - A	
1	Verify the truth tables of any 3 gates NOT, AND, OR, NAND, NOR, XOR using IC's.
2	Test the performance of Full Adder.
3	Test the performance of Full Subtractor.
4	Test the performance of JK flip-flops.
5	Test the performance of Demultiplexer.
PART - B	
6	Test the performance of 3-bit Parity Generator and 4-bit Parity Checker using basic logic gates with an even parity bit.
7	Test the performance of Inverting Amplifier and Non inverting Amplifier using Op-amp IC 741.
8	Test the performance of Integrator and Differentiator using Op-amp IC 741.
9	Test the performance of Astable multivibrator using IC 555.
10	Test the performance of IC Voltage Regulator Power supplies using IC 7805, IC 7912.



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

SNO	ALLOCATION	MARKS
1	Aim (05) ,Circuit diagram from Part – A (30)	35
2	Aim (05) ,Circuit diagram 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



1055233440	C PROGRAMMING AND DATA STRUCTURES	L	T	P	C
PRACTICUM		2	0	4	4

Introduction

C programming language is one of the most widely used and influential programming languages. Data structures are used to organize and manipulate data in a way that is efficient and easy to understand. C is a popular programming language for implementing data structures due to its low-level access to memory and ability to perform pointer arithmetic.

Course Objectives

- To develop C Programs using basic programming constructs
- To teach how to write modular, efficient and readable C programs
- To develop applications in C using arrays, structures and pointers.
- To impart the basic concepts of data structures and algorithms.
- To design and implement linear data structures – lists, stacks, and queues.
- To implement sorting and searching algorithms

Course Outcomes

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

CO1: Understand the need for logical analysis and thinking for program development.

CO2: Develop C programs to solve simple mathematical and decision making problems

CO3: Design and implement applications using functions, arrays and structures and pointers.

CO4: Define, use and implement the list, stack and queue using arrays.

CO5: Implement various sorting and searching Techniques.

Pre-requisites: Nil



CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C01	2	1	1	-	-	-	1
C02	2	1	1	2	-	-	1
C03	3	2	2	-	-	-	2
C04	3	3	2	2	-	1	3
C05	3	3	2	2	-	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 of discrepancies.



1055233440	C PROGRAMMING AND DATA STRUCTURES	L	T	P	C
PRACTICUM		2	0	4	4

Assessment Methodology

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

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

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



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

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

SCHEME OF EVALUATION

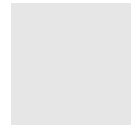
PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055233440	C PROGRAMMING AND DATA STRUCTURES	L	T	P	C
PRACTICUM		2	0	4	4
Unit I	INTRODUCTION TO C PROGRAMMING				
Introduction to C programming- Structure of a C program- Data Types - Constants – Keywords – Operators- Variables –Assignment- Input/Output statements- printf(),scanf()-Decision making if, if-else, else-if-ladder statements -Control statements- while, do_while, for loop, go to, continue and break statements.					6
Ex No 1: Write a C program to find sum and average of three numbers.					6
Unit II	ARRAYS AND FUNCTIONS				
Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional arrays- Functions: function prototype, function definition, function call– Recursion					6
Ex No 2: Write a C program to find both the largest and smallest number in a list of integers using array.					12
Ex No 3: Write a program to find factorial of a number using recursion.					
Unit III	STRUCTURES, POINTERS AND STRINGS				
Structure: Definition- Nested structures– Array of structures – Self referential structures- Pointers: Definition – Initialization – Pointers arithmetic - Call by reference- String handling functions – strlen() , strcpy(), strcmp(), strcat() and strrev() functions					6
Ex No 4: Write a C Program to Calculate Total and Percentage marks of a student using structure.					12
Ex No 5: Write a C program to check if a string is a palindrome using string reversal and comparison functions					
UNIT IV	LINEAR DATA STRUCTURES – LIST, STACK, QUEUE				
Introduction to Data Structures– Abstract Data Types (ADTs) – List ADT – Array–Based Implementation – Linked List – Doubly Linked Lists – Circular Linked List – Stack: Operations– Implementation of Stack – Applications – Queue: Operations – Queue Implementation – Applications					6
Ex No 6: Write a program in ‘C’ to create a singly linked list containing at least five elements.					18
Ex No 7: Write C programs that implement stack (its operations) using array.					
Ex No 8: Write C programs that implement Queue (its operations) using array.					



UNIT V	NON-LINEAR DATA STRUCTURES, SORTING AND SEARCHING	
Trees – Binary Trees – Tree Traversals Introduction, Sorting: Types of sorting – Bubble sort, Merge Sort – Examples– Searching: Linear search–Binary search.		6
Ex No 9: Write a C program that implements bubble sort to sort given list of integers in ascending order. Ex No 10: Write a C program to perform binary search operation for a key value in a given list of integers.		12
TOTAL PERIODS		90

Suggested List of Students Activity

- Assignments/Presentation/Seminars by students based on the course.
- Online quizzes based on the course.
- Mini project that shall be an extension of any practical lab exercise to real-world application

Textbooks for Reference:

1. E.Balagurusamy, Programming in ANSI C, 5th Edition, TataMc-Graw Hill, 2012.
2. Yeswanth Kanetkar, Let us C, 4th Revised Edition, BPB Publications, 2011.
3. Venkatesh N. Baitipuli, Introduction to Data structures Using C, 5th Edition, University Science Press, 2009

Web-based/Online Resources

- <https://www.geeksforgeeks.org/c-programming-language/>
- <https://www.geeksforgeeks.org/data-structures/>
- <https://www.javatpoint.com/data-structure-tutorial>
- <http://swayam.gov.in/>

Equipment / Facilities required to conduct the Practical Portion

1. Hardware Requirement:

- Desktop Computers /Laptop
- Printer

2. Software Requirement:

- Windows / Linux Operating System
- C- Compiler with Editor



BOARD PRACTICAL EXAMINATION

PART - A

Ex No 1: Write a C program to find sum and average of three numbers.

Ex No 2: Write a C program to find both the largest and smallest number in a list of integers using array.

Ex No 3: Write a program to find factorial of a number using recursion.

Ex No 4: Write a C Program to Calculate Total and Percentage marks of a student using structure.

Ex No 5: Write a C program to check if a string is a palindrome using string reversal and comparison functions

PART - B

Ex No 6: Write a program in 'C' to create a singly linked list containing at least five elements.

Ex No 7: Write C programs that implement stack (its operations) using array.

Ex No 8: Write C programs that implement Queue (its operations) using array.

Ex No 9: Write a C program that implements bubble sort to sort given list of integers in ascending order.

Ex No 10: Write a C program to perform binary search operation for a key value in a given list of integers.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055233540	ELECTRONIC DEVICES AND CIRCUITS	L	T	P	C
Practicum		2	0	4	4

Introduction:

This subject is fundamental, and all circuit branch engineers must have a basic understanding of electronic devices like diodes, transistors.

Course Objectives:

- The objective of this course is to enable the student
- To learn the construction and operation of PN junction diode.
- To study the VI characteristics of PN junction diode.
- To understand Zener diode as a special case of PN junction diode.
- To understand the operation of BJT, FET, Oscillators.
- To understand the feedback concept.
- To analyse the operation of wave shaping circuits.

Course Outcomes:

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

CO1: Describe intrinsic, N-type and P-type semiconductors.

CO2: Apply the characteristics of PN junction diode and Zener diode in various applications.

CO3: Analyze the input and output characteristics of CE amplifier.

CO4: Design amplifier and oscillator circuits using simulation tool.

CO5: Construct an astable multivibrator and clipper and clamper circuits.

Pre-requisites: Basics of semiconductor physics

CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
CO1	3	2	1	2	---	---	---
CO2	3	3	3	3	---	---	1
CO3	2	2	3	3	---	---	---
CO4	3	2	3	3	---	---	2
CO5	3	3	3	3	---	---	---

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



Instructional Strategy:

1. Teachers are suggested to take measures to create interest and enhance learning confidence in students.
2. Teachers should give examples from daily routine/realistic/real-world as well as relate to engineering/technology applications on various concepts and principles in each topic so that students are made to understand and grasp the concepts and principles.
3. Demonstration can make the subject interesting and develop scientific temper in the students. Student activities should be planned on all the topics.
4. Theory - Demonstrate/practice-Activity approach may be followed throughout the course.



1055233540	ELECTRONIC DEVICES AND CIRCUITS	L	T	P	C
Practicum		2	0	4	4

Assessment Methodology:

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

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

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



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

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

SCHEME OF EVALUATION

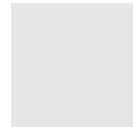
PART	DESCRIPTION	MARKS
A	Aim (05) , Circuit diagram (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055233540	ELECTRONIC DEVICES AND CIRCUITS	L	T	P	C
PRACTICUM		2	0	4	4
UNIT I - PN JUNCTION DIODE, ZENER DIODE, FILTERS, RECTIFIERS					
Basics of semiconductor physics: Energy band structure of insulator, conductor, semiconductor, electronic properties of Si, Ge atoms- Semiconductor types- Intrinsic, P-type and N-type semiconductors. PN junction diode: Construction, working of PN junction diode (Forward and Reverse bias) and its V-I characteristics. Carrier transport: Diffusion current- Drift current- mobility -conductivity-resistivity. Zener diode: Construction, working of Zener diode and its V-I characteristics, Comparison between Avalanche and Zener breakdown- Zener diode as a voltage regulator. LED, Photo diode: Construction- working-Characteristics-Applications, Solar cell. Filters: Definition-Types of Filters- Application. Rectifiers: Introduction-Half wave(HW), Full wave(FW) & Bridge Rectifiers(BR).					10
1. Plot the V-I characteristics of a PN junction diode (Si) with an experimental setup. Find its cut-in voltage. 2. Construct a circuit to test forward and reverse bias characteristics of Zener diode and note its breakdown voltage. 3. Construct a center tapped transformer FWR circuit. Draw the input & output signal Use different values of Capacitor and what do you infer by observing the output 4. Construct a Bridge Rectifier; Compare its output with FWR output. Which one gives better output					20
UNIT II - BJT, FET, FEEDBACK AMPLIFIERS, OSCILLATORS AND WAVE SHAPING CIRCUITS AND OSCILLATORS					
Bipolar Junction Transistor (BJT): Construction, working of NPN & PNP transistor, Transistor configurations-CB, CE, CC. Input & output characteristics of CE, CB, CC configurations. Transistor -as an amplifier, as a switch Biasing circuits - Need for biasing, types, Self-bias circuit. Field Effect Transistor (FET): Construction, working principle, classification, Drain and Transfer Characteristics, FET as an amplifier. MOSFET- Construction, types. Compare BJT, FET. Feed Back Amplifiers: Feed Back - Definition, Types, Derivation of Expression for					20



Gain of Amplifier with Feed Back. Effect of feedback (negative) on gain, stability, distortion, impedance and bandwidth of an amplifier. RC coupled amplifier with emitter bypass capacitor. OSCILLATORS: Barkhausen criterion for oscillations, tank circuits, Different oscillator circuits- Hartley, Colpitts, phase shift, Wien's bridge, and crystal oscillator. Their working principles (no mathematical derivation). WAVE SHAPING CIRCUITS: Clipper and Clamper Circuit: Clipper- Definition, positive and negative Clipper circuits. Clamper- Definition, positive and negative Clamper circuits. Multivibrator Circuits- Definition, Basics of astable, monostable, bistable, Construction & working of astable.	
5. Construct a circuit to test input and output characteristics of CE configuration. 6. Construct a circuit to plot drain and transfer characteristics of FET. 7. Design and verify RC coupled amplifier(2-stage) using simulation tool like Multisim/PSpice. 8. Design a Hartley and RC phase shift Oscillator circuit and plot the output waveform and also find frequency of oscillation. Use Multisim/PSpice. 9. Construct clippers and clampers circuits to analyse their outputs. 10. Construct an astable multivibrator circuit to generate a square wave using two set of resistors, capacitors values and calculate their frequency. Note: At least Four experiments should be done using bread board	40
Total	90

Suggested List of Students Activity:

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

Text Book for Reference

1. [Robert L. Boylestad](#); [Louis Nashelsky](#); [Franz Monssen](#) "Electronic Devices and Circuit Theory" Pearson Education, Limited, 2008.
2. S Salivahanan, N Suresh Kumar, "Electronic Devices And Circuits" Mc Graw Hill 5th Edition



3. Jacob Millman Christos C Halkias , "Millman's Electronic Devices and Circuits (SIE)" , 4th Edition, McGraw Hill Education.

Web-based/Online Resources:

<https://nptel.ac.in/>

Equipment / Facilities required to conduct the Practical Course

List of Equipments:

1. DC Regulated power supply (0-30V,1A)
2. Signal Generator (1MHz)
3. Dual trace CRO (20MHz/30MHz)
4. Digital Multimeter
5. DC Voltmeter (Analog/Digital)
6. DC Ammeter (Analog/Digital)
7. Desktop Computer
8. Simulation Tool – Multisim/ PSpice Software.

BOARD PRACTICAL EXAMINATION

PART A

1. Plot the V-I characteristics of a PN junction diode (Si) with an experimental setup. Find its cut-in voltage.
2. Construct a circuit to test forward and reverse bias characteristics of Zener diode and note its breakdown voltage.
3. Construct a centre tapped transformer FWR circuit. Draw the input & output signal. Use different values of Capacitor and what do you infer by observing the output
4. Construct a Bridge Rectifier, Compare its output with FWR output. Which one gives better output.
5. Construct a circuit to test input and output characteristics of CE configuration.

PART B

6. Construct a circuit to plot drain and transfer characteristics of FET.
7. Design and verify RC coupled amplifier (2-stage) using simulation tool like Multisim / PSpice.
8. Design a Hartley and RC phase shift Oscillator circuit and plot the output waveform and also find frequency of oscillation. Use Multisim/PSpice.
9. Construct clippers and clampers circuits to analyse their outputs.
10. Construct an astable multivibrator circuit to generate a square wave using two set of resistors, capacitors values and calculate their frequency.



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



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

Introduction

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

Course Objectives

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

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

Course Outcomes

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

CO1: understand functional architecture of an operating system.

CO2: distinguish CPU scheduling algorithms.

CO3: analyze process coordination.

CO4: classify File System and directory implementations.

CO5: Resource Management

Pre-requisites: Nil



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	2	2	2	2	2	---	---
C02	2	3	3	2	2	---	---
C03	2	2	2	3	3	---	---
C04	2	2	3	2	2	---	---
C05	2	3	2	3	3	---	---

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

Instructional Strategy

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



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

Assessment Methodology

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

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 10 Marks for each assessment test. Best of one will be considered for the internal assessment of 10 Marks. Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.



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

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

SCHEME OF EVALUATION

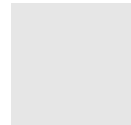
PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1052233640	OPERATING SYSTEMS	L	T	P	C
PRACTICUM		1	0	2	2
PART A	INTRODUCTION TO OS				
Introduction to operating system: Basics of Operating system- types of operating system- operating system services – operating system structures – Process Management – Process scheduling 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 Deadlocks – Virtual Memory – Page Replacement Algorithms					8
Ex No:1 Write a syntax and execute the directory management commands : ls, cd, pwd, mkdir, rmdir Ex No:2 Write a syntax and execute the file management commands such as cat, chmod, cp, mv, rm, more Ex No:3 Write a syntax and execute the general purpose commands : wc, cal, date, who, tty, ln Ex No:4 Using the simple filters verify pr, head, tail, cut, paste, nl, sort grep, egrep, fgrep, write and wall					15
PART B	SHELL SCRIPTS				
File operations (New, Open, Close, Save, Save and Exit, Print) – Text Editing operations (inserting ,deleting ,finding, replacing, copying and moving)- use of shell scripts – Numerical operations – Looping – Swapping techniques – string operations- using command line arguments – filters-date function- Relational Operations -Logical Operations – Boolean operations – Basic Arithmetic operations – case statement – search directory or file .					7
Ex No 5: Write a shell script that accepts a numerical value N and find sum . Ex No 6: Write a shell script to find factorial of the given number . Ex No 7: Write a shell script to perform arithmetic calculator using case statement. Ex No 8: Write a shell script using command line arguments and reports on whether it is a directory, file or something else.					15
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”, 9th Edition, Pearson Education/PHI, 2018.
- Andrew S Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson/PHI, 2014.

Website links for reference:

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

Suggested List of Students Activity

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

Equipment / Facilities required to conduct the Practical Portion

1. Hardware Requirement:

- Desktop Computers
- Printer

2. Software Requirement:

- Linux Operating System



BOARD PRACTICAL EXAMINATION

PART – A

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

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

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

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

PART – B

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

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

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

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

SCHEME OF VALUATION		
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



SEMESTER 4



1055234110	PRINCIPLE OF COMMUNICATION ENGINEERING	L	T	P	C
THEORY		4	0	0	4

Introduction:

This subject is aimed at offering a basic understanding of communication principles and their applications in communication systems. This is helpful for a beginner who wants to acquire knowledge on the communication systems.

Course Objectives:

The objective of this course is to enable the students to

To know the Basic parts of Communication system

- To know the electromagnetic spectrum
- To understand the modulation process
- To understand the analog communication modulation technique
- To study AM, FM receivers.
- To study about various types of wave propagation method
- To learn the basic terms of antenna
- To study various types of antennas.
- To have a basic knowledge on information theory.
- To understand the various multiplexing technique.

Course Outcomes:

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

CO1: Understand the basics of communication & need for modulation concept

CO2: Understand the Various analog modulation techniques.

CO3: Understand the working of radio receivers.

CO4: Analyze various types of antennas.

CO5: Understand the source coding techniques& multiplexing techniques.

Pre-requisites:

Basics of Fourier Transform, basics of probability theory.



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	2	1	1	-	-	---
C02	3	3	1	3	-	-	1
C03	3	3	3	1	-	-	1
C04	3	3	3	3	-	-	2
C05	3	3	2	3	-	-	2

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

Instructional Strategy:

1. Teachers are suggested to take measures to create interest and enhance learning confidence in students.
2. Teachers should give examples from daily routine/realistic/real-world as well as relate to engineering/technology applications on various concepts and principles in each topic so that students are made to understand and grasp the concepts and principles..
3. Demonstration can make the subject interesting and develop scientific temper in the students. Student activities should be planned on all the topics.
4. Theory - Demonstrate/practice-Activity approach may be followed throughout the course.
5. Utilize visual aids such as diagrams, and animations to clarify complex concepts like modulation, demodulation process. Visual representations may help the students to learn the subject with interest.



1055234110	PRINCIPLE OF COMMUNICATION ENGINEERING	L	T	P	C
THEORY		4	0	0	4

Assessment Methodology:

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

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

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

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

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

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

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

Question Pattern: Model Examination and End Semester Examination

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

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



1055234110	PRINCIPLES OF COMMUNICATION ENGINEERING	L	T	P	C
Theory		4	-	-	4
UNIT I	BASICS OF COMMUNICATION SYSTEM				
Communication: Definition, types, compare analog & digital Communication, block diagram of Communication system, Definition of message signal, carrier signal, modulated signal. Relation between wavelength & frequency. Electromagnetic frequency spectrum and their applications. Fourier transform: Introduction, power spectral density. Modulation: Definition, need for modulation, types of Modulation, advantage of modulation. Sampling: Concept of sampling, Sampling theorems, Nyquist criterion and aliasing effect. Quantization: Concept of quantization & its types . Filters: Definition, first order RC LPF, RC HPF. Second order RC BPF and BSF- Cut off frequency, their ideal characteristics.					10
Unit II	CONTINUOUS WAVE MODULATION TECHNIQUES				
Amplitude modulation: Derivation of AM wave equation, Modulation index for sinusoidal AM, Frequency spectrum for sinusoidal AM (DSB-FC, DSB-SC, SSB-SC), Total power in AM wave. AM transmitter: Low level modulated & High-level modulated AM transmitter. AM Receivers: Superheterodyne Receiver, Receiver characteristics: sensitivity, selectivity, fidelity, double spotting, image frequency & its rejection. Frequency Modulation: Definition, frequency deviation, modulation index, Frequency spectrum of FM, Narrow band FM-generation, Wide band FM, performance comparison of Wide band, Narrow band FM. FM Transmitter: Indirect FM transmitter, Stereophonic FM transmitter. FM Receiver: Stereophonic FM Receiver, AFC, Compare AM, FM.					13
Unit III	ANTENNAS				
Principle of radiation, Resonant and non resonant antennas, Radiation Pattern of $\lambda/2$, λ and $3\lambda/2$ dipoles, Radiation pattern of grounded $\lambda/4$, $\lambda/2$, and λ dipole. Radiation resistance, total resistance, efficiency, beam width, gain, aperture area of an antenna. (no derivation) , Antenna Array - Principle of Pattern Multiplication, Broad Side array, End Fire array , Folded dipole and Rhombic antenna, Yagi antenna and parasitic elements , Log Periodic and Loop antenna, Parabolic antennas and					13



Horn antenna.		
Unit IV	EM WAVE PROPAGATION	
Ground Wave propagation and effect of curvature of the earth, Space Wave Propagation, Line of sight distance, Sky Wave Propagation, Ionospheric and its characteristics, Critical frequency . Effect of the Earth's magnetic field on ionospheric propagation, MUF and Skip distance, Ionospheric absorption and disturbances. Atmospheric noise. Scatter propagation.		12
Unit V	INFORMATION THEORY, MULTIPLEXING AND MULTIPLE ACCESS SCHEME	
Measure of information, Entropy, Source coding theorem- Shannon–Fano coding, Huffman Coding, Channel capacity, Shannon-Hartley law. Concept of multiplexing: FDM and TDM. Multiple Access: FDMA, TDMA and CDMA – Application to Mobile communication and Satellite communication.		12
TOTAL HOURS		60

Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments based on the course.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.
- Visits to instrumentation and communications industries must be carried out, so as to make the students can understand where and how the various instruments are used in the industry.

Text Books for Reference:

1. George Kennady, Bernard Davis, S R M Prasanna , “Electronic communication systems”, McGraw Hill Education
2. Louis E. Frenzel, “Principles of Electronic Communication Systems”, McGraw Hill Education (india) Pvt. Ltd.
3. Wayne Tomasi, “Electronic communication systems”, Pearson Education

Web-based/Online Resources:

1. <https://nptel.ac.in/>



1055234210	COMPUTER NETWORKS	L	T	P	C
THEORY		3	0	0	3

Introduction

This course aims at teaching students the importance of networks in all aspects of life. This course introduces the basic concepts of networks like network classification, network topologies and devices, transmission media, network models and concept of TCP/IP. Imparting this knowledge will help students to understand current network technologies and will also help them to pursue specialized programs leading to a professional career in the Networking and Communication Industry.

Course Objectives

The objective of this course is to enable the student to

- Build knowledge of the fundamental concepts of computer networking.
- Realize the benefits and applications of computer network.
- Familiarize the students with basic terminologies in computer networking.
- Use various network devices efficiently.
- Administer and maintain a computer network.
- Preparing the students for Advanced courses in computer networking.

Course Outcomes

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

- CO1: Identify and compare different network topologies, communication media and network devices.
- CO2: Define Network models, compare OSI reference model & TCP/IP model.
- CO3: Describe the functions of Network Layer i.e. addressing, subnetting & routing and design a network with a router connecting different subnets.
- CO4: Explain different Transport Layer functions i.e. Port addressing, Error control and Flow control mechanism
- CO5: Explain the different protocols used at application layer.

Pre-requisites: Nil



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	2	2	2	---	---	2
C02	3	3	2	---	---	---	---
C03	3	3	3	3	---	---	2
C04	3	2	2	3	---	---	---
C05	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.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.



1055234210	COMPUTER NETWORKS	L	T	P	C
THEORY		3	0	0	3

Assessment Methodology

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

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

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

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

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

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

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

Question Pattern: Model Examination and End Semester Examination

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

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



1052234210	COMPUTER NETWORKS	L	T	P	C
THEORY		3	0	0	3
Unit I	INTRODUCTION TO DATA COMMUNICATION AND NETWORK				
Components of a data communication - Data flow in communication: Simplex, Half duplex, Full duplex - Introduction to Networks - Elements of a Network - Types of Connections: Point to point, Multipoint					2
Types of Networks: Classification based on Geography: LAN, MAN, WAN – Classification by their component: Client-Server, Peer to Peer – Internet, Intranet, Wi-Fi, Bluetooth, Mobile Network.					3
Network Topologies: Star, Bus, Ring, Mesh, Hybrid – Advantages and Disadvantages of each topology.					3
Unit II	MEDIA AND NETWORK DEVICES				
Transmission Media: Classification of transmission media – Guided media: Twisted pair, Coaxial, Fibre optics – Unguided media: Radio waves, Microwaves, Infrared.					4
Cable wiring standards - Straight through Cable, Crossover Cable, Connectors, Jacks, Patch Panels					2
Network devices: NIC, Repeaters, Hub and its types, Bridges and their types, Switches, Routers, (Wired and Wireless) –Gateways, Modems					3
Unit III	NETWORK MODELS AND PHYSICAL LAYER				
Network Models: OSI Model – Layered architecture – OSI Reference model, TCP/IP protocol suite - Comparison of OSI and TCP/IP					7
Physical Layer: Overview of Physical Layer					
UNIT IV	DATA LINK AND NETWORK LAYER				
Data Link Layer: Data Link sub layers: MAC Sub-layer, LLC - Addressing: Physical Address - 802.X Protocols: Concepts CSMA/CD (802.3) – Token bus (802.4) –Token ring (802.5) – Comparison between 802.3, 802.4 and 802.5 - Ethernet - Types of Ethernet (Fast Ethernet, gigabit Ethernet, High speed Ethernet 10GE to 800GE) - Switching: Definition – Circuit switching – Packet switching .					7
Network Layer: IP Address: Dotted Decimal Notation – Ipv4 Address classes – Basics of Subnetting – Subnet Masking - VLSM Technique – IPv6 concept only - Role of Network layer: Introduction to routing					4



UNIT V	HIGHER LAYERS OF OSI MODEL	
	Transport Layer Protocols: Transport Layer overview - Connection Oriented and Connectionless Services – Port number, Sockets – TCP & UDP.	3
	Presentation and Session Layer: Session layer function and protocols - Presentation layer function and Protocols	3
	Application Layer: Introduction to Application Layer Protocols and their role - DNS, Electronic Mail, the World Wide Web, DHCP, FTP, Telnet	4
TOTAL HOURS		45

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based on the course.
- Periodic class/online quizzes conducted based on the course.
- A fun physical activity where students would create a network topology. This enables students to analyze the problem statement, brainstorm and form a network topology .

Textbook for Reference:

1. Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw-Hill, 2007.
2. Andrew S. Tanenbaum "Computer Networks", Fifth Edition, Pearson Prentice Hall Edition, 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>



1052234340	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 in Java.
- 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

C01: Demonstrate knowledge on Java Programming fundamentals.

C02: Develop programs in Java using control structures, array and string.

C03: Demonstrate use of object - oriented programming concepts in Java.

C04: Apply programming skills to solve overriding problems using interface.

C05: Develop applications using swing components.

Pre-requisites: Nil



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	3	3	3	1	1	2
C02	3	3	3	3	1	1	2
C03	3	3	3	3	1	2	2
C04	3	3	3	3	1	2	2
C05	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 of discrepancies.



1052234340	JAVA PROGRAMMING	L	T	P	C
Practicum		2	0	4	4

Assessment Methodology

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

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

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



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

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

SCHEME OF EVALUATION

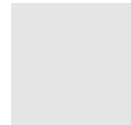
PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1052234340	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					12



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.		
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 and advanced 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 based on the course.
- Programming assignments
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.

Equipment / Facilities required to conduct the Practical Portion

1. Hardware(s) Requirement:

- Desktop / Laptop
- Printer

2. Software(s) Requirement:

- Windows 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 using conditional 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 bubble sort.

PART – B

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 the appropriate color.

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



1052234440	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 to

CO1: 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	P01	P02	P03	P04	P05	P06	P07
C01	3	2	2	3	---	---	---
C02	3	3	3	3	---	---	---
C03	3	3	3	3	---	---	---
C04	3	2	3	3	---	---	---
C05	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 of discrepancies.



1052234440	PYTHON PROGRAMMING	L	T	P	C
PRACTICUM		1	0	4	3

Assessment Methodology

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

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

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



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

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

SCHEME OF EVALUATION

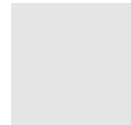
PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1052234440	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. Ex No 8: Write a python program to create a 2D-dimensional array and demonstrate					16



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

Suggested List of Students Activity

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

Textbook for Reference:

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

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 three numbers.

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

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.

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 element using where () function.

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.

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		
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



1055234520	NETWORK LAB	L	T	P	C
PRACTICAL		0	0	4	2

Introduction:

This course will help the students to understand the function of networks and get exposure to different existing and upcoming communication technologies. The students will be able to create and manage networks and enable communication among devices. This course also gives the knowledge and competency to diagnose the problems in computer networks and connecting devices and also gives the knowledge for troubleshooting for systematic repair and maintenance of computer networks.

Course Objectives

The objective of this course is

1. To enable the students to perform different cabling in a network
2. To enable students to Configure Internet connection and use utilities to debug the network issues.
3. To provide the students with hands-on experience in networking the computers using various networking devices.
4. Students can configure routers for any kind of topology.
5. To develop students' skills in designing and troubleshooting computer networks through practical experimentation.

Course Outcomes

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

- CO1: Know the concepts of Computer Networking, routing, and addressing, and also configure several types of cables and connectors.
- CO2: Assemble and configure various networking devices - NIC, Hub, Router, Switch, etc.,
- CO3: Setup simple computer networks and also basic wireless networks.
- CO4: Discover and assign IP address and also locate the MAC address of a computer.
- CO5: Diagnose & solve network problems and issues remotely.

Pre-requisites

- Students should have basic knowledge of computers.
- Knowledge of networking cables would be beneficial.



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	2	3	-	2	-	-	1
C02	3	2	1	3	1	3	-
C03	2	3	3	2	3	2	2
C04	-	2	-	3	2	-	-
C05	-	3	2	2	3	3	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 assemble devices like NIC, Hub, Router, Switch, etc., Visual representations help reinforce learning and improve comprehension.
- **Case Studies:** Present case studies of real-world examples. Analyzing case studies helps students understand the design process, constraints, and considerations involved in network design.
- **Group Projects:** Assign group projects that require students to design and implement computer networks. This encourages teamwork, enhances problem-solving skills, and reinforces learning through practical application.
- **Guest Lectures and Industry Visits:** Invite guest speakers from industry or academia to share insights into computer network applications, emerging technologies, and career opportunities. Organize visits to relevant industries or laboratories to expose students to real-world experience.



1055234520	NETWORK LAB	L	T	P	C
PRACTICAL		0	0	4	2

Assessment Methodology:

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

Note:

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

SCHEME OF EVALUATION

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



- **CA 3:** Practical document should be maintained for every exercise / experiment immediately after completion of the practice. The same should be evaluated for 10 Marks. The total marks awarded should be converted to 10 Marks for the internal assessment. The practical document should be submitted for the Practical Test and End Semester Examination with a bonafide certificate.

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

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

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

SCHEME OF 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 (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100



1055234520	NETWORK LAB		L	T	P	C
PRACTICAL			0	0	4	2
Part - A	Tools and Devices for Networking					
Need for Crimping tool – Use of Cable Tester – Clamping tool – Study of installation and configuration of connecting devices – Modem – Hub – Switch – Router.						
Ex.No	Name of the Experiment					
1	Do the following cabling works in a network a) Cable Crimping b) Test the Crimped cable using a Cable tester.					30
2	Implement the cross-wired cable and straight-through cable using the clamping tool.					
3	Installation and configuration of Network Devices: Modem, HUB, Switch, and Routers.					
4	Establish Peer to Peer network connection between two systems using Switch and Router in a LAN.					
5	Creation of a simple network with two PCs using a hub. a. Identify the proper cable to connect the PCs to the hub b. Configure workstation IP address information. c. Test connectivity using the Ping command					
6	Creation of various network topologies using network devices, cables, and computers.					
Part - B	Networking commands and Subnetting					
Study of basic networking commands in Windows and Linux – Study of Subnetting and IP Address configuration – DHCP – Firewall.						
Ex.No	Name of the Experiment					
7	Configuration of Internet connection and use IPCONFIG, PING/Tracert, and Netstat utilities to debug the Network issues.					30
8	Learn to use commands like tcpdump, netstat, nslookup, and traceroute in Windows. Capture ping and traceroute PDUs using a network protocol analyzer and examine.					



9	Learn to use commands like ping, nslookup, traceroute, host, netstat, ARP, Dig, Route, Ethtool, Hostname, and ifconfig in Linux.	
10	Create a subnet with 5 systems and configure Host IP, Subnet Mask, Default Gateway, and DNS for the systems in that subnet. (TCP/IP Configuration).	
11	Configure a DHCP server and firewall.	
12	Transfer of files between systems in LAN.	
TOTAL HOURS		60

Suggested List of Students Activity

1. Actively involve themselves in designing network topologies as a team/individual.
2. Investigate and compare the specifications, availability, and costs of two different topologies and also analyze their features and suitability for various networks.
3. Presentation/Seminars by students on any recent technological developments based on the course.
4. Participate in group discussion about the issues faced in creating networks using various devices.

Text Book for Reference:

- Behrouz A. Forouzan, "Data Communications and Networking with TCP/IP Protocol Suite", Sixth Edition TMH, 2022.
- Tami Evanson, "Network+ Lab manual", BPB Publications.
- James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Eighth Edition, Pearson Education, 2021.

Web-based/Online Resources

- <https://nptel.ac.in/>
- <http://swayam.gov.in/>
- <https://www.wikihow.com/Set-up-an-FTP-Between-Two-Computers>
- <https://www.networkstraining.com/windows-ip-commands/>
- <http://swayam.gov.in/>
- <https://www.wikihow.com/Set-up-an-FTP-Between-Two-Computers>
- <https://www.networkstraining.com/windows-ip-commands/>
- <https://www.studocu.com/en-us>



Equipment / Facilities required to conduct the Practical Course:

Software Requirement:

- Windows /Linux OS
- Windows Server/Linux Server
- Packet Tracer

Hardware Requirement:

- Desktop Systems
- Network Cables (Coaxial Cable, UTP, STP, OFC cable)
- RJ 45 connectors, RJ-11, BNC, SCST
- Crimping Tool
- Screwdriver set
- Wires / Wire cutters
- Cable tester
- Modem
- NIC
- Switch
- Hub
- Router

BOARD PRACTICAL EXAMINATION

PART A	
1	Do the following cabling works in a network a) Cable Crimping b) Test the Crimped cable using a Cable tester.
2	Implement the cross-wired cable and straight-through cable using the clamping tool.
3	Installation and configuration of Network Devices: Modem, HUB, Switch, and Routers.
4	Establish Peer to Peer network connection between two systems using Switch and Router in a LAN.
5	Creation of a simple network with two PCs using a hub. a. Identify the proper cable to connect the PCs to the hub b. Configure workstation IP address information.



	c. Test connectivity using the Ping command
6	Creation of various network topologies using network devices, cables, and computers.
PART - B	
7	Configuration of Internet connection and use IPCONFIG, PING/Tracert, and Netstat utilities to debug the Network issues.
8	Learn to use commands like tcp dump, netstat, nslookup, and traceroute in Windows. Capture ping and traceroute PDUs using a network protocol analyzer and examine.
9	Learn to use commands like ping, nslookup, traceroute, host, netstat, ARP, Dig, Route, Ethtool, Hostname, and ifconfig in Linux.
10	Create a subnet with 5 systems and configure Host IP, Subnet Mask, Default Gateway, and DNS for the systems in that subnet. (TCP/IP Configuration).
11	Configure a DHCP server and firewall.
12	Transfer of files between systems in LAN.

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 (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100



1055234620	SYSTEM ADMINISTRATION LAB	L	T	P	C
PRACTICAL		0	0	4	2

Introduction:

System administration involves managing allocation of user names and passwords, monitoring disk space and other resource use, performing backups, monitoring security configuration, and setting up new hardware and software. Students will learn how to install, configure, manage, and troubleshoot various operating systems, networks, and services commonly used in enterprise environments.

Course Objectives

The objective of this course is

- To acquire an appreciation for issues relevant to network server administration
- To understand Windows server administration and various services
- To understand LINUX administration and various services
- To describe the administration concepts for managing, debugging and securing the networks.
- To learn various networking commands of LINUX system.

Course Outcomes

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

C01: Install and configure Windows server administration and various services.

C02: Demonstrate the Linux commands with appropriate options for various networking and administration scenarios.

C03: Install and configure Linux administration and various services.

C04: Use the essential Windows/Linux administration concepts for given problem.

Pre-requisites

- Students should have basic knowledge of computers.



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
CO1	3	2	-	1	-	-	2
CO2	3	2	-	1	-	-	1
CO3	3	2	-	1	-	-	2
CO4	3	2	-	1	-	-	2

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:** Create diagrams and info graphics illustrating network topologies, server configurations, and system architectures. Use tools like Microsoft Visio or draw.io to design visually appealing diagrams that depict the relationships between different components
- **Video Tutorials and Online Resources:** Curate video tutorials and online resources that demonstrate system administration techniques, tools, and best practices. Share links to relevant videos and resources with students to supplement their learning and provide additional guidance outside of lab sessions.
- **Group Projects:** Assign group projects that require students to design and implement computer networks. This encourages teamwork, enhances problem-solving skills, and reinforces learning through practical application.



1055234620	SYSTEM ADMINISTRATION LAB	L	T	P	C
PRACTICAL		0	0	4	2

Assessment Methodology:

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

Note:

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

SCHEME OF EVALUATION

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



- **CA 3:** Practical document should be maintained for every exercise / experiment immediately after completion of the practice. The same should be evaluated for 10 Marks. The total marks awarded should be converted to 10 Marks for the internal assessment. The practical document should be submitted for the Practical Test and End Semester Examination with a bonafide certificate.

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

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

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

SCHEME OF 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 (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100



1055234620		SYSTEM ADMINISTRATION LAB		L	T	P	C
PRACTICAL				0	0	4	2
Part - A		Windows Administration					
Ex.No		Name of the Experiment					
1		Installation and configuration of Windows 2008/2012 Server operating system					30
2		Installation and configuration of DHCP Server in Windows.					
3		Installation and configuration of Mail Server.					
4		Installing & configuring a Virtual Machine.					
5		Installation and configuration of DNS Server.					
6		Transfer files between systems in LAN using FTP Configuration.					
Part - B		Linux Administration					
Ex.No		Name of the Experiment					
7		Installation & configuration of Linux OS.					30
8		Creating and managing user & group accounts in LINUX.					
9		Illustrate the various Linux networking commands.					
10		Setting up FTP Server and configure httpd Web Server.					
11		Demonstrate remote desktop access in Linux.					
12		Configuring an NFS Server & Client.					
TOTAL PERIODS							60

Suggested List of Students Activity

1. Actively involve themselves in designing network topologies as a team/individual.
2. Investigate and compare the specifications, availability, and costs of two different topologies and also analyze their features and suitability for various networks.
3. Presentation/Seminars by students on any recent technological developments based on the course.



4. Participate in group discussion about the issues faced in creating networks using various devices.

Textbooks for Reference:

- Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, UNIX and Linux System Administration Handbook, 4th edition, Prentice Hall; 2010.
- Richard Petersen, The Complete Reference Linux, 6th Edition, Tata Mcgraw Hill, 2008.
- Orin Thomas, Administering Windows Server 2012 – Training guide, O Reilly Media, 2013.

Web-based/Online Resources

- <https://nptel.ac.in/>
- <http://swayam.gov.in/>
- https://www.tutorialspoint.com/linux_admin/index.htm
- <https://www.linode.com/docs/guides/linux-system-administration-basics/>

Equipment / Facilities required to conduct the Practical Course

Software Requirement:

- Windows /Linux OS
- Windows Server/Linux Server

Hardware Requirement:

- Desktop Systems
- LAN cable
- Router



BOARD PRACTICAL EXAMINATION

Ex.No	PART A
1	Installation and configuration of Windows 2008/2012 Server operating system
2	Installation and configuration of DHCP Server in Windows.
3	Installation and configuration of Mail Server.
4	Installing & configuring a Virtual Machine.
5	Installation and configuration of DNS Server.
6	Transfer files between systems in LAN using FTP Configuration.
Ex.No	PART B
7	Installation & configuration of Linux OS.
8	Creating and managing user & group accounts in LINUX.
9	Illustrate the various Linux networking commands.
10	Setting up FTP Server and configure httpd Web Server.
11	Demonstrate remote desktop access in Linux.
12	Configuring an NFS Server & Client.

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 (Part A or Part –B)	15
4	Output	10
5	Viva Voce	05
6	Total	100



SEMESTER 5



1055235110	DIGITAL COMMUNICATION	L	T	P	C
THEORY		3	0	0	3

Introduction:

This subject introduces students to the fundamental concepts and techniques for digital communication principles. This course fulfils the need for students to have a thorough knowledge of digital modulation, error control coding and spread spectrum communication techniques.

Course Objectives:

The objective of this course is to enable the students to

- To know the Basics of Digital Communication
- To study about the various types of signals
- To understand the sampling process and Spread spectrum communication
- To understand the pulse digital modulation methods
- To learn about types of coding methods
- To study about various error control codes
- To learn the Digital modulation techniques

Course Outcomes:

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

- CO1: Understand the basics of digital communication
- CO2: Understand the Various pulse digital modulation techniques and line coding
- CO3: Understand the various digital modulation schemes.
- CO4: Analyze the error detection and correction methods.
- CO5: Understand the spread spectrum communication techniques.

Pre-requisites:

- Analog Communication,
- Basics of Analog and digital electronics



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
CO1	3	2	1	1	-	-	2
CO2	3	3	1	1	-	-	2
CO3	3	3	2	1	-	-	2
CO4	3	3	2	1	-	-	2
CO5	3	2	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 Applications: Integrate real-world examples and applications of digital communication 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. Analyzing case studies helps students understand the design process, constraints, and considerations involved in digital logic design.

Use of Visual Aids: Utilize visual aids such as diagrams, charts, and animations to clarify complex concepts like modulation, demodulation, spread spectrum techniques. Visual representations help reinforce learning and improve comprehension..

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.



1055235110	DIGITAL COMMUNICATION	L	T	P	C
THEORY		3	0	0	3

Assessment Methodology:

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

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

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

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

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

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

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

Question Pattern: Model Examination and End Semester Examination

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

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



1055235110	DIGITAL COMMUNICATION	L	T	P	C
Theory		3	-	-	3
Unit I	BASICS OF DIGITAL COMMUNICATION				
Introduction of signal and classification, Block diagram of digital communication system. Merits/demerits and Comparison of analog and digital communications. Base band and pass band transmission. Information capacity, entropy, bit-rate, baud rate and bandwidth of digital data , Sampling: sampling process, and sample and hold circuit, Types of sampling, Sampling theorems, Nyquist criterion and aliasing effect.					10
Unit II	PULSE DIGITAL MODULATION TECHNIQUES				
Quantization: Definition, process and classification, Quantization noise, Pulse-code modulation system, DPCM, Delta modulation system and adaptive delta modulation, Comparison of different pulse modulation methods. Line coding and types: unipolar RZ and NRZ, Polar RZ and NRZ, bipolar NRZ, split phase Manchester format.					8
Unit III	DIGITAL MODULATION TECHNIQUES				
Generation and detection of Binary ASK, FSK, PSK, QPSK(Coherent only), DPSK, Minimum Shift Keying (MSK) and GMSK. Advantages/Disadvantages and applications of different digital modulation techniques. Comparison of different modulation techniques.					9
Unit IV	ERROR CONTROL CODING				
Types of codes, Discrete memory less channel ,Error control coding methods ,forward error correction , error detection with retransmission ,types of errors :random error and burst error, Principles of linear block codes, Hamming code, Binary cyclic codes, Cyclic redundancy check code (CRC),Convolution code.					9
Unit V	SPREAD SPECTRUM TECHNIQUES				
Spread spectrum communication, Pseudo noise sequences, Properties of PN sequence: Balance property, Run property and Correlation property, Direct sequence spread spectrum systems ,Processing gain and performance, Frequency hopping systems ,Comparison of fast hopping versus slow hopping ,Synchronization, Jamming consideration, Commercial application of spread spectrum communication.					9
TOTAL PERIODS					45



Suggested List of Students Activity:

- Presentation / Seminars by students on any recent technological developments based on the course.
- Periodic class /online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.
- Visit nearby BSNL and TV station and prepare detail report of digital communication.
- Student may view video lectures from NPTEL on Digital communication systems and submit assignments on required topics.

Text Books for Reference:

1. Simon Haykin ,Digital Communication Systems, 1st edition , John Wiley & Sons Inc, 2013
2. Wayne Tomasi ,Electronic communication systems, 5th Edition ,Pearson Education,2008
3. T. L. Singal,Analog and Digital Communications, 1st Edition, Mc Graw Hill Education Pvt. Ltd,2012

Web-based/Online Resources:

1. <https://nptel.ac.in/courses/117101051>
2. https://onlinecourses.nptel.ac.in/noc22_ee10/preview



1055235211	Wireless Communication and Standards	L	T	P	C
THEORY		3	0	0	3

Introduction:

In this world of connectivity and collaborative work environment, it is necessary to connect to the network from anywhere, with anybody, at any time. Wireless communication provides connectivity with mobility, flexibility and convenience. Wireless devices are used across the various industries like Healthcare, Education, Automation, Renewable energy sector, Automobile etc. Effective use of social networking has become possible due to high end wireless devices. This course will help the students to develop skills to handle wireless and mobile communication systems such as 2G/3G/4G/5G.

Course Objectives:

- To understand the basics of wireless communication
- To create the foundation of cellular concepts which will be useful for understanding the fundamentals of cellular mobile communication systems design
- To understand various multiple access techniques
- To know about wireless systems.
- To learn the fundamental and emerging trends in Mobile Communication, wireless Network/protocol architecture and broadcast systems.

Course Outcomes:

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

CO1: Describe the mobile and wireless network systems such as 2G/3G/4G/5G and its evolution.

CO2: Explain cellular concepts like frequency reuse, hand-off and Interference

CO3: Differentiate between multiple access schemes and concept of Spread Spectrum techniques

CO4: Understand the architecture of wireless systems such as GSM, UMTS, IMT-2000.

CO5: Compare the different wireless standards

Pre-requisites:

Basics of Analog and Digital Communication



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	1	1	-	1	1	1
C02	3	2	3	-	1	-	1
C03	3	2	3	-	1	-	-
C04	2	1	1	-	1	-	1
C05	2	1	2	-	1	-	-

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

Instructional Strategy:

These are the sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course.

- Massive Open Online Courses (MOOCs) may be used to teach various topics/sub topics.
- Information and Communication Technology (ICT) enabled learning are to be employed.
- Real world applications/Case studies-based teaching learning can be provided.
- Guide student(s) in undertaking micro projects



1055235211	Wireless Communication and Standards	L	T	P	C
THEORY		3	0	0	3

Assessment Methodology:

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

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

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

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

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

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

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

Question Pattern: Model Examination and End Semester Examination

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

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



1055235211	WIRELESS COMMUNICATION AND STANDARDS	L	T	P	C
THEORY		3	0	0	3
Unit I	INTRODUCTION TO WIRELESS COMMUNICATION SYSTEMS				
Evolution of mobile radio communications, examples of wireless communication systems-paging systems, cordless telephone systems, cellular telephone systems, comparison of common wireless communication systems, trends in cellular radio and personal communications. Modern Wireless Communication Systems: 2G,3G,4G,5G wireless networks.					9
Unit II	CELLULAR CONCEPT				
Introduction, Cell, Cell structure, Cluster, Frequency reuse, Channel Assignment strategies-Fixed and Dynamic assignment, Hand off Strategies-Concept of hand off, Types of hand off-Soft, Hard, MAHO(Mobile Assisted Handoff), Interference and system capacity-Cochannel Interference, Adjacent Channel Interference, Improving coverage and capacity in cellular systems- Cell splitting, Sectoring, Microcell Zone Concept.					9
Unit III	MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION				
Introduction to Multiple Access Techniques –Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA)-Distinction between TDMA FDD and TDMA TDD, Spread spectrum multiple access-Frequency Hopped Multiple Access (FHMA), Code Division Multiple Access (CDMA), Space Division Multiple Access.					9
Unit IV	WIRELESS SYSTEMS				
Global System for Mobile Communication - Features and Services- GSM architecture, GSM entities, Need for 3G ,4G and 5G technology, IMT 2000 Global standards-Vision-Compatibility, service and spectrum requirements, UMTS features and architecture.					9
Unit V	WIRELESS STANDARDS				
IEEE 802 Architecture - WiFi-IEEE 802.11a/g(OFDM)-IEEE 802.11b(DSSS), IEEE 802.15(WPAN), Wireless Metropolitan Area Network (WMAN) - Wi-MAX-IEEE 802.16-4G LTE-LTE Advanced - 5G and advances.					9
TOTAL PERIODS					45



Suggested List of Students Activity:

- Visit nearby MTNL/BSNL exchange and prepare detail report of entire setup of their cellular systems.
- Visit nearby CDMA based cellular switching centre and prepare details of the entire setup of their cellular system.
- Prepare a report on TRAI regulations related to mobile communications (spectrum allocation)
- Compare specifications/features/technology of different mobile phones available in market (Minimum 12 specifications)
- Prepare a brief report on how radiations from BTS and handsets affect human beings.

Text Book for reference:

- 1) Theodore S. Rappaport, "Wireless Communications, Principles and Practice", 2nd edition, Pearson Publication New Delhi, 2014.
- 2) Stallings W., "Wireless Communications & Networks", 2nd edition, Prentice Hall, 2009.
- 3) Lee, C.Y. William, "Mobile Cellular Telecommunication Systems", 2nd edition, McGraw Hill Education, New Delhi, 2017.

Website links for reference:

- <https://archive.nptel.ac.in/courses/117/102/117102062/>
- <https://www.digimat.in/nptel/courses/video/106106167/L01.html>



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

Introduction

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

Course Objectives

The objective of this course is to enable the student to

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

Course Outcomes

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

C01: Understand Data Warehousing principles, architecture, and ETL processes, including Dimensional Modeling.

C02: Utilize tools and technologies proficiently for Data Warehousing.

C03: Develop skills in core Data Mining concepts.

C04: Master advanced Data Mining techniques like Support Vector Machines, Neural Networks, Text Mining, and DBSCAN for in-depth analysis.

C05: Apply Data Warehousing and Data Mining in real-world scenarios.

Pre-requisites: Nil



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	3	3	1	1	2	1
C02	3	3	3	1	1	3	2
C03	3	3	3	1	1	3	1
C04	3	3	3	1	1	3	2
C05	3	3	3	1	1	3	2

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

Instructional Strategy

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



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

Assessment Methodology

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

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

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

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

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

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

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

Question Pattern: Model Examination and End Semester Examination

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

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



1052235212	Data Warehousing And Data Mining	L	T	P	C
Theory		3	0	0	3
Unit I	INTRODUCTION TO DATA WARE HOUSING				
Introduction to Data Warehousing: Concepts and Architecture - Data Warehouse Design: Dimensional Modeling, Fact, and Dimension Tables - ETL Processes: Data Extraction, Transformation, and Loading - Data Warehouse Implementation: Tools and Technologies					8
Unit II	DATA WAREHOUSING TECHNIQUES AND TOOLS				
Data Warehouse Lifecycle: Planning, Design, Implementation, and Maintenance - Data Quality and Metadata Management - OLAP and Multidimensional Data Analysis - Data Warehousing in Cloud Environments					9
Unit III	INTRODUCTION TO DATA MINING				
Fundamentals of Data Mining: Concepts, Tasks, and Challenges - Data Preprocessing: Data Cleaning, Integration, Transformation, and Reduction - Classification Techniques: Decision Trees, Naive Bayes, and k-Nearest Neighbors - Clustering Techniques: K-means, Hierarchical Clustering - Association Rule Mining and Frequent Pattern Analysis					10
Unit IV	CLASSIFICATION TECHNIQUES				
Introduction to Classification: supervised learning and classification - Decision Trees: ID3, C4.5, and CART algorithms, handling overfitting and pruning techniques - Naive Bayes Classifier: Principles of Bayesian classification, Naive Bayes algorithm for text classification - k-Nearest Neighbors (KNN): KNN algorithm, Distance metrics and parameter selection					10
Unit V	CLUSTERING TECHNIQUES				
Introduction to Clustering – Basics concepts of clustering – Partitioning Methods: K-Means clustering – hierarchical clustering: Agglomerative and Divisive Hierarchical clustering Methods - Comparison between partitioning and Hierarchical clustering approaches					8
TOTAL PERIODS					45



Suggested List of Students Activity

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

Text Book and References

- "Data Warehousing: Concepts, Techniques, Products and Applications" by S. S. V. Rajan.
- Data Warehousing: Data Mining & OLAP" by Alexis Leon and Mathews Leon.
- "Data Mining: Techniques, Methods and Algorithms" by B. B. Priyadarsini and C. Malarvizhi"
- "Data Mining: Concepts and Techniques" by P. V. Rajkumar and K. Sarukesi"
- "Data Warehousing and Data Mining: Techniques, Tools, and Applications" by S. K. Singh and S. Dhamija.

Web-based/Online Resources

<https://www.geeksforgeeks.org/data-mining/>

<https://www.javatpoint.com/data-mining-cluster-analysis>

https://www.tutorialspoint.com/dwh/dwh_schemas.htm



1052235213	CRYPTOGRAPHY	L	T	P	C
THEORY		3	0	0	3

Introduction

This program aims to help the students to understand and recognize various threats to security and to provide the students with the fundamental knowledge of what cryptography is, how it has evolved, and some key encryption techniques used today.

Course Objectives

The objective of this course is to enable student:

- To gain knowledge on various threats to security in network.
- To realize the need for network security.
- To gain knowledge about cryptography and how it evolved.
- To learn various Encryption algorithms.
- To apply different types of encryption techniques to encrypt/decrypt data or information.
- To learn about message authentication and hash functions.

Course Outcomes

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

- CO1: Identify and describe the common types of security threats and the potential threats to CIA of Computer Systems.
- CO2: Define cryptography, describe the elements of the encryption process and apply various encryption standards.
- CO3: Compare symmetric and asymmetric encryption systems.
- CO4: Evaluate the authentication and hash algorithms.
- CO5: Examine the effects on digitized security.

Pre-requisites: Nil



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	2	1	---	---	---	1
C02	3	3	3	---	---	1	2
C03	3	3	3	---	---	---	1
C04	3	3	3	---	1	---	---
C05	3	2	3	---	---	---	---

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

Instructional Strategy

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



1052235213	CRYPTOGRAPHY	L	T	P	C
THEORY		3	0	0	3

Assessment Methodology

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

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

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

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

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

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

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

Question Pattern: Model Examination and End Semester Examination

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

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



1052235213	CRYPTOGRAPHY	L	T	P	C
THEORY		3	0	0	3
Unit I	INTRODUCTION AND SECURITY CONCEPTS				
Information Security Concepts - Need for security - Threats to security: Viruses and Worms, Intruders, Information Warfare (IW)					3
Types of security attacks: Denial of service, backdoors and trapdoors, sniffing, spoofing, man in the middle, Encryption attacks – Brute Force attack - Malware: Viruses, Logic bombs.					3
Network security model, CIA model, non-repudiation.					3
Unit II	CRYPTOGRAPHY AND CLASSICAL CIPHERS				
Introduction to cryptography: ciphers, encryption, decryption – Cryptology - Cryptanalysis - Steganography					3
Classical encryption techniques: substitution ciphers - Caesar's cipher- Transposition ciphers - monoalphabetic and polyalphabetic transposition techniques					3
Types of Cryptography: Symmetric key and Asymmetric Key Cryptography, Hashing					3
Unit III	SYMMETRIC KEY CRYPTOGRAPHY				
Introduction to Symmetric-key cryptography;					2
Block Ciphers - Data Encryption Standard (DES), Advanced Encryption Standard (AES); Stream Ciphers - RC4					4 2
UNIT IV	ASYMMETRIC/PUBLIC KEY CRYPTOGRAPHY				
Need and Principles of Public-key/Asymmetric cryptosystems.					2
Public-key Algorithms: RSA Algorithm - Key Distribution and Management Diffie-Hellman algorithm – Elliptic Curve Cryptography (ECC): Introduction to Bitcoin - Digital signature.					8
UNIT V	MESSAGE AUTHENTICATION AND INTEGRITY				
Authentication requirement – Message Authentication Code - Hashing: Hash Function, Message Digest (MD5), Secure Hash algorithm (SHA);					5
Digital certificate: Basics, certificate authorities, registration authorities, steps for obtaining a digital certificate, steps for verifying authenticity and integrity of a certificate.					4
TOTAL PERIODS					45



Suggested List of Students Activity

- Presentation/Seminars by students on recent technological developments in the field like – Cryptocurrency and Bitcoins can be encouraged.
- Periodic class/online quizzes conducted based on the course.
- Students can be tasked to perform simulation and assignments suggested in Virtual labs initiative.
- Fun activities like treasure hunt shall be designed where students should crack cipher texts to get clues.
- Students can be encouraged to search the internet in their leisure time for fun worksheets/workshops based on Cryptography.

e.g, <https://www.stem.org.uk/resources/elibrary/resource/36022/cryptography-workshop> – Role Play based online learning activity.

Text Book for References

- William Stallings, Cryptography and Network Security Principles and Practice, 5th Edition, Pearson Education Inc, 2010.
- Behrouz A. Forouzan, Introduction to Cryptography and Network Security, 1st Edition, McGraw-Hill, 2008.
- William Stallings, Network Security Essentials: Applications and Standards, 4th Edition, Pearson Education Inc, 2013.

Web-based/Online Resources

- NPTEL course - Foundations of Cryptography by Prof.Ashish Choudhury:
https://onlinecourses.nptel.ac.in/noc24_cs01/preview
- Virtual Labs, An MoE of India Initiative – simulations here will help students understand each cipher better:
<https://cse29-iiith.vlabs.ac.in/>



1055235214	NETWORK SECURITY	L	T	P	C
THEORY		3	0	0	3

Introduction

This subject provides an introduction to the fundamental concepts and principles of network security. Students will learn about various threats, vulnerabilities, and attacks targeting networked systems and explore strategies for mitigating risks and protecting information

Course Objectives

The objective of this course is to enable the student to

- To understand the basic concepts of network security
- To learn the fundamentals of cryptography and its application to network security.
- To understand the mathematics behind cryptography
- To understand the concept of authentication protocols and digital signatures.
- To learn various network security attacks.
- To understand the IP and Web security.

Course Outcomes

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

CO1: Describe network security fundamental concepts

CO2: To get better knowledge on fundamental concepts of cryptography, encryption and hashing techniques

CO3: Acquire the knowledge of various authentication protocols, key exchange mechanism, and digital certificates

CO4: Identify and assess different types of threats and attacks such as social engineering, rootkit, and botnets, etc

CO5: Demonstrate the ability to select among available network security technology and protocols such as IDS, firewalls, SSL, TLS, etc

Pre-requisites:

Basic understanding of computer networking concepts.



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	2	1	1	-	-	1
C02	3	3	3	3	-	-	1
C03	3	3	3	3	-	-	1
C04	3	3	2	2	-	-	3
C05	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 of discrepancies.



1055235214	NETWORK SECURITY	L	T	P	C
THEORY		3	0	0	3

Assessment Methodology

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

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

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

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

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

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

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

Question Pattern: Model Examination and End Semester Examination

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

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



1055235214	NETWORK SECURITY	L	T	P	C
Theory		3	0	0	3
Unit I	INTRODUCTION TO NETWORK SECURITY				
Overview of Networking Security– Security Services and Mechanisms: Confidentiality, Authentication, Integrity, Non Repudiation, Auditability, Access Control and Availability– Attacks – Types of Attacks: Criminal attacks – Legal Attacks – Active attacks – Passive attacks –Security Attacks: Interruption, Interception, Modification and Fabrication.					7
Unit II	PUBLIC–KEY CRYPTOGRAPHY				
Basics of Cryptography – Symmetric Encryption Principles –Symmetric Block Encryption Algorithms – DES, AES – Stream ciphers –RC4 – Digest function – Public key Cryptography Principles–RSA– Diffe Hellman algorithm– Secure Hash Functions – HMAC					10
Unit III	AUTHENTICATION AND SECURITY				
Authentication Overview – Authentication Protocols: Kerberos– Authentication and Key Establishment – Key Exchange – User Authentication –Password Based Authentication –Password Security – Certificate Authority and Key Management – Digital Signatures					9
UNIT IV	SECURITY ATTACKS				
Buffer Overflow Attacks & Format String Vulnerabilities – Denial of Service Attacks – Hijacking Attacks– Exploits and Defenses – Internet Worms – Viruses – Spyware – Phishing– Botnets – TCP Session Hijacking – ARP attacks – Route Table Modification – UDP Hijacking – Man in the Middle attacks –Spoofing Basics – IP, DNS and ARP Spoofing					9
UNIT V	WEB SECURITY				
Network defense tools: Firewalls, VPNs, Intrusion Detection, and filters – Email privacy: Pretty Good Privacy (PGP) and S/MIME – IP security : Overview–IP Security Architecture Web security: Secure Socket Layer (SSL) and Transport Layer Security (TLS) – Secure Electronic Transaction (SET)					10
TOTAL HOURS					45



Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments based on the course.
- Periodic class quizzes conducted based on the course
- Group discussions will allow students to express their opinions on trending topics related to the course.

Textbooks for Reference:

1. William Stallings, Network Security Essentials: Applications and Standards 5th Edition, Pearson Education, 2014.
2. William Stallings, Cryptography and Network Security Principles and Practices, 4th Edition, Pearson Education, 2008.
3. Behrouz A. Foruzan, Cryptography and Network Security, TataMcGraw Hill, 2007

Web-based/Online Resources

1. <https://www.geeksforgeeks.org/network-security/>
2. <https://www.javatpoint.com/computer-network-security>



1052235215	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 learning are 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 to

C01: Remember the basic concepts of Artificial intelligence.

C02: Solve basic AI based problems.

C03: Define the concept of Artificial Intelligence.

C04: Apply AI techniques to real-world problems to develop intelligent Systems.

C05: Select appropriately from a range of techniques when implementing intelligent systems.

Pre-requisites: Nil



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	3	3	1	1	3	1
C02	3	3	3	1	1	3	2
C03	3	3	3	1	1	3	1
C04	3	3	3	1	1	3	2
C05	3	3	3	1	1	3	2

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

Instructional Strategy

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



1052235215	ARTIFICIAL INTELLIGENCE	L	T	P	C
THEORY		3	0	0	3

Assessment Methodology

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

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

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

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

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

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

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

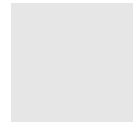
Question Pattern: Model Examination and End Semester Examination

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

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



1052235215		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 TECHNIQUES							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 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.

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>



1055235216	CYBER SECURITY	L	T	P	C
THEORY		3	0	0	3

Introduction

This subject will be responsible for establishing a comprehensive understanding in the field of cyber security. The students would be able to go deeper into hard-core cyber security topics during the course duration. The students know about the various ways to defend internet-connected devices and services from malicious attacks by hackers, spammers and cybercriminals.

Course Objectives

The objective of this course is to enable the student to

- Understand the basic concepts of cyber security.
- Learn about security attacks.
- Able to understand various modes of Cyber Crimes and Preventive measures.
- To understand the Cyber Legal laws and Punishments.
- Learn about approaches to secure networks, firewalls, and intrusion detection and prevention systems.

Course Outcomes

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

CO1: Outline the basics of cyber security, security principles and models.

CO2: Develop a deeper understanding and comprehend different types of cyber-attacks.

CO3: Have an overview of the cybercrime and identify the need for cyber laws on cybercrime.

CO4: Realize about tools and methods used in cybercrime.

CO5: Employ intrusion detection and prevention tools and explore the Next Generation Security.

Pre-requisites:

- Basics of Computer Networks and Security.
- Knowledge about Cryptography.



CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C01	1	2	3	2	3	-	-
C02	2	2	3	2	2	-	-
C03	1	1	3	2	2	1	2
C04	1	2	3	3	1	-	2
C05	2	2	3	2	3	-	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.
- **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 analyse potential sources of error in case of discrepancies.



1055235216	CYBER SECURITY	L	T	P	C
THEORY		3	0	0	3

Assessment Methodology

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

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

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

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

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

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

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

Question Pattern: Model Examination and End Semester Examination

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

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



1055235216	CYBER SECURITY	L	T	P	C
THEORY		3	0	0	3
Unit I	Introduction to Cyber Security				
Cyber Security: Definition - Need for cyber security – Evolution of Cyber Security - Issues and challenges - Cyber Security Architecture and Components - Fundamental security principles: threats, attacks and vulnerability - Cyber security models (the CIA triad, the star model, the Parkerianhexad).					9
Unit II	Cyber Attacks				
Introduction - Scope of Cyber Attacks - Ransomware - Password Cracking- Keyloggers and Spywares - Virus and Worms - Trojan Horse - Steganography - DoS and DDoS Attacks - SQL injection - Phishing – Identity Theft (ID Theft): Types and Techniques.					9
Unit III	Cyber Crime and IT Act.				
Cyber Crime - Reason for Cyber Crime – History of Cyber Crime - Classification of Cybercrimes – Cybercriminals - Organisations dealing with Cyber Crime and Cyber security in India - Cyber Laws – The Indian IT Act, 2000 – Cybercrime and Punishment.					9
UNIT IV	Reconnaissance And Scanning				
Reconnaissance and types – Footprinting Tools: Harvester – Whois – Netcraft; Footprinting with DNS – Google Hacking - Social Engineering Reconnaissance; Scanning: Concept – Identify Active machines - Port Scanning – Scanning Methods: Ping sweeps – Nmap – XMAS.					9
UNIT V	Intrusion Detection and Prevention Systems				
Intrusion Detection System(IDS): Overview and Classification of IDS - Network-Based IDSs - Host-Based IDSs; Intrusion Prevention Systems: Introduction - Honeypots and Honeynets; Firewalls: Need for Firewalls - Types of Firewalls – IDS vs Firewalls.					9
TOTAL HOURS					45



Suggested List of Students Activity:

- Presentation/Seminars by students on any recent technological developments based on the course.
- Periodic class/online quizzes on a weekly/fortnightly based on the course.
- Blended learning activities to explore the recent trends and developments in the field.
- Case study on recent cybercrime cases registered in India and their punishments.
- Group Discussion on cyber security tools among the students.
- Demonstration of installation and working of the cyber security tools.

Textbooks for Reference:

1. Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", First Edition, Wiley Publishers, 2011.
2. Lawrence C. Miller, "Cyber security for Dummies" -Palo Alto Networks, Seventh Edition, John Wiley & Sons, Inc., 2022.
3. William Stallings, "Effective Cyber security: A Guide to Using Best Practices and Standards", First Edition, Addison - Wesley Professional Publishers, 2018.

Web-based/Online Resources

- <https://nptel.ac.in>
- <http://swayam.gov.in>
- <https://www.youtube.com/watch?v=IEyl59slwTg>
- <https://www.youtube.com/watch?v=OYsY5B9pqYU>



1055235340	ADVANCE COMPUTER NETWORKING	L	T	P	C
PRACTICUM		1	0	4	3

Introduction

The course is designed for students with basic knowledge of networking and involves both theory and practical sections. This course is designed to introduce the fundamentals of some advanced networking concepts, like routing protocols, wireless networks etc. This course provides students with an opportunity to learn the fundamentals behind the design of wireless sensor networks. Students will also learn to use network simulators to design various network scenarios.

Course Objectives

The objective of this course is to enable the student

- To gain knowledge in rapidly growing technologies in networks.
- To learn to develop solutions involving campus network topology design, switching, routing, internet connectivity.
- To get familiar with wireless sensor network and its applications.
- To simulate various network topologies in software.
- To demonstrate practical skills acquired through laboratories sessions either individually or as a group.

Course Outcomes

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

CO1: Demonstrate an appreciation of theory and practice of wireless LAN.

CO2: Demonstrate ability to setup and administer a network with both wired and wireless devices.

CO3: Simulate working of wired and wireless networks and illustrate understanding of networking concepts.

CO4: Describe the overview of wireless sensor networks and enabling technologies for WSN.

CO5: Apply the design principles of WSN architectures and implement LEACH protocol by simulating environment situations.

Pre-requisites:

Student should have taken a basic course on Computer Networks.



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	2	2	2	---	---	1
C02	3	3	3	3	---	2	2
C03	3	3	3	3	---	---	2
C04	3	2	3	---	---	---	---
C05	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 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.



1055235340	ADVANCE COMPUTER NETWORKING	L	T	P	C
PRACTICUM		1	0	4	3

Assessment Methodology

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

Note:

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

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



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

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

SCHEME OF EVALUATION

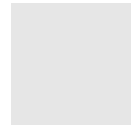
PART	DESCRIPTION	MARKS
A	Aim (05) , Procedure(30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055235340	ADVANCE COMPUTER NETWORKING	L	T	P	C
PRACTICUM		1	0	4	3
Unit I	INTRODUCTION TO WIRELESS LAN				
ISM band, 802.11a/b/g wireless standards - Adhoc, infrastructure mode of WLAN - Access Point in Repeater Mode - Security in WLAN, MAC Filtering, WEP/WPA - Evaluation of WLAN, Wireless Home Networking - IEEE 802.11 standard for WLAN					4
Ex No 1: Study the interfaces in a router. (Console port, AUI, Serial, Auxiliary, Ethernet, Fast Ethernet, BRI). Setup up a Wi-Fi router in your lab, log in and configure the router. Connect a PC in your lab to Wi-Fi. Ex No 2: a) Wireless LAN setup in infrastructure mode - Configure a Wi-Fi router in one floor of your institution, use wireless access points to extend Wi-Fi to other floors in your organization b) Wireless LAN setup in adhoc mode - Create a ADHOC network in a windows device, add other windows devices to this ADHOC network and ensure connection through ping command.					12
Unit II	ROUTING BASICS				
IP Routing: Static Routing - Dynamic Routing - Basic Routing Protocols					3
Ex No 3: Create two subnets, configure a Wi-Fi router to connect these subnets (have wired and wireless devices in the subnets). Add static routes as required and use ping command to ensure the connectivity between these subnets. Ex No 4: Telnet into the router and perform basic router commands to get stats of the devices connected to your router. Ex No 5: Download and install a network simulator.					18
Unit III	APPLICATION LAYER PROTOCOLS				
DNS - Concept of Domain name space, DNS operation. DHCP - Static and Dynamic Allocation, DHCP operation. Remote Login: TELNET					4
Ex No 6: Create a topology with one server and few client computers, use DHCP and show dynamic IP allocation using relevant simulation software.					18



Ex No 7: Configure Domain Name Server (DNS) using relevant simulation software.	
Ex No 8: Configure Telnet Server in a windows machine and access it by using a client connected in intranet.	
UNIT IV	OVERVIEW OF WIRELESS SENSOR NETWORK
Single-Node Architecture - Hardware Components- Network Characteristics- Types of wireless sensor networks - Introduction to IEEE 802.15.4 standard and ZigBee – Overview of Routing protocols in WSN – LEACH protocol	4
Ex No 9: Simulate a wireless sensor network. Ex No 10: Implementation of LEACH routing protocol in simulation.	12
TOTAL HOURS	75

Suggested List of Students Activity

- Presentation/Seminars by students on emerging technological developments in wireless networks can be encouraged.
- 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

- Andrew S. Tenenbaum, Computer Networks, 5th Edition, Pearson Publication, 2011.
- William Stallings, Wireless Communications and Networks, 2nd Edition, Pearson Education Inc, 2005.
- C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks Architectures and Protocols", 2nd Edition, Pearson Publication, 2015.

Web-based/Online Resources

- CISCO – Routing protocols:
<https://www.cisconetsolutions.com/introduction-to-routing-protocols/>
- Blog about NS2 simulator:
<https://ns2blogger.blogspot.com/p/ns2-program-for-wireless-topology.html>



Equipment / Facilities required to conduct the Practical Portion

1. Hardware Requirement:

- Desktop Computers with wireless network adapter
- Wi-Fi Router ,Wireless Access Points (WAP)
- Wireless devices like Laptop, Smartphone, Printer

2. Software Requirement:

- Network simulation software – like CISCO packet tracker/NS2

BOARD PRACTICAL EXAMINATION

PART – A

Ex No 1: Study the interfaces in a router. (Console port, AUI, Serial, Auxiliary, Ethernet, Fast Ethernet, BRI). Setup up a Wi-Fi router in your lab, log in and configure the router. Connect a PC in your lab to Wi-Fi.

Ex No 2: a) Wireless LAN setup in infrastructure mode - Configure a Wi-Fi router in one floor of your institution, use wireless access points to extend Wi-Fi to other floors in your organization

(OR)

b) Wireless LAN setup in adhoc mode - Create a ADHOC network in a windows device, add other windows devices to this ADHOC network and ensure connection through ping command.

Ex No 3: Create two subnets, configure a Wi-Fi router to connect these subnets (have wired and wireless devices in the subnets). Add static routes as required and use ping command to ensure the connectivity between these subnets.

Ex No 4: Telnet into the router and perform basic router commands to get stats of the devices connected to your router.

Ex No 5: Download and install a network simulator.

PART – B

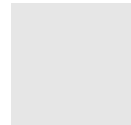
Ex No 6: Create a topology with one server and few client computers, use DHCP and show dynamic IP allocation using relevant simulation software.

Ex No 7: Configure Domain Name Server (DNS) using relevant simulation software.

Ex No 8: Configure Telnet Server in a windows machine and access it by using a client connected in intranet.

Ex No 9: Simulate a wireless sensor network.

Ex No 10: Implementation of LEACH routing protocol in simulation.



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055235440	CLOUD COMPUTING	L	T	P	C
PRACTICUM		2	0	4	4

Introduction

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

- CO1: 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 the knowledge about Computer Networks.

The student should have the basic Knowledge about network protocols.



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	3	2	1	1	1	3
C02	2	3	3	1	2	1	3
C03	3	2	2	1	1	1	3
C04	3	2	3	1	2	2	3
C05	3	2	3	2	1	2	3

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

Instructional Strategy

- The facilitator can administer a quick quiz or poll to get an understanding of how far along students are in their learning.
- In a classroom setting, working on case studies encourages students to think critically about what they've learned, not just recite points back to the class.
- The student can use Think-pair-share method, such that it could spark debate between the grouped or paired students.
- The use of simulations and games in your instructional toolkit can give you a deeper look at the impact of learning, as well as demonstrate how students can invent and experiment with learned concepts.



1055235440	CLOUD COMPUTING	L	T	P	C
PRACTICUM		2	0	4	4

Assessment Methodology

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

Note:

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

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



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

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

SCHEME OF EVALUATION

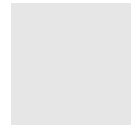
PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055235440	CLOUD COMPUTING				L	T	P	C
PRACTICUM					2	0	4	4
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	Schedule an online meeting with Google Meet through Google Calendar.							12
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, what is virtual machine, server virtualization models, server virtualization platforms Architecture.								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.							12
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.							12
6	Install OpenStack on your workstation and launch the first instance.							
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	
7	Install Docker Engine on Linux / Windows.	12
8	Protect Google Sheets and Range with various access permissions.	
Unit - 5	CLOUD COMPUTING APPLICATIONS	
Adobe Creative Cloud Firefly design models– GitHub repository basics– LinkedIn Benefits– Zoho WorkDrive Features – Storage Concept of Google Bigtable.		6
Ex. No.	Name of the Experiment	
9	Setup a github account and develop a simple python project.	12
10	Create a column family with an age-based garbage-collection policy in Google Bigtable.	
TOTAL HOURS		90

Suggested List of Students Activity

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

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>



Facilities & Equipment required for the conduct of practicals

Hardware Requirement

Desktop computers with internet connection

Printer

Software Requirement

Windows / Linux operating System

BOARD PRACTICAL EXAMINATION

PART - A

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of existing OS.
2. Setting up a Java development Virtual Machine with VirtualBox.
3. Schedule an online meeting with Google Meet through Google Calendar.
4. Use Google Drive as Storage as a Service to Store, Organize, Share and Collaborate.
5. Install Google App Engine and create simple web applications using python/java.

PART – B

6. Install OpenStack on your workstation and launch the first instance.
7. Install Docker Engine on Linux / Windows.
8. Protect Google Sheets and Range with various access permissions.
9. Setup a github account and develop a simple python project.
10. Create a column family with an age-based garbage-collection policy in Google Bigtable.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055235541	DATA ANALYTICS AND DATA ANALYSIS	L	T	P	C
PRACTICUM		1	0	2	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 inbuilt 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 from multiple 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 to

CO1: 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 panda

CO4: 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	P01	P02	P03	P04	P05	P06	P07
C01	3	3	2	2	-	2	1
C02	3	3	3	3	-	1	3
C03	3	2	3	3	-	-	-
C04	3	3	3	3	2	-	-
C05	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 of discrepancies.



1055235541	DATA ANALYTICS AND DATA ANALYSIS	L	T	P	C
PRACTICUM		1	0	2	3

Assessment Methodology

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

Note:

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

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



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

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

SCHEME OF EVALUATION

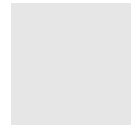
PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055235541	DATA ANALYTICS AND DATA ANALYSIS	L	T	P	C
PRACTICUM		1	0	2	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.					6
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.					8
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 5: Load a dataset into a data frame, drop the non- numeric columns and list out the basic static analysis of each column. Ex No 6: Load a dataset into a data frame, find correlation matrix and plot the heat map to find highly correlated feature of the target feature.					8
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 7: 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 8: Visualize a pre-cleaned dataset to detect an outlier and filter out them					8
TOTAL HOURS					45



Suggested List of Students Activity

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

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>

Text Book for References

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2. Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, O'REILLY 2018, Second Edition.
3. Fabio Nelli, Python Data Analytics, APRESS, 2015
4. Field Cady, The Data Science Handbook, John Wiley & Sons, 2017

Web-based/Online Resources

<https://www.kaggle.com/code/kumudatk/introduction-to-machine-learning#pandas>
<https://www.kaggle.com/code/doukanelik/missing-values>
<https://www.kaggle.com/code/mahnazarjmand/clustering-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 each column and fill the null values with suitable default value.

PART – B

Ex No 5: Load a dataset into a data frame, drop the non-numeric columns and list out the basic static analysis of each column.

Ex No 6: Load a dataset into a data frame, find correlation matrix and plot the heat map to find highly correlated feature of the target feature.

Ex No 7: 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 8: Visualize a pre-cleaned dataset to detect an outlier and filter out them.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055235542	CELLULAR COMMUNICATION AND MOBILE COMPUTING PLATFORM	L	T	P	C
PRACTICUM		1	0	2	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 transport layer. The students should be able to simulate various network topologies with different routing algorithms and they can analyze how each routing algorithm is performing its job.

Course Outcomes:

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

- C01: To explore various modulation techniques, multiplexing techniques and familiarize with wireless LAN technologies including IEEE 802.11, HIPERLAN, and Bluetooth.
- C02: To understand the evolution and concepts of cellular communication explore the practical issues of mobile computing using network simulation tools.
- C03: To analyse and compare different ad hoc routing protocols.
- C04: To identify the limitations of traditional TCP and understand various TCP improvements and their benefits.
- C05: 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
C01	3	2	1	1	3	2	2
C02	3	3	1	1	3	3	2
C03	2	3	2	1	1	1	3
C04	1	3	2	3	1	1	3
C05	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 of discrepancies.
- 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.



1055235542	CELLULAR COMMUNICATION AND MOBILE	L	T	P	C
PRACTICUM	COMPUTING PLATFORM	1	0	2	3

Assessment Methodology:

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

Note:

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

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



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

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

SCHEME OF EVALUATION

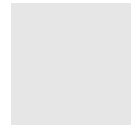
PART	DESCRIPTION	MARKS
A	Aim (05) , Procedure (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055235542	CELLULAR COMMUNICATION AND MOBILE	L	T	P	C
Practicum	COMPUTING PLATFORM	1	0	2	3
UNIT I 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 * 1. Installation of Network Simulator (Eg.NS2) 2. Implementation of Bluetooth network (transfer a file from one device to another). 3. Simulate authentication and encryption techniques used in GSM and analyze their performance. 4. Illustration of Hidden Terminal Problem using Network Simulator.					14
UNIT II MOBILE NETWORK AND TRANSPORT LAYER					
Mobile IP - Mobility features in IPv6 - Proactive and reactive adhoc routing protocols-DSDV, DSR. 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 * 5. Simulate the Distance Vector Routing Algorithm and Analyze the performance metrics such as throughput, packet drop rate etc. 6. Create a mobile chatting application using TCP with a mobile client.					08
UNIT III 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 * 7. Set up a simple mobile network topology using a network simulator. Configure and manage mobile devices within a simulated network environment. 8. 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).					08
TOTAL HOURS					45



Suggested List of Students Activity:

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

Text Books for Reference:

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

Web-based/Online Resources:

1. http://www.isi.edu/nsnam/ns/doc/ns_doc.pdf
2. <https://www.nsnam.org/docs/release/3.22/tutorial/ns-3-tutorial.pdf>

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. Simulate authentication and encryption techniques used in GSM and analyze their performance.
4. Illustration of Hidden Terminal Problem using Network Simulator.

PART – B

5. Simulate the Distance Vector Routing Algorithm and Analyze the performance metrics such as throughput, packet drop rate etc.
6. Create a mobile chatting application using TCP with a mobile client.
7. Set up a simple mobile network topology using a network simulator. Configure and manage mobile devices within a simulated network environment.
8. 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 EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055235543	MICROCONTROLLER APPLICATIONS	L	T	P	C
Practicum		1	0	2	2

Introduction

This subject introduces the students to learn about microcontroller 8051 and architecture, Programming and interfacing. Also this subject is intended to develop the skills to solve the application problems related to microcontrollers and will enables the students to do the project effectively.

Course Objectives

The objective of this course is to enable the student

- To understand the architecture of 8051.
- To understand the Pin details of 8051
- To read and write simple 8051 assembly language programs.
- To understand the concept of peripherals.
- To understand the use the interfacing techniques

Course Outcomes

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

CO1: Analyze the architecture of 8051 microcontroller

CO2: Know the instruction set and addressing mode of 8051 microcontroller

CO3: interpret the programme for 8051 in assembly language for the given operations

CO4: Learn basics of peripherals

CO5: Interface the various interface board to microcontroller 8051

Pre-requisites:

Basics of digital logic circuits



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	2	2	2	---	---	1
C02	3	3	2	3	---	---	1
C03	3	3	3	3	---	---	1
C04	3	2	2	2	---	---	2
C05	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.
- Encourage Critical Analysis: Foster an environment where students can honestly assess experiment outcomes and analyze potential sources of error in case of discrepancies.



1055235543	MICROCONTROLLER APPLICATIONS	L	T	P	C
Practicum		1	0	2	2

Assessment Methodology

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

Note:

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

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



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

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

SCHEME OF EVALUATION

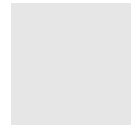
PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055235543	MICROCONTROLLER APPLICATIONS	L	T	P	C
Practicum		1	0	2	2
Unit I	INTRODUCTION OF 8051 MICROCONTROLLER				
Blocks of Microcontroller 8051: ALU, PC, DPTR, PSW, Internal RAM, Internal ROM, Latch, SFRs, General purpose registers, Timer/Counter, Interrupt, Ports -Pin details of 8051- Memory organization of 8051- Classification of 8051 instructions: data transfer instructions- Arithmetic instructions-Logical instructions- Branching instructions- Bit manipulation instructions- Structure of Assembly language- Different Addressing modes of 8051					8
Ex No 1: i) Write an assembly language program for adding two 8 bit and execute the same using 8051 trainer kit. ii) Write an assembly language program for subtracting two 8 bit numbers and execute the same using 8051 trainer kit. Ex No 2: i)Write an assembly language program using 8051 to perform 8 bit multiplication and execute the same using 8051 trainer kit. ii) Write an assembly language program using 8051 to perform 8 bit division and execute the same using 8051 trainer kit. Ex No 3: Write an assembly language program using 8051 to find the smallest number of the array of given numbers. Ex No 4: Write an assembly language program using 8051 to find the biggest number of the array of given numbers.					14
Unit II	PERIPHERAL INTERFACING				
Peripherals Of 8051: Timer/Counter: SFRs for Timer- Modes of Timers/counters- Programming 8051 Timer (Simple programs). Serial Communication: Basics of serial communication-SFRs for serial communication-Basics of RS232 standard-8051 serial port programming. Interfacing: Relay interfacing - Seven segment LED display interfacing- ADC interfacing- DAC interfacing - DC motor interfacing.					7
Ex No 5: Write a program to perform serial communication between two 8051 microcontroller kits and verify the output. Ex No 6: Write a program to interface Digital I /O board with microcontroller and out the led in rolling display. Ex No 7: Write a program to interface seven segment LED interface with microcontroller and display the character. Ex No 8: Write a program to interface DAC interface board with microcontroller and generate square waveform at DAC output.					16
TOTAL HOURS					45



Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based on the course.
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.
- Prepare a list of industrial partners in automation to understand the skill set required for employability.

Text Books for Reference:

- Ajit pal, "Microcontrollers, Principles and Applications ", PHI Ltd, 2011.
- Raj kamal, "Microcontroller architecture, programming, interfacing and system design", Pearson education, 2012.
- A. Nagoor kani, "Microprocessors and microcontroller" McGraw Hill Education, 2017.

Web-based/Online Resources

- <https://archive.nptel.ac.in/courses/108/105/108105102/>
- <https://www.sanfoundry.com/>

Equipment / Facilities required to conduct the Practical Portion

Hardware Requirement:

- 8051 Microcontroller kits
- CRO
- Digital I/O Interface board
- Seven segment LED display interface board
- 8 bit DAC interface board
- RS 232 serial port cable



BOARD PRACTICAL EXAMINATION

PART – A

Ex No 1:

- i) Write an assembly language program for adding two 8 bit and execute the same using 8051 trainer kit. **(OR)**
- ii) Write an assembly language program for subtracting two 8 bit numbers and execute the same using 8051 trainer kit.

Ex No 2:

- i) Write an assembly language program using 8051 to perform 8 bit multiplication and execute the same using 8051 trainer kit. **(OR)**
- ii) Write an assembly language program using 8051 to perform 8 bit division and execute the same using 8051 trainer kit.

Ex No 3:

Write an assembly language program using 8051 to find the smallest number of the array of given numbers.

Ex No 4:

Write an assembly language program using 8051 to find the biggest number of the array of given numbers.

PART – B

Ex No 5:

Write a program to perform serial communication between two 8051 microcontroller kits and verify the output.

Ex No 6:

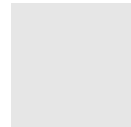
Write a program to interface Digital I /O board with microcontroller and out the led in rolling display.

Ex No 7:

Write a program to interface seven segment LED interface with microcontroller and display the character.

Ex No 8:

Write a program to interface DAC interface board with microcontroller and generate square waveform at DAC output.



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055235544	INTERNET OF THINGS	L	T	P	C
PRACTICUM		1	0	2	3

Introduction:

Internet of Things (IoT) is presently a hot technology worldwide. Government, academia, and industry are involved in different aspects of research, implementation, and business with IoT. IoT cuts across different application domain like agriculture, space, healthcare, manufacturing, construction, water, and mining. This course will give a hands-on experience to the students in designing and developing Internet of Things applications and models. The course aims to groom the students to enable them to work on current technology and prepare the students to keep pace with the changing face of technology and the requirements of the growing IT industry.

Course Objectives:

After undergoing the subject, students will be able to:

- Understand the concepts of Internet of Things.
- understand the component parts of an IoT network and its connections
- identify the sensors and other devices needed for different IoT solutions
- Build small IoT applications with sensors and actuators
- Create the Thing Speak cloud and upload the data into the same

Course Outcomes:

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

CO1: Define IoT, its Components and Communication Models

CO2: Design the IoT Application with LED, LCD, IR Sensor and Ultrasonic Sensor and Switches CO3: Define IoT Design Methodologies

CO4: Create IoT Based application with sensors and upload the data in the Thing speak Cloud.

CO5: Describe the applications of IoT.

Pre-requisites: Nil



CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C01	2	2	2	-	-	-	1
C02	3	3	3	2	2	-	2
C03	2	2	3	3	2	-	2
C04	3	3	3	3	2	1	2
C05	2	2	3	3	2	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.



1055235544	INTERNET OF THINGS	L	T	P	C
PRACTICUM		1	0	2	3

Assessment Methodology

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

Note:

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

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



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

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

SCHEME OF EVALUATION

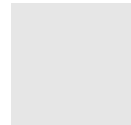
PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055235544	INTERNET OF THINGS	L	T	P	C
PRACTICUM		1	0	2	3
Unit I	INTRODUCTION TO IOT				
Introduction to the IoT and IoT Devices -- IoT Configurations – Basic Components – IOT functional blocks- Sensors – Actuators - Introduction to Arduino – Arduino Programming Structure – Sketches – Pins – Basic functions in Arduino : digitalWrite(), digitalWrite(), pinMode(), delay(), loop(), setup()					5
Ex No 1: Creating different led patterns and controlling them using push button switches. Ex No 2: Display "Hello World " in LCD 16X2 Display With Arduino					8
Unit II	DESCRIBING DATA				
IoT communication Models - IoT communication API's – Different types of Sensors- Integration of Sensors and Actuators with Arduino- Using Libraries in Arduino.					5
Ex No 3: Create the simple security system using IR sensor and Buzzer Ex No 4: Calculate the distance to an object with the help of an ultrasonic sensor and display it on an LCD.					8
Unit III	IOT & CLOUD				
IoT Levels: IOT Level-1- IOT Level-2- IOT Level-3-IOT Level-4 - IOT Level-5- IOT Level-6. Thing Speak Cloud – Setting up a cloud account in Thing Speak cloud platform.					5
Ex No 5: Interfacing Temperature Sensor (LM35) and humidity sensor Ex No 6: Upload Temperature and humidity data to Thing Speak with Node MCU/Raspberry Pi. Ex No 7: Create a simple application for Controlling of motor using input Switches. Ex No 8: Develop the simple Smart light system using PIR Sensor and Relays					14
TOTAL HOURS					45



Suggested List of Students Activity:

- Presentation/Seminars by students on any recent Applications in IoT, Industry 4.0 and Digital Twins
- online quizzes
- Blended learning activities to explore the recent trends and developments in the field.
- Model Development

Text Books for Reference:

1. Jeeva Jose, "Internet of Things", First Edition, Khanna Book Publishing, 2018
2. Arshdeep Bahga and Vijay Madisetti, "Internet of Things - A Hands-On Approach ", First Edition, Orient Blackswan Private Limited, 2015.
3. Mayur Ramgir, "Internet of Things- Architecture, Implementation, and Security", First Edition, Pearson Education, 2019

Web-based/Online Resources:

1. https://onlinecourses.nptel.ac.in/noc19_cs65/preview
2. https://onlinecourses.nptel.ac.in/noc21_ee85/preview
3. [Internet of Things: Design Concepts and Use Cases - Course \(swayam2.ac.in\)](https://swayam2.ac.in/courses/IoT/)
4. <https://www.arduino.cc/en/IoT/HomePage>
5. <https://thingspeak.com/>
6. [IoT Projects and Tutorials using Arduino, Raspberry Pi, ESP8266 & NodeMCU \(iotdesignpro.com\)](https://iotdesignpro.com/)

Equipment / Facilities required conducting the Practical Course

Software Requirement:

1. Arduino IDE
2. Thing Speak Cloud

Hardware Requirement:

1. Arduino kit -
2. Node MCU
3. LED Lights
4. 330K Resistor
5. Push Button
6. Servo Motor 5 V DC
8. Ultrasonic Sensor



9. 16x2 LCD Display
10. PIR Sensor
11. Buzzer
12. IR Sensor
13. Moisture sensor
14. Motor Drive
15. LM35 Temperature Sensor
16. 5V DC Relay
17. Mini Bread Board
18. Jumper Wires
19. Data Cables

BOARD PRACTICAL EXAMINATION

PART – A

Ex No 1: Creating different led patterns and controlling them using push button switches.

Ex No 2: Display “Hello World “ in LCD 16X2 Display With Arduino

Ex No 3: Create the simple security system using IR sensor and Buzzer

Ex No 4: Calculate the distance to an object with the help of an ultrasonic sensor and display it on an LCD..

PART – B

Ex No 5: Interfacing Temperature Sensor (LM35) and humidity sensor

Ex No 6: Upload Temperature and humidity data to Thing Speak with Node MCU/Raspberry Pi.

Ex No 7: Create a simple application for Controlling of motor using input Switches.

Ex No 8: Develop the simple Smart light system using PIR Sensor and Relays

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055235654	INNOVATION AND STARTUP	L	T	P	C
PRACTICUM		1	0	2	2

Introduction:

The integration of Innovation and Start-ups concept within the syllabus is testament to the forward thinking nature of educational institutions. By introducing this concept, students are provided with a solid foundation upon which they can build their skills in Innovation and Start-ups. This course can bridge the gap between theory and practice. It allows students to apply the knowledge they have acquired in a real world context, thereby enhancing their understanding and retention of the above concept. This experimental learning approach not only fosters a deeper level of engagement but also trains student with practical skills necessary to navigate the complexities of the business world. This also empowers students to become an Innovator or Entrepreneur. With necessary tools and knowledge, educational institutions are preparing the next generation of entrepreneurs to tackle the challenges and opportunities that lie ahead. This syllabus will explore the different facets of innovation, including its importance, types and strategies for fostering a culture of innovation within organizations

Course Objectives:

The objective of this course is to enable the students

- To understand the concept of Innovation and Start-ups
- To acquire knowledge of Prototype development, IPR, Patents and Copyrights
- To have the practical experience in preparing Business plan for Start-ups
- To visit the existing nearby industry to prepare project report about the present challenges of that industry
- To know the different funding supports available from Government and Non-Government schemes for Start-ups

Course Outcomes:

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

C01: Differentiate between Innovation and Start-ups

C02: Explain the importance of IPR, Patents and Copyrights.

C03: Describe the methodology to be adopted for preparing the Business Plan

C04: Gain practical experience by Industrial training and visiting the nearby industry

C05: Explore and identify various funding facilities available from Government and Non-Government Schemes for Start-ups



Pre-requisites:

There are no specific prerequisites for this course, although a basic understanding of business and technology concepts would be beneficial.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C01	-	-	1	-	2	3	3
C02	-	-	1	-	2	3	3
C03	-	-	1	-	2	3	3
C04	-	-	1	-	2	3	3
C05	-	-	1	-	2	3	3

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



1055235654	INNOVATION AND STARTUP	L	T	P	C
PRACTICUM		1	0	2	2

Assessment Methodology

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Class Assessment (Unit I,II & Unit III)	Seminar Presentations (Unit IV)	Submission of Industry Visit Project Report (Unit V)	Practical Examination (Project)
Duration	2 hours	---	---	3 hours
Exam Marks	50	20	30	100
Converted to	10	10	20	60
Marks	10	10	20	60

Continuous Assessment - 40 marks

S. No	Description	Marks
CA1	Class Assessment (50 marks) - Unit – I,II & III Written Examination - Theory Questions i) 10 questions out of 15 questions (10 x 3 marks :30 marks) ii) 4 questions out of 6 questions (4 x 5 marks : 20 marks)	10 marks
CA 2	Seminar Presentations (20 marks- each topic carries 10 marks) - Unit IV Students should present any two topics with PPTs	10 marks
CA 3	Submission of Industry Visit Project Report - (30 marks) - Unit V	20 marks
	Total	40 marks



End Semester Examination –Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Board of Examinations.

Detailed Allocation of Marks

S. No	Description	Marks
Part A	Written Examination – Unit –I,II & III Theory Questions	
i)	10 questions out of 15 questions (10 x 3 marks = 30 marks)	45
ii)	3 questions either or pattern (3 x 5 marks = 15 marks)	
Part B		
i)	Presentation of Industry Visit Project Report	25
ii)	Interaction and Evaluation	30
TOTAL		100



1055235654	INNOVATION AND STARTUP				L	T	P	C
Practicum					1	0	2	2
Unit I	INTRODUCTION TO INNOVATION							
An Introduction to Innovation and Creativity- Innovation in current Environment - Types of Innovation - Challenges of Innovation - Steps of Innovation Management - Divergent v/s Convergent thinking - Design thinking and Entrepreneurship								6
Unit II	INCUBATION CLUBS, IPR, PATENTS AND COPYRIGHTS							
Idea Generation - Incubation Clubs - Prototype Development - Marketing of Innovation - Management of Innovation - Creation of IPR -Types of IPR - Patents and Copyrights - Patents in India - Technological and Non-Technological Innovation Process.								6
Unit III	GOVERNMENT AND NON-GOVERNMENT FUNDING SCHEMES FOR START-UPS							
An introduction to Start-up - Start-ups in India - Procedure for registration of Start-ups - Business Model- Business Plan - Case Studies - Opportunities and Challenges - Funding supports from Government Schemes -MUDRA, TANSEED, NEEDS, PMEGP, UYEGP – Non-Government Schemes - CSR Fund - Angel Investors - Venture Capitalist								6
Unit IV	SEMINAR							
All the students have to select a minimum of 2 topics from the list given below. They are expected to collect the resources with the help of faculty assigned to them to prepare PPTs for presentation 1. Idea Generation 2. Innovation Management 3. Product Development 4. Business Model Innovation 5. Organizational Culture and Change Management 6. Leadership and Innovation 7. Barriers to Innovation 8. Innovation Marketing 9. E-Commerce success stories (any one) 10. Role of Start-ups in Higher Education 11. Professional Networking in Building Brands								9



12. How to start a start-up in India		
Unit V	EXPOSURE TO INDUSTRY	
All the students should visit and study the nearby industries, incubation centres, start-ups etc., and select any one to prepare a project report which covers the Name of the Industry/Organization, Introduction of the Industry, Type of the Industry, Scope of the Industry, Plant Layout and Location, Details of Plant and Machineries, Process flow chart, Manufacturing Methods, Process of Manufacturing, Product Manufacturing, Quality Control, Marketing, Product selling - Conclusion		18
TOTAL HOURS		45



1055235773	INDUSTRIAL TRAINING	SUMMER	C
Theory		VACATION	2

Introduction

Industrial training is a crucial component of the diploma engineering curriculum, designed to bridge the gap between theoretical knowledge and practical application. Typically conducted during vacation periods, this two-week training program provides students with hands-on experience in their respective engineering fields. The primary objectives are to enhance practical skills, familiarize students with industry standards, and prepare them for future employment.

Two-week industrial training during vacation periods is an invaluable part of diploma engineering education. It not only equips students with practical skills but also provides a comprehensive understanding of the industry, preparing them for successful engineering careers.

Objectives

1. **Practical Exposure:** Students gain direct exposure to real-world engineering practices, tools, and technologies.
2. **Skill Enhancement:** The training helps in developing technical and soft skills that are essential for professional growth.
3. **Industry Insight:** Students learn about the working environment, operational procedures, and challenges faced by industries.
4. **Professional Networking:** The training offers opportunities to interact with industry professionals, which can be beneficial for career prospects.
5. **Application of Knowledge:** It allows students to apply classroom knowledge to solve practical problems, enhancing their understanding and retention of engineering concepts.

Structure of the Training Program

- **Orientation:** Introduction to the company, its operations, and safety protocols.
- **Project Assignment:** Students are assigned specific projects or tasks relevant to their field of study.
- **Supervision and Mentorship:** Industry professionals guide and mentor students throughout the training.
- **Skill Development Workshops:** Sessions on technical skills, software tools, and industry best practices.



- **Assessment and Feedback:** Performance evaluations and constructive feedback to help students improve.

Benefits for Students

- **Enhanced Employability:** Practical experience makes students more attractive to potential employers.
- **Confidence Building:** Working in a real-world setting boosts confidence and professional demeanor.
- **Clarified Career Goals:** Exposure to various roles and responsibilities helps students define their career paths.

Course Outcomes

CO 1: Demonstrate proficiency in using industrial machinery, tools, and software.

CO 2: Able to identify, analyze, and solve engineering problems using industry-standard methods and practices.

CO 3: Gain a comprehensive understanding of industrial manufacturing processes, quality control, and safety practices.

CO 4: Exhibit improved communication, teamwork, and professional behavior in an industrial setting.

CO 5: Apply theoretical concepts learned in their coursework to practical engineering tasks and projects.

Duties Responsibilities of the Faculty Mentor.

One faculty mentor should be assigned for every 30 students by the HOD / Principal. Faculty mentors shall play a crucial role in overseeing and guiding students during their industrial training program in Diploma engineering.

Pre-Training Responsibilities:

1. **Orientation and Preparation:**
 - Conduct orientation sessions to familiarize students with the objectives, expectations, and guidelines of the industrial training program.
 - Assist students in understanding the importance of industrial training in their academic and professional development.
2. **Placement Coordination:**
 - Collaborate with the placement cell or industry liaison office to secure suitable training placements for students that align with their academic specialization and career interests.



- Facilitate communication between the institution and host organizations to ensure smooth coordination of training arrangements.

3. Training Plan Development:

- Help students develop a detailed training plan outlining learning objectives, tasks, and expected outcomes for the training period.
- Guide students in setting SMART (Specific, Measurable, Achievable, Relevant, Time-bound) goals for their training experience.

During Training Responsibilities:

4. Monitoring and Support:

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

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 learn new skills and technologies relevant to your field of study.
- Take initiative in asking questions, seeking clarification, and participating in discussions with supervisors and colleagues.

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 as required. 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 that of 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, and lessons 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 future career 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 a record is called Industrial training Diary. Students have to write this report regularly. All days for the week should be accounted for clearly giving attendance particulars (Presence, absence, Leave, Holidays etc.). The concern of the Industrial supervisor is to periodically check these progress reports.

In addition to the diary, students are required to submit a comprehensive report on training with details of the organisation where the training was undergone after attestation by the supervisors. The comprehensive report should incorporate study of plant / product / process / construction along with intensive in-depth study on any one of the topics such as processes, methods, tooling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of Industrial training. Any data, drawings etc. should be incorporated with the consent of the Organisation.



Scheme of Evaluation

Internal Assessment

Students should be assessed for 40 Marks by industry supervisor and polytechnic faculty mentor for the Internal Assessment.

Sl. No.	Description	Marks
A	Punctuality and regularity. (Attendance)	10
B	Level / proficiency of practical skills acquired. Initiative in learning / working at site	10
C	Self-expression / communication skills. Interpersonal skills / Human Relation.	10
D	Report and Presentation.	10
Total		50

End Semester Examination - Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Board of Examinations after the completion of industrial training. The marks scored will be converted to 60 marks for the End Semester Examination.

Sl. No.	Description	Marks
A	Daily Activity Report and Attendance certificate.	20
B	Comprehensive report on Internship, Relevant Internship Certificate from the concerned department.	30
C	Presentation by the student at the end of the Internship.	30
D	Viva Voce	20
Total		100



SEMESTER VI



6000236111	ADVANCED ENGINEERING MATHEMATICS	L	T	P	C
THEORY		3	0	0	3

Introduction:

Mathematics is essential for engineering students to understand core engineering subjects. It provides the framework for engineers to solve problems in engineering domains. This course is designed to bridge the gap between diploma mathematics and B.E/B.Tech mathematics in matrix algebra, differential calculus, vector calculus, differential equations, and Laplace transforms.

Course Objectives:

The objective of this course is to enable the students to

1. Understand the concepts of eigen-values and eigen-vectors of matrices.
2. Learn the notation of partial differentiation and determine the extremities of functions of two variables.
3. Acquire knowledge in vector calculus which is significantly used to solve engineering problems.
4. Formulate and solve differential equations.
5. Understand Laplace transformation and its engineering applications.

Course Outcomes:

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

CO1: Find eigenvalues and corresponding eigenvectors of a square matrix.

CO2: Apply the knowledge of partial differentiation to evaluate Jacobian and extremities of two variable functions.

CO3: Evaluate the gradient of a scalar field and the divergence and curl of vector fields.

CO4: Solve ordinary differential equations using various techniques.

CO5: Use Laplace transforms to solve first-order ordinary differential equations.

Pre-requisites: Matrices, Determinants, Differentiation, Integration and Vector Algebra.



CO/PO Mapping:

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	3	2	1	1	1	3
C02	3	3	2	1	1	1	3
C03	3	3	2	1	1	1	3
C04	3	3	2	1	1	1	3
C05	3	3	2	1	1	1	3

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

Instructional Strategy:

- A theory-demonstrate-practice-activity strategy may be used to ensure that learning is outcome-based.
- All demonstrations/Hands-on practices might be under a simulated environment.
- Use inducto-deductive approach to achieve the desired learning objectives.
- Use open-ended questions to nurture the problem-solving and reasoning skills among students.
- Support and guide the students for self-study.
- State the need for mathematics with engineering studies and provide real-life examples.



6000236111	ADVANCED ENGINEERING MATHEMATICS	L	T	P	C
Theory		3	0	0	3

Assessment Methodology:

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

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

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

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

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

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

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

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

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

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



6000236111		ADVANCED ENGINEERING MATHEMATICS	L	T	P	C
THEORY			3	0	0	3
Unit I	EIGENVALUES AND EIGENVECTORS					
	Characteristic equation – Eigen-values of 2×2 and 3×3 real matrices – Eigen-vectors of 2×2 real matrices – Properties of eigen-values (excluding proof) – Cayley-Hamilton theorem (excluding proof) – Simple problems.					7
Unit II	FUNCTIONS OF SEVERAL VARIABLES					
	Partial derivatives of two variable and three variable functions (up to second order) – Homogeneous functions and Euler’s theorem (excluding proof) – Jacobian matrix and determinant – Maxima and minima of functions of two variables – Simple problems.					7
Unit III	VECTOR CALCULUS					
	Scalar filed and Vector field – Vector differential operator – Gradient of a scalar field – Directional derivative – Divergence and curl of a vector field (excluding properties) – Solenoidal and irrotational vector fields – Simple problems.					7
Unit IV	DIFFERENTIAL EQUATIONS					
	Differential equation – Formation – Order and degree – Solution of a differential equation – Equations of first order and first degree – Variable separable method – Leibnitz’s Linear equations – Second order equations of the form $(aD^2 + bD + c)y = e^{nx}$ where a, b, c and n are constants and the auxiliary equation $am^2 + bm + c = 0$ has only real roots) – Complementary function – Particular integral – General solution – Simple problems.					7
Unit V	LAPLACE TRANSFORMS					
	Definition of Laplace transform – Laplace transforms of standard functions - Linearity and change of scale property (excluding proofs) – First shifting property – Laplace transforms of derivatives – Properties (excluding proofs) – Inverse Laplace transforms – Properties (excluding proofs) – Solving first order ordinary differential equation using Laplace transforms – Simple problems.					7
TEST AND REVISION						10
	TOTAL					45



Suggested List of Students Activities:

- Demonstrate the applications of eigen-values in stability analysis, decouple of three-phase systems and vibration analysis.
- Demonstrate maxima and minima of two variable functions using GeoGebra graphing calculator.
- Demonstrate solenoidal vector field and irrotational vector field using engineering applications.
- Demonstrate the applications of differential equations in solving engineering problems.
- Presentation /Seminars by students.
- Quizzes.

Text Books for Reference:

1. John Bird, Higher Engineering Mathematics, Routledge, 9th Edition, 2021.
2. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2012.
3. Arumugam, S., Thangapandi Isaac, A., & Somasundaram, A., Differential Equations and Applications, Yes Dee Publishing Pvt. Ltd., 2020.
4. Duraipandian, P., & Kayalal Pachaiyappa, Vector Analysis, S Chand and Company Limited, 2014.
5. Narayanan, S., & Manicavachagom Pillai T.K., Calculus Volume I and II, .Viswanathan Publishers Pvt. Ltd., 2007.

Website Links for Reference:

- www.khanacademy.org/math/
- <https://www.mathportal.org/>
- <https://openstax.org/subjects/math>
- www.mathhelp.com/
- <https://www.geogebra.org/>
- <https://www.desmos.com/>
- <https://phet.colorado.edu/>



6000236112	ENTREPRENEURSHIP	L	T	P	C
Theory		3	0	0	3

Introduction

Development of a diploma curriculum is a dynamic process responsive to the society and reflecting the needs and aspiration of its learners. Fast changing society deserves changes in educational curriculum particularly to establish relevance to emerging socio-economic environments; to ensure equity of opportunity and participation and finally promoting concern for excellence. In this context the course on entrepreneurship and start ups aims at instilling and stimulating human urge for excellence by realizing individual potential for generating and putting to use the inputs, relevant to social prosperity and thereby ensure good means of living for every individual, provides jobs and develop Indian economy.

Course Objectives

After completing this subject, the student will be able to

- Acquire entrepreneurial spirit and resourcefulness
- Familiarize Acquire knowledge about the business idea and product selection
- Analyze the banking and financial institutions
- Understand the pricing policy and cost analysis
- Get knowledge about the business plan preparation

Course Outcomes

CO1: Understand the process of entrepreneurship

CO2: Analyse the importance of generation of ideas and product selection

CO3: Familiarization of various financial and non financial schemes

CO4: Acquire various cost components to arrive pricing of the product

CO5: Learn the preparation of project feasibility report

Pre-requisites

Knowledge of basics of Engineering and Industrial engineering



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	-	-	-	-	3	1	3
C02	-	-	-	-	3	3	3
C03	-	-	-	1	-	3	2
C04	-	1	3	3	2	3	2
C05	-	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.



6000236112	ENTREPRENEURSHIP	L	T	P	C
THEORY		3	0	0	3

Assessment Methodology

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

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

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

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

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

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

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

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

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

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



6000236112	ENTREPRENEURSHIP	L	T	P	C
THEORY		3	0	0	3
UNIT I	Entrepreneurship – Introduction and Process				
Concept of entrepreneurship - Importance, Myths about Entrepreneurship, Pros and Cons of Entrepreneurship, Process of Entrepreneurship, , Competencies and characteristics of an entrepreneur -, Ethical Entrepreneurship, Entrepreneurial Values and Attitudes, Creativity, Innovation and entrepreneurship- Entrepreneurs - as problem solvers, Mindset of an employee and an entrepreneur, - Risk Taking-Concepts					7
UNIT II	Business Idea				
Types of Business: Manufacturing, Trading and Services, Stakeholders: sellers, vendors and consumers and Competitors, E- commerce Business Models, business idea generation -Types of Resources - Human, Capital and Entrepreneurial tools and resources, etc.,- setting business goals- Patent, copyright and Intellectual property rights, Customer Relations and Vendor Management, -Business Ideas vs. Business Opportunities, Opportunity – SWOT ANALYSIS of a business idea - Business Failure – causes and remedies.- Types of business risks,					7
UNIT III	Banking				
Size and capital based classification of business enterprises- Role of financial institutions, Role of Government policy, Entrepreneurial support systems, Incentive schemes for state government, and Incentive schemes for Central governments.					7
UNIT IV	Pricing and Cost Analysis				
Types of Costs - Variable - Fixed- Operational Costs - Break Even Analysis - for single product or service, -financial Business Case Study, Understand the meaning and concept of the term Cash Inflow and Cash Outflow- Pricing- Calculate Per Unit Cost of a single product, , Understand the importance and preparation of Income Statement, Prepare a Cash Flow Projection- Factors affecting pricing.- GST.					7
UNIT V	Business Plan Preparation				
Feasibility Report – Technical analysis, financial analysis- Market Research - Concept, Importance and Process- tools for market research- Market Sensing and Testing, Marketing and Sales strategy, Digital marketing, Branding - Business name, logo, tag line, Promotion strategy, Business Plan Preparation, -Concept and Importance, , Execution of Business Plan					7
Revision and Test					10
TOTAL HOURS					45



Suggested list of Students Activity

1. Students can explore app development or web design. They'll learn about technology, user experience, and marketing.
2. Hosting events, workshops, or conferences allows students to practice project management, networking, and marketing skills.
3. Encourage students to address social or environmental issues through innovative business solutions. This fosters empathy and creativity.
4. Part of entrepreneurship clubs or organizations provides networking opportunities, mentorship, and exposure to real-world challenges.
5. Competitions like business plan contests or pitch events allow students to showcase their ideas and receive feedback.
6. Students can create and sell handmade crafts, artwork, or other products. This teaches them about production, pricing, and customer relations.
7. Students can provide consulting services in areas they're knowledgeable about, such as social media marketing or financial planning.
8. Encourage students to create and manage their own small business or offer freelance services. This hands-on experience helps them understand various aspects of entrepreneurship.

Text Books for References:

1. G.K. Varshney, Fundamentals of Entrepreneurship, Sahitya Bhawan Publications, Agra., 2019.
2. H.Nandan, Fundamentals of Entrepreneurship, Prentice Hall India Learning Private Limited, Third Edition, 2013.
3. R.K. Singal, Entrepreneurship Development & Management, S K Kataria and Sons, 2013.

Website Links for References:

- <https://ocw.mit.edu/courses/15-390-new-enterprises-spring-2013/resources/lecture-1/>
- https://onlinecourses.nptel.ac.in/noc20_ge08/preview



6000236113	PROJECT MANAGEMENT	L	T	P	C
THEORY		3	0	0	3

Introduction

Project management is the systematic application of knowledge, skills, tools, and techniques to project activities to meet specific project requirements. It involves planning, organizing, and managing resources to achieve project goals within defined scope, time, and budget constraints. Project management encompasses several key processes and phases, including initiation, planning, execution, monitoring and controlling, and closing. It is essential across various industries to ensure projects are completed successfully, efficiently, and effectively, aligning with organizational objectives and stakeholder expectations. Project managers play a crucial role in leading teams, managing risks, ensuring quality, and communicating with stakeholders to drive project success.

Course Objectives

After completing this subject, the student will be able,

- To understand the concept, characteristics and elements of projects.
- To understand the stages in Project Life Cycle.
- To appreciate the need for Project Portfolio Management System.
- To know the considerations in choosing appropriate project management structure.
- To understand the components of techno-economic feasibility studies.
- To know about the detailed project report
- To learn about project constraints.
- To understand the techniques of evaluation.
- To get insight into the Social Cost Benefit Analysis Method.
- To know how to construct project networks using PERT and CPM.
- To learn how to crash project networks
- To understand the meaning of project appraisal.
- To understand the meaning of project audits.
- To know the qualities of an effective project manager.
- To understand the stages in Team Development model.



Course Outcomes

CO 1: Understand the Project Management Principles.

CO 2: Learn to create and manage project schedules.

CO 3: Create structure and manage the project commitments.

CO 4: Gain enterprise support.

CO 5: Prepare Detailed Project Report (DPR).

Pre-requisites :

Basic Knowledge.

CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	1	1	-	-	-	2	2
C02	2	2	1	-	1	3	2
C03	3	2	3	3	1	3	3
C04	3	2	2		1	3	2
C05	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.



6000236113	PROJECT MANAGEMENT	L	T	P	C
THEORY		3	0	0	3

Assessment Methodology

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

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

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

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

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

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

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

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

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

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



6000236113		PROJECT MANAGEMENT	L	T	P	C
Theory			3	0	0	3
UNIT I	Project Management – An Overview, Project Portfolio Management System and Structure, Steps in Defining Project and Project Delays					
Project – Classification – Importance of Project Management – An Integrated Approach – Project Portfolio Management System – The Need – Choosing the appropriate Project Management Structure: Organizational considerations and project considerations – steps in defining the project – project Rollup – Process breakdown structure – Responsibility Matrices – External causes of delay and internal constraints.						7
UNIT II	Various Stages and Components of Project Feasibility Studies, Phases of a Project, Stages in Project Life Cycle and Project Constraints					
Project feasibility studies - Opportunity studies, General opportunity studies, specific opportunity studies, pre-feasibility studies, functional studies or support studies, feasibility study – components of project feasibility studies – Managing Project resources flow – project planning to project completion: Pre-investment phase, Investment Phase and operational phase – Project Life Cycle – Project constraints.						7
UNIT III	Project Evaluation under Certainty and Uncertainty, Project Evaluation, Commercial and Social Cost Benefit Analysis					
Project Evaluation under certainty - Net Present Value (Problems - Case Study), Benefit Cost Ratio, Internal Rate of Return, Urgency, Payback Period, ARR – Project Evaluation under uncertainty – Methodology for project evaluation – Commercial vs. National Profitability – Social Cost Benefit Analysis, Commercial or National Profitability, social or national profitability.						7
UNIT IV	Developing Project Network using PERT and CPM, Project Appraisal and Control Process.					
Developing a Project Plan - Developing the Project Network – Constructing a Project Network (Problems) – PERT – CPM – Crashing of Project Network (Problems - Case Study) – Resource Leveling and Resource Allocation – how to avoid cost and time overruns – Steps in Project Appraisal Process – Project Control Process – Control Issues – Project Audits – the Project Audit Process – project closure – team, team member and project manager evaluations.						7



UNIT V	Project Managing Versus Leading of Project, Qualities of Project Manager and Managing Project Teams, Team Building Models and Performance Teams and Team Pitfalls.	
	Managing versus leading a project - managing project stakeholders – social network building (Including management by wandering around) – qualities of an effective project manager – managing project teams – Five Stage Team Development Model – Situational factors affecting team development – project team pitfalls.	7
	Revision and Test	10
	TOTAL HOURS	45

Suggested list of Students Activity,

Project Simulation and Role-Playing:

- Activity: Participate in simulated project scenarios where students take on different roles within a project team (e.g., project manager, team member, stakeholder).
- Purpose: This helps students understand the dynamics of project management, including leadership, communication, and team collaboration.

Case Study Analysis:

- Activity: Analyze real-world case studies of successful and failed projects.
- Purpose: This activity enables students to apply theoretical knowledge to practical situations, identify best practices, and learn from the challenges and solutions implemented in real projects.

Project Plan Development:

- Activity: Develop a comprehensive project plan for a hypothetical or real project, including scope, schedule, budget, risk management, and quality management plans.
- Purpose: This allows students to practice creating detailed and structured project plans, honing their skills in planning and organizing project activities.

Group Project:

- Activity: Work in teams to manage a project from initiation to closure, simulating a real project environment.
- Purpose: Group projects help students learn how to work collaboratively, manage group dynamics, and apply project management tools and techniques in a team setting.



Project Management Software Training:

- Activity: Gain hands-on experience with project management software such as Microsoft Project, Asana, or Trello.
- Purpose: This activity equips students with practical skills in using technology to plan, track, and manage project tasks and resources efficiently.

Text Books for Reference:

1. Clifford F. Gray And Erik W. Larson, Project Management – The Managerial Process, Tata Mcgraw Hill.
2. Dragan Z. Milosevic, Project Management Toolbox: Tools And Techniques For The Practicing Project Manager,
3. Gopalakrishnan, P/ Ramamoorthy, V E, Textbook Of Project Management, Macmillan India. Ltd.
4. Harold Kerzner, Project Management: A Systems Approach To Planning, Scheduling, And Controlling, Eighth Edition, John Wiley & Sons
5. Jason Charvat, Project Management Methodologies: Selecting, Implementing, And Supporting Methodologies And Processes For Projects, John Wiley & Sons
6. Kevin Forsberg, Ph.D, Hal Mooz, Visualizing Project Management: A Model For Business And Technical Success, Second Edition, Pmp And Howard Cotterman, John Wiley & Sons.

Website Links for Reference:

<https://youtu.be/pc9nvBsXsuM>

NPTEL Courses

https://youtu.be/PqQqTAu_FiM



6000236114	FINANCE FUNDAMENTALS	L	T	P	C
THEORY		3	0	0	3

Introduction

This course gives a deep insight into the finance fundamentals such as money management and the process of acquiring needed funds. It also encompasses the oversight, creation, and study of money, banking, credit, investments, assets, liabilities that make up financial systems and improves overall financial literacy.

Course Objectives

The objective of this course is to

1. Identify different ways to save money for future
2. Understand various techniques to raise capital
3. Get acquainted with the essential terminologies used in finance language
4. Get exposed to different types of budgeting
5. Instill the concept of costing and its impact on profitability

Course Outcomes

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

- CO1: Manage financial resources effectively to achieve personal goals
- CO2: Ensure that the business has enough money to meet its obligations and that it can recover in the future
- CO3: Exhibit financial literacy through the usage of different terminologies appropriate to the context
- CO4: Differentiate different types of budgeting and allocate the resources
- CO5: Apply the idea of marginal costing in decision making

Pre-requisites

Knowledge of basic mathematics



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	1	1	-	-	-	2	2
C02	2	2	1	-	1	3	2
C03	3	2	3	3	1	3	3
C04	3	2	2		1	3	2
C05	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.



6000236114	FINANCE FUNDAMENTALS	L	T	P	C
THEORY		3	0	0	3

Assessment Methodology

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

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

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

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

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

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

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

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

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

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



6000236114	FINANCE FUNDAMENTALS				L	T	P	C
THEORY					3	0	0	3
UNIT I	Personal Finance							
Personal Finance – Meaning, Objectives and advantages – Individual Perspective – Family Perspective – Time Value of Money – Personal Savings: Meaning, Different modes of Saving – Bank Deposit, Online Investments, Insurance, Stocks, Gold, Real Estate – Returns Vs Risk – Financial Discipline – Setting Alerts for commitments (With Real time Examples)								7
UNIT II	Business Funding							
Sources: Personal Savings – Borrowings - Venture Capital – Venture Capital Process – Commercial Banks – Government Grants and Scheme.								7
UNIT III	Finance language							
Capital – Drawing – Income – Expenditure – Revenue Vs Capital Items – Assets – Fixed Assets – Current Assets – Fictitious Assets – Liabilities – Long-term Liabilities – Current Liabilities – Internal Liabilities – External Liabilities – Share holders fund: Equity Share capital, Preference Share Capital, Reserve & Surplus – Borrowings: Debentures, Bank Loan, Other Loan – Depreciation – Reserve Vs Provision.								7
UNIT IV	Budgeting							
Budgetary Control – Meaning – Preparation of various budgets – Purchase budget – Sales Budget – Production budget – Cash Budget – Flexible budgets. (With Problems)								7
UNIT V	Marginal Costing							
Marginal Costing – Meaning – Marginal Costing Vs Absorption Costing – Concepts of Variable Cost, Fixed Cost and Contribution – PV Ratio – Break Even Point – Margin of Safety – Key Factor – Application of Marginal Costing in decision making – Make or Buy – Shutdown or Continue – Exploring New Markets (With Problems)								7
Revision and Test								10
TOTAL HOURS								45



Suggested list of Students Activity

Financial Statement Analysis:

- Activity: Analyze and interpret financial statements, including balance sheets, income statements, and cash flow statements of different companies.
- Purpose: This activity helps students understand the financial health and performance of organizations, developing skills in financial analysis and critical thinking.

Investment Portfolio Management:

- Activity: Create and manage a simulated investment portfolio, making decisions on asset allocation, stock selection, and diversification.
- Purpose: This allows students to apply theoretical concepts in a practical setting, learning how to evaluate investment opportunities and manage financial risk.

Case Study Analysis:

- Activity: Examine real-world case studies involving financial decisions made by companies, such as capital budgeting, mergers and acquisitions, and financial restructuring.
- Purpose: Case studies provide insights into the application of finance principles in business scenarios, enhancing problem-solving and decision-making skills.

Financial Modeling:

- Activity: Build financial models using spreadsheets to forecast future financial performance, conduct sensitivity analysis, and evaluate business projects.
- Purpose: Financial modeling is a critical skill in finance, enabling students to project financial outcomes and support strategic decision-making with quantitative analysis.

Classroom Discussions and Debates:

- Activity: Participate in discussions and debates on current financial issues, market trends, and economic policies.
- Purpose: Engaging in discussions helps students stay informed about the latest developments in finance, develop their communication skills, and form well-rounded opinions on financial matters.

Text Books for Reference:

1. Banking Theory, Law & Practice - Dr.L.Natarajan, Margham Publications.
2. Corporate Accounting by T.S.Reddy and Dr.A.Murthy, Margham Publications.
3. Management Accounting by T.S.Reddy and Dr.Y.Hariprasd Reddy, Margham Publications.
4. Cost Accounting by T.S.Reddy and Dr.Y.Hariprasd Reddy, Margham Publications.



1052236115	5G TECHNOLOGY	L	T	P	C
THEORY		3	0	0	3

Introduction:

This course provides an in-depth understanding of 5G technology, covering foundational concepts, essential radio access technologies, core network architecture, protocols and standards, and emerging technologies in wireless communication.

Course Objectives:

The objective of this course is to enable the students to

- Understand the fundamental principles and evolution of wireless communication systems, including the transition from previous generations to 5G.
- Identify and explain the key features, requirements, and use cases of 5G networks in various industries and applications.
- Analyze the architecture and components of 5G networks, including radio access technologies, core network elements, and network slicing.
- Develop proficiency in radio access technologies such as OFDM, MIMO.
- Explore emerging technologies and applications in 5G, such as IoT, edge computing, and AI integration, and assess their impact on future communication systems.
- Gain hands-on experience in implementing and troubleshooting 5G networks through practical exercises and simulations.
- Understand the regulatory and standardization processes governing 5G deployment, ensuring compliance and interoperability with global standards.
- Analyze security protocols and mechanisms implemented in 5G networks to ensure data confidentiality, integrity, and availability.
- Develop critical thinking and problem-solving skills to address challenges and optimize performance in 5G network design, deployment, and management.

Course Outcomes:

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

CO1: Understanding 5G principles, features, and applications.

CO2: Proficiency in 5G radio access technologies.

CO3: Mastery of 5G core network architecture and protocols.

CO4: Knowledge of 5G protocol stack and interworking mechanisms.

CO5: Exploring emerging technologies and applications in 5G networks.



Pre-requisites:

- Basic understanding of telecommunications and networking principles.
- Proficiency in mathematics, including algebra and trigonometry.
- Knowledge of computer architecture and programming concepts.
- Familiarity with wireless communication technologies and laboratory equipment.

CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	2	1	1	-	-	-	-
C02	2	2	1	2	-	-	1
C03	1	1	2	2	-	-	1
C04	2	1	1	2	-	-	1
C05	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.



1052236115	5G TECHNOLOGY	L	T	P	C
Theory		3	0	0	3

Assessment Methodology:

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

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

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

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

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

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

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

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

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

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



1052236115	5G TECHNOLOGY	L	T	P	C
THEORY		3	-	-	3
Unit I	Introduction to 5G Technology				
Overview of wireless communication systems - Evolution from 1G to 5G - Key features and requirements of 5G networks - Comparison between 4G and 5G technologies - network latency and its importance in 5G - 5G spectrum bands and frequency ranges- Basics of network coverage and capacity in 5G - 5G enabled devices and their functionalities - role of AI and ML in enhancing 5G capabilities - network slicing and its benefits in 5G deployment - 5G architecture and network elements					9
Unit II	Radio Access Technologies in 5G				
Introduction to radio access technologies (RATs) and their role in wireless communication - multiple access techniques (FDMA, TDMA, CDMA) and their evolution in 5G - orthogonal frequency-division multiplexing (OFDM) and its significance in 5G - multiple-input multiple-output (MIMO) and its application - beam forming techniques - small cell deployment - heterogeneous network (HetNet) architecture .					9
Unit III	Core Network in 5G				
Evolution of core network architecture from 4G to 5G (e.g., LTE to NGC) - Network slicing and virtualization in 5G core - Service-based architecture (SBA) and control plane/user plane separation (CUPS) - Network functions virtualization (NFV) and software-defined networking (SDN) - Edge computing and mobile edge computing (MEC) in 5G networks					9
Unit IV	5G Protocols and Standards				
Overview of 5G protocol stack (PHY, MAC, RLC, PDCP, RRC, etc.) - 3GPP standardization process and release versions - NR (New Radio) air interface protocol architecture - Signalling procedures and message flows in 5G networks - Interworking and coexistence with legacy networks (e.g., LTE, Wi-Fi).					9
Unit V	Emerging Technologies and Applications in 5G				
Internet of Things (IoT) and machine-to-machine (M2M) communications in 5G - Vehicle-to-everything (V2X) communication and smart transportation systems - Augmented reality (AR), virtual reality (VR), and immersive multimedia applications. Network security and privacy considerations in 5G networks - Future trends and challenges in 5G technology development.					9
TOTAL PERIODS					45



Suggested List of Students Activity:

The following student activities or similar activities can be assigned for assessing IA marks

- Students are tasked with conducting research on the evolution of wireless communication systems, spanning from the first-generation (1G) to the fifth-generation (5G) networks. They gather information on the technological advancements, key milestones, and the impact of each generation on society and industries
- Using simulation software such as OPNET or NS-3, students simulate a 5G network deployment scenario. They configure parameters such as base stations, user equipment, and traffic patterns to model realistic network conditions.
- Students analyze a real-world case study of a 5G network deployment project. They examine the challenges faced by the network operators, the design decisions made during the deployment process, and the outcomes achieved.
- Students conduct an in-depth analysis of the signalling protocols used in 5G networks. They examine protocols such as the Radio Resource Control (RRC) protocol, Session Management (SM) protocol, and User Plane Protocol (UPP), studying their functionalities, message formats, and interactions.
- Each student selects an emerging technology relevant to 5G, such as Internet of Things (IoT), edge computing, or network slicing. They research the technology's principles, applications, and potential impact on 5G networks
- In the laboratory, students perform hands-on experiments related to radio access technologies or core network components. For example, students may configure and test a small-scale OFDM-MIMO system to understand its performance characteristics.
- Students collaborate in groups to design a 5G network architecture tailored to a specific use case or scenario. Each group conducts comprehensive research on network requirements, technology options, and deployment considerations. They develop a detailed network design proposal, considering factors such as coverage, capacity, scalability, and cost-effectiveness. Finally, groups present their design proposals to the class, showcasing their understanding of 5G network planning and their ability to address environmental and sustainability concerns.



Text Books:

1. AfifOsseiran, Jose F Monserrat, Patrick Marsch, "5G Mobile and Wireless CommunicationsTechnology", Cambridge University Press, 2016
2. 5G Mobile and Wireless Communications Technology, AfifOsseiran, Cambridge University Press, Second Edition,2011
3. 5G NR: The Next Generation WirelessAccess Technology, Erik Dahlman, Elsevier, Ed.1st 2016
4. Fundamentals of 5G Mobile Networks, Jonathan Rodriguez, Wiley, First Edition

Text Books for Reference:

- Afif Osseiran, Jose F Monserrat, Patrick Marsch, 5G Mobile and Wireless Communications Technology, 1st Edition, Cambridge University Press, 2016
- Erik Dahlman, 5G NR: The Next Generation Wireless Access Technology , 1st Edition, Elsevier, 2016.
- Jonathan Rodriguez , Fundamentals of 5G Mobile Networks, 1st Edition, Wiley, 2015
- HarriHolma, AnttiToskala, Takehiro Nakamura, "5G Technology 3GPP NEW RADIO", John Wiley & Sons, 1/e, 2020.

Website Links for Reference:

NPTEL : <https://nptel.ac.in/courses/108/105/108105134/>

Udemy: <https://www.udemy.com/course/5g-mobile-networksmorden-wireless-communication-technology/>



1052236116	DEVOPS	L	T	P	C
THEORY		3	0	0	3

Introduction

The DevOps is the combination of two words, one is Development and other is Operations. It is a culture to promote the development and operation process collectively. The DevOps course will help to learn DevOps basics and provide depth knowledge of various DevOps tools such as Git, Maven, Ansible, Jenkins.

Course Objectives

The objective of this course is to enable the student to

- To understand basics of Devops.
- To illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems.
- To understand the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment).
- To understand the version control tools like Git.
- To understand about configuration management using Ansible

Course Outcomes

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

C01: Understand basics of Devops.

C02: Perform continuous integration and continuous testing and Continuous deployment using Jenkins by building and automating test case using Maven.

C03: Ability to perform automated continuous deployment.

C04: Understand different actions performed through version control tools like Git.

C05: Ability to do configuration management using Ansible.

Pre-requisites: Nil



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	2	3	3	-	-	-
C02	3	3	3	3	-	-	-
C03	3	3	3	3	-	-	-
C04	3	3	2	3	-	-	-
C05	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.



1052236116	DEVOPS	L	T	P	C
THEORY		3	0	0	3

Assessment Methodology:

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

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

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

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

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

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

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

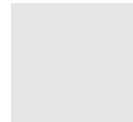
Question Pattern: Model Examination and End Semester Examination-Theory Exam

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

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



1052206116	DEVOPS	L	T	P	C
THEORY		3	0	0	3
Unit I	INTRODUCTION TO DEVOPS				
Introduction to Devops – History of Devops – Devops Definition – Devops Main Objectives – Devops and Software Development Life Cycle – Waterfall Model – Agile Model.					8
Unit II	COMPILE AND BUILD USING MAVEN				
Introduction - Installation of Maven – Maven Build Requirements - Maven POM Builds (pom.xml), Maven Build lifecycle - Maven repositories (local, global) , Maven create and build Artifacts, Maven Dependencies – Maven Plugins.					10
Unit III	CONTINUOUS INTEGRATION USING JENKINS				
Introduction to Jenkins – Continuous Integration with Jenkins – Jenkins Management – Scheduling build jobs - Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace Management.					10
Unit IV	VERSION CONTROL USING GIT				
GIT Features – 3 – Tree Architecture – GIT Clone/Commit/Push – GIT Hub Projects – GIT Rebase & Merge – GIT Stash, Reset, Checkout – GIT Clone, Fetch,Pull.					10
Unit V	CONFIGURATION MANAGEMENT USING ANSIBLE				
Introduction to Ansible, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles.					7
TOTAL PERIODS					45



Suggested List of Students Activity

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

Text Books for Reference:

1. Jennifer Davis, Ryn Daniels, "Effective DevOps", 1st edition, O'Reilly, 2017.
2. David Johnson, "Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps", Second Edition, CreateSpace Independent Publishing Platform, 2016.
3. Mariot Tsitoara, "Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer", Second Edition, Apress, 2019.

Website Links for Reference:

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



1052236241	DATA SCIENCE	L	T	P	C
PRACTICUM		1	0	4	3

Introduction:

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 introduces 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 to

CO1: 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
C01	3	2	2	-	-	-	1
C02	3	3	3	2	-	-	2
C03	3	3	3	3	-	-	2
C04	3	3	3	3	-	-	2
C05	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.



1052236241	DATA SCIENCE	L	T	P	C
PRACTICUM		1	0	4	3

Assessment Methodology

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

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

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



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

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

SCHEME OF EVALUATION

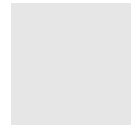
PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1052236241	DATA SCIENCE	L	T	P	C
PRACTICUM		1	0	4	3
Unit I	INTRODUCTION TO DATA SCIENCE				
Data Science: Need, benefits and uses – facets of data -Data Science Process - Basics of Numpy Arrays.					3
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				
Statistical Analysis: Mean Median, Mode, Standard Deviation, Range, Percentile. Missing value analysis - Numpy arrays : aggregations –computations on arrays, Introduction to Pandas					3
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				
Data manipulation with Pandas: data indexing and selection –missing data; Data Transformation: Removing duplicates- Replacing values -aggregation and grouping.					3
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				
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	
Basic Machine Learning Algorithms: Classification: Support vector machines- Naive Bayes- Decision Trees- Clustering- Confusion Matrix.	3
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 in data science.
- online quizzes
- Blended learning activities to explore the recent trends and developments in the field.
- 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, and TensorFlow, , 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/clustering-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 EXAMINATION

PART - 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 its elements. 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 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 and find 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 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.

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.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1052236242	CLOUD PLATFORM	L	T	P	C
PRACTICUM		1	0	4	3

Introduction

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

C01: Analyze the trade-offs between deploying applications in the cloud and over the local infrastructure.

C02: Use and Manage Virtual Machines on AWS, Google Cloud and Azure platforms.

C03: Understand and apply the spectrum of Cloud computing capabilities to deploy virtual machines on Eucalyptus and Open Stack.

C04: Learn about using hosting services, storage services, networking services and machine learning services.

C05: 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	P01	P02	P03	P04	P05	P06	P07
C01	1	2	2	-	-	-	1
C02	1	3	3	-	-	-	1
C03	1	3	3	-	-	-	1
C04	1	3	3	-	-	-	1
C05	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 and outside the classroom.
- It may be necessary for the teacher to pre-teach the skills and processes necessary to achieve the intended learning outcomes.
- The teacher needs to encourage students to share their thoughts so that the entire class can benefit from individual insights.
- Teachers can encourage divergent thinking by asking students to transform a teacher guided image into several others of their own creation.



1052236242	CLOUD PLATFORM	L	T	P	C
PRACTICUM		1	0	4	3

Assessment Methodology

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

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

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



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

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

SCHEME OF EVALUATION

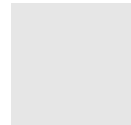
PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1052236242	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

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>

Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments 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 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 and deploying a Virtual Server (EC2 Instance) on AWS.

Ex No 2: Host a Static Website in AWS using Amazon S3.

Ex No 3: Setup a GCP Account and project ,explore the GCP console and resource hierarchy 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 and resource groups. Deploy Virtual Machines (VMs) on Azure

PART – B

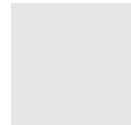
Ex No 6: Implement Azure Storage Solutions: Blob Storage and File Storage.

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

Ex No 8: Create an instance using OpenStack.

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1052236243	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 visualizations based on principles of data analytic, how to construct compelling visualizations using the free 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

- Explain the principles of effective data visualization.
- Gain proficiency in using data visualization tools.
- Use techniques for designing and creating various types of visualizations.
- Develop critical thinking skills for evaluating and improving visualizations.
- Apply data visualization concepts to real-world datasets.

Pre-requisites: Basics of statistics



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	3	2	2	1	1	1
C02	3	3	3	3	1	1	2
C03	3	3	3	3	1	1	1
C04	3	3	3	2	1	1	1
C05	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.



1052236243	DATA VISUALIZATION	L	T	P	C
PRACTICUM		1	0	4	3

Assessment Methodology

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

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

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



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

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

SCHEME OF EVALUATION

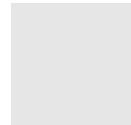
PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1052236243	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					12
Ex. No. 2 Explore your dataset using Dataframe, info, shape, head, tail, dtypes, describe, grouping of data in python					
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					12
Ex. No. 4 Identify and fill missing values within the dataset					
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					12
Ex. No. 6 Creating Density Plot and Histogram with ggplot					
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					12
Ex. No. 8. Creating Violin Plot and Boxplot with Seaborn					
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.					12
Ex. No. 10 Visualization of Spatial Data.					
TOTAL HOURS					75



Suggested List of Students Activity

- Presentation/Seminars by students on any recent technological developments based on the course.
- Programming assignments to demonstrate visualization techniques on various domains 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.

Textbook for Reference:

1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with 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 Exporting Dataset
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 EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055236244	FIBRE OPTIC COMMUNICATION	L	T	P	C
PRACTICUM		1	0	4	3

Introduction:

All type of communication circuits uses fibre links to get broadband services to home and all working environments. In this subject the students are provided with basics of optical fibre transmission and reception. Also the students can develop their skills by conducting experiments either by simulation or using hardware modules.

Course Objectives:

- To introduce the basics of light transmission through fibre and understand the losses in fibers.
- To understand the characteristics of devices used in optical transmitters and receivers
- To understand the design considerations for building digital link.
- To expose to systems and networks in practice.

Course Outcomes:

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

C01: Understand the performance of simple optical link by measurement of losses.

C02: Analyze the characteristics of optical sources.

C03: Analyze the characteristics of optical detectors.

C04: Develop simple optical communication link.

C05: Analyze the Eye Pattern and the impact on BER.

Pre-requisites:

Knowledge of basic Science-optics



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	1	-	1	1	-	-
C02	3	2	3	3	-	-	-
C03	3	3	3	3	-	-	-
C04	3	2	3	3	-	2	-
C05	3	1	-	3	-	-	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 of discrepancies.



1055236244	FIBRE OPTIC COMMUNICATION	L	T	P	C
PRACTICUM		1	0	4	3

Assessment Methodology

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

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

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



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

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

SCHEME OF EVALUATION

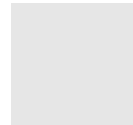
PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055236244	FIBRE OPTIC COMMUNICATION	L	T	P	C
PRACTICUM		1	0	4	3
Unit I	INTRODUCTION TO OPTICAL FIBRE				
Optical Spectral bands - Evolution of fibre optical system -Elements of Optical Fibre Systems - Optical Fibre Modes and Configurations- Mode theory of Circular Wave guides - Single Mode Fibre - Graded Index fibre - Fibre Materials- Signal degradation in fibers- Advantages and applications of fibre optic transmission systems.					3
Practical: 1.Determine the Numerical Aperture of the given optical fibre. 2.Find the bending loss in fibre with two different fibre lengths.					12
Unit II	OPTICAL TRANSMITTER				
Optical sources- Light-Emitting Diodes (LEDs)- Laser Diodes -Comparison and applications					3
Practical: 3.Obtain the V-I Characteristics of LED. 4.Obtain the V-I Characteristics of Laser diode.					12
Unit III	OPTICAL RECEIVER				
Photo detectors-Photodiodes - Avalanche photo diodes- Comparisons of photo detector- Receiver Noise and sensitivity-Digital Receiver Performance-BER Calculation-Eye Diagrams.					3
Practical: V-I Characteristics of Photo diode. Digital Communication Link -eye diagram Digital Communication Link – Bit Error Rate calculation					18
Unit IV	SYSTEM CONFIGURATIONS				
Optical link design - Optical Power Launching and Coupling -System Design considerations - Optical amplifiers - Multiplexing strategies - Wavelength division multiplexing .					3
Practical: Analog and digital link. V-I Characteristics of opto- coupler.					18
Unit V	ADVANCES IN OPTICAL FIBRE SYSTEMS				
DWDM -SONET/SDH - Wavelength Routing Networks - Optical switches - Ultra High Capacity Networks.					3
TOTAL HOURS					75



Suggested List of Students Activity:

- Visit nearby MTNL/BSNL exchange and prepare detail report on optic fibre and transmission.
- Prepare a list of industrial partners in fibre optic communication to understand the skill set required for employability.
- Student may view video lectures from NPTEL on Optical communication systems and submit assignments on required topics.

Textbook for Reference :

1. Keiser G , "Optical Fibre Communications", McGraw Hill, 2014.
2. John M. Senior , "Optical Fibre Communications Principles and Practice", PHI, 2014.
3. G.P. Agarwal , "Fibre optic Communication Systems", 4th edition, John Wiley and sons, 2012.

Website link for reference:

1. <https://archive.nptel.ac.in/courses/108/106/108106167/>
2. <https://bop-iitk.vlabs.ac.in/exp/numerical-aperture- measurement/simulation.html>

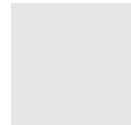
Board Practical Examination

Part – A

1. Determine the Numerical Aperture of the given optical fibre.
2. Find the bending loss in fibre with two different fibre lengths.
3. Obtain the V-I Characteristics of LED.
4. Obtain the V-I Characteristics of Laser diode.
5. Obtain V-I Characteristics of Photo diode.

Part – B

6. Study the eye diagram in Digital Communication Link.
7. Calculate the bit error rate in Digital Communication Link
8. Test the performance of a fibre optic analog link and draw the input and output waveforms..
9. Test the performance of a fibre optic digital link and draw the input and output waveforms..
10. Obtain the V-I Characteristics of opto- coupler.



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1052236245	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
PRACTICUM		1	0	4	3

Introduction

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
C01: Identify various concepts of mobile programming that make it unique from programming for other platform.

C02: Critique mobile applications on their design pros and cons.

C03: Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.

C04: Test Android applications.

C05: Deploy applications to the Android marketplace for distribution.

Pre-requisites: Nil.



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
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	-

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.



1052236245	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
PRACTICUM		1	0	4	3

Assessment Methodology

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

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

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



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

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

SCHEME OF EVALUATION

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

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1052236245		MOBILE APPLICATION DEVELOPMENT	L	T	P	C
PRACTICUM			1	0	4	3
Unit I	INTRODUCTION TO MOBILE APPLICATION DEVELOPMENT					
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					
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					
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					
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					
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 developments based 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: A Brain-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 EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1052236246	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

C01: Demonstrate knowledge on UI and UX design concepts.

C02: Develop and performing a competitive analysis in UX design.

C03: Design user personas using persona UXPressia's online builder tool.

C04: Develop interaction design and functional layout.

C05: Creating web and mobile app applications using visual design tools.

Pre-requisites: Nil



CO/PO Mapping

CO / PO	P01	P02	P03	P04	P05	P06	P07
C01	3	3	3	1	1	1	2
C02	3	3	3	3	1	1	2
C03	3	3	3	3	2	2	2
C04	3	3	3	2	2	3	2
C05	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.



1052236246	UI AND UX DESIGN	L	T	P	C
PRACTICUM		1	0	4	3

Assessment Methodology

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

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

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



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

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

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

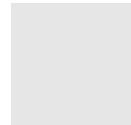
PART	DESCRIPTION	MARKS
A	Aim (05) , Program (30)	35
B	Execution and Output	15
TOTAL		50
C	Practical Documents (As per the portions)	10
		60

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

Question pattern – Written Test Theory

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

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



SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1052236246	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 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 - Design a 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 developments based on the course.
- Programming assignments
- Periodic class/online quizzes conducted based on the course.
- Blended learning activities to explore the recent trends and developments in the field.

Textbook for Reference:

- Tom Green, Joseph Labrecque, A Guide to UX Design and Development: Developer's Journey 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, First 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/>

Equipment / Facilities required to conduct the Practical Portion

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 of interaction 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 EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

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



1055236351	INTERNSHIP	Periods	C
PROJECT		520	12

Introduction

Internships in educational institutions are designed to provide students with practical experience in their field of study and to bridge the gap between academic knowledge and professional practice.

Objectives

After completing Internship, Interns will be able to,

- Apply the theoretical knowledge and skill during performance of the tasks assigned in internship.
- Demonstrate soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship.
- Document the Use case on the assigned Task.
- Enable interns to apply theoretical knowledge gained in the classroom to real-world practical applications.
- Provide hands-on experience in the industrial practices.
- Develop essential skills such as communication, organization, teamwork, and problem-solving.
- Enhance specific skills related to the intern's area of focus.
- Offer a realistic understanding of the daily operations and responsibilities.
- Provide opportunities to work under the guidance of experienced supervisors and administrators.
- Allow interns to explore different career paths.
- Help interns make informed decisions about their future career goals based on first hand experience.
- Facilitate the establishment of professional relationships with supervisor, administrators, and other professionals in the field.
- Provide access to a network of contacts that can be beneficial for future job opportunities and professional growth.
- Foster personal growth by challenging interns to step out of their comfort zones and take on new responsibilities.
- Build confidence and self-efficacy through successful completion of internship tasks and projects.



- Give insight into the policies, regulations, and administrative practices.
- Allow interns to observe and understand the implementation of standards and policies in practice.
- Provide opportunities for constructive feedback from supervisors and mentors, aiding in the intern's professional development.
- Enable self-assessment and reflection on strengths, areas for improvement, and career aspirations.
- Encourage sensitivity to the needs and backgrounds of different groups, promoting inclusive and equitable industrial practices.

Course Outcomes

CO 1: Demonstrate improved skills.

CO 2: Exhibit increased professional behavior.

CO 3: Apply theoretical knowledge and principles in real-world practices.

CO 4: Develop and utilize assessment tools to evaluate the learning and practices.

CO 5: Engage in reflective practice to continually improve their learning and professional growth.

Facilitating the Interns by an Internship Provider

- Orient intern in the new workplace. Give interns an overview of the organization, Explain the intern's duties and introduce him or her to co-workers.
- Develop an internship job description with clear deliverables and timeline.
- Allow the interns in meetings and provide information, resources, and opportunities for professional development.
- The interns have never done this kind of work before, they want to know that their work is measuring up to organizational expectations, hence provide professional guidance and mentoring to the intern.
- Daily progress report of Intern is to be evaluated by industry supervisor. Examine what the intern has produced and make suggestions. Weekly supervision meetings can help to monitor the intern's work.

Duties Responsibilities of the Faculty Mentor

- To facilitate the placement of students for the internship
- To liaison between the college and the internship provider
- To assist the Industrial Training Supervisor during assessment



Instructions to the Interns

- Students shall report to the internship provider on the 1st day as per the internship schedule.
- Intern is expected to learn about the organization, its structure, product range, market performance, working philosophy etc.
- The interns shall work on live projects assigned by the internship provider.
- The Intern shall record all the activities in the daily log book and get the signature of the concerned training supervisor.
- Intern shall have 100% attendance during internship programme. In case of unavoidable circumstances students may avail leave with prior permission from the concerned training supervisor of the respective internship provider. However, the maximum leave permitted during internship shall be as per company norms where they are working and intern shall report the leave sanctioned details to their college faculty mentor.
- The interns shall abide all the Rules and Regulations of internship provider
- Intern shall follow all the safety Regulations of internship provider.
- On completion of the internship, the intern shall report to the college and submit the internship certificate mentioning duration of internship, evaluation of interns by internship provider, Student's Diary and Comprehensive Training Report.

Attendance Certification

Every month students have to get their attendance certified by the industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution supervisor. Regularity in attendance and submission of report will be duly considered while awarding the Internal Assessment mark.

Training Reports

The students have to prepare two types of reports: Weekly report in the form of diary to be submitted to the concerned staff in-charge of the institution. This will be reviewed while awarding Internal

Industrial Training Diary

Students are required to maintain the record of day-to-day work done. Such a record is called Industrial training Diary. Students have to write this report regularly. All days for the week should be accounted for clearly giving attendance particulars (Presence, absence, Leave, Holidays etc.). The concern of the Industrial supervisor is to periodically check these progress reports.



Comprehensive Training Report

In addition to the diary, students are required to submit a comprehensive report on training with details of the organization 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 Organization.

Scheme of Evaluation

Internal Assessment

Students should be assessed for 50 Marks by industry supervisor and polytechnic faculty mentor during 3rd Month and 5th Month. The total marks (50 + 50) scored shall be converted to 40 marks for the Internal Assessment.

Sl. No.	Description	Marks
A	Punctuality and regularity. (Attendance)	10
B	Level / proficiency of practical skills acquired. Initiative in learning / working at site	10
C	Ability to solve practical problems. Sense of responsibility	10
D	Self expression / communication skills. Interpersonal skills / Human Relation.	10
E	Report and Presentation.	10
Total		50



End Semester Examination - Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Board of Examinations after the completion of internship period (June - May). The marks scored will be converted to 60 marks for the End Semester Examination.

Sl. No.	Description	Marks
A	Daily Activity Report.	20
B	Comprehensive report on Internship, Relevant Internship Certificate from the concerned department.	30
C	Presentation by the student at the end of the Internship.	30
D	Viva Voce	20
Total		100



1055236353	FELLOWSHIP	Periods	C
PROJECT		520	12

Introduction

The Fellowship in the Diploma in Engineering program is designed to provide aspiring engineers with a comprehensive educational experience that combines theoretical knowledge with practical skills. This fellowship aims to cultivate a new generation of proficient and innovative engineers who are equipped to meet the challenges of a rapidly evolving technological landscape.

Participants in this fellowship will benefit from a robust curriculum that covers core engineering principles, advanced technical training, and hands-on projects. The program emphasizes interdisciplinary learning, encouraging fellows to explore various branches of engineering, from mechanical and civil to electrical, electronics & communication and computer engineering. This approach ensures that graduates possess a versatile skill set, ready to adapt to diverse career opportunities in the engineering sector.

In addition to academics, the fellowship offers numerous opportunities for professional development. Fellows will engage with industry experts through seminars, workshops, and internships, gaining valuable insights into real-world applications of their studies. Collaborative projects and research initiatives foster a culture of innovation, critical thinking, and problem-solving, essential attributes for any successful engineer.

By offering this fellowship, participants become part of a vibrant community of learners and professionals dedicated to advancing the field of engineering. The program is committed to supporting the growth and development of each fellow, providing them with the tools and resources needed to excel both academically and professionally.

The Fellowship in the Diploma in Engineering is more than just an educational endeavor; it is a transformative journey that equips aspiring engineers with the knowledge, skills, and experiences necessary to make significant contributions to society and the engineering profession.

Objectives

After completing students will be able to,

- Provide fellows with a solid foundation in core engineering principles and advanced technical knowledge across various engineering disciplines.
- Equip fellows with hands-on experience through laboratory work, projects, and internships, ensuring they can apply theoretical knowledge to real-world scenarios.



- Promote interdisciplinary understanding by encouraging exploration and integration of different engineering fields, fostering versatility and adaptability in fellows.
- Encourage innovation and creativity through research projects and collaborative initiatives, enabling fellows to develop new solutions to engineering challenges.
- Facilitate professional growth through workshops, seminars, and interactions with industry experts, preparing fellows for successful careers in engineering.
- Develop critical thinking and problem-solving skills, essential for tackling complex engineering problems and making informed decisions.
- Strengthen connections between academia and industry by providing opportunities for internships, industry visits, and guest lectures from professionals.
- Foster leadership qualities and teamwork skills through group projects and collaborative activities, preparing fellows for leadership roles in their future careers.
- Instill a sense of ethical responsibility and awareness of the social impact of engineering practices, encouraging fellows to contribute positively to society.
- Promote a culture of lifelong learning, encouraging fellows to continually update their knowledge and skills in response to technological advancements and industry trends.
- Prepare fellows to work in a global engineering environment by exposing them to international best practices, standards, and cross-cultural experiences.

Course Outcomes

CO 1: Demonstrate a strong understanding of core engineering principles and possess the technical skills necessary to design, analyze, and implement engineering solutions across various disciplines.

CO 2: Apply theoretical knowledge to practical scenarios, effectively solving engineering problems through hands-on projects, laboratory work, and internships.

CO 3: Exhibit the ability to conduct research, develop innovative solutions, and contribute to advancements in engineering through critical thinking and creative approaches to complex challenges.

CO 4: Understand and adhere to professional and ethical standards in engineering practice, demonstrating responsibility, integrity, and a commitment to sustainable and socially responsible engineering.

CO 5: Enhance strong communication skills, both written and verbal, and be capable of working effectively in teams, demonstrating leadership and collaborative abilities in diverse and multidisciplinary environments.



Important points to consider to select the fellowship project.

Selecting the right fellowship project is crucial for maximizing the educational and professional benefits of a Diploma in Engineering program.

- **Relevance to Future Plans:** Choose a project that aligns with your long-term career aspirations and interests. This alignment will ensure that the skills and knowledge you gain will be directly applicable to your desired career path.
- **Industry Relevance:** Consider the current and future relevance of the project within the industry. Opt for projects that address contemporary challenges or emerging trends in engineering.
- **Access to Facilities:** Ensure that the necessary facilities, equipment, and materials are available to successfully complete the project. Lack of resources can hinder the progress and quality of your work.
- **Mentorship and Guidance:** Select a project that offers strong mentorship and support from experienced faculty members or industry professionals. Effective guidance is crucial for navigating complex problems and achieving project objectives.
- **Project Scope:** Assess the scope of the project to ensure it is neither too broad nor too narrow. A well-defined project scope helps in setting clear objectives and achievable milestones.
- **Feasibility:** Evaluate the feasibility of completing the project within the given timeframe and with the available resources. Consider potential challenges and ensure you have a realistic plan to address them.
- **Technical Skills:** Choose a project that allows you to develop and enhance important technical skills relevant to your field of study. Practical experience in using specific tools, technologies, or methodologies can be highly beneficial.
- **Soft Skills:** Consider projects that also offer opportunities to develop soft skills such as teamwork, communication, problem-solving, and project management.
- **Innovative Thinking:** Select a project that encourages creativity and innovative problem-solving. Projects that push the boundaries of traditional engineering approaches can be particularly rewarding.
- **Societal Impact:** Consider the potential impact of your project on society or the engineering community. Projects that address significant challenges or contribute to social good can be highly fulfilling and make a meaningful difference.



Guidelines to select Fellowship

- Ensure the program is accredited by a recognized accrediting body and has a strong reputation for quality education in engineering.
- Ensure it covers core engineering principles that align with your interests and career goals.
- Investigate the qualifications and experience of the faculty mentor. Look for programs with faculty who have strong academic backgrounds, industry experience, and active involvement in research.
- Check if the program provides adequate hands-on training opportunities, such as laboratory work, workshops, and access to modern engineering facilities and equipment.
- Assess the program's connections with industry. Strong partnerships with companies can lead to valuable internship opportunities, industry projects, and exposure to real-world engineering challenges.
- Explore the availability of research opportunities. Participation in research projects can enhance your learning experience and open doors to innovative career paths.
- Look for programs that offer professional development resources, such as workshops, seminars, and networking events with industry professionals and alumni.
- Ensure the program provides robust support services, including academic advising, career counseling, mentorship programs, and assistance with job placement after graduation.
- Consider the cost of the program and available financial aid options, such as scholarships, grants, and fellowships. Evaluate the return on investment in terms of career prospects and potential earnings.
- Research the success of the program's alumni. High employment rates and successful careers of past graduates can indicate the program's effectiveness in preparing students for the engineering field.

Duties Responsibilities of the Faculty Mentor

Each student should have a faculty mentor for the Institute.

- Get the approval from the Chairman Board of Examinations with the recommendations of the HOD/Principal for the topics.
- Provide comprehensive academic advising to help fellows select appropriate specializations, and research projects that align with their interests and career goals.



- Guide fellows through their research projects, offering expertise and feedback to ensure rigorous methodology, innovative approaches, and meaningful contributions to the field.
- Assist fellows in developing technical and professional skills through hands-on projects, laboratory work, and practical applications of theoretical knowledge.
- Offer career advice and support, helping fellows explore potential career paths, prepare for job searches, and connect with industry professionals and opportunities.
- Provide personal mentorship, fostering a supportive relationship that encourages growth, resilience, and a positive academic experience.
- Facilitate connections between fellows and industry professionals, alumni, and other relevant networks to enhance their professional opportunities and industry exposure.
- Ensure fellows have access to necessary resources, including research materials, lab equipment, software, and academic literature.
- Regularly monitor and evaluate the progress of fellows, providing constructive feedback and guidance to help them stay on track and achieve their goals.
- Instill and uphold high ethical and professional standards, encouraging fellows to practice integrity and responsibility in their work.
- Assist with administrative tasks related to the fellowship program, such as preparing progress reports, writing recommendation letters, and facilitating grant applications.
- Organize and participate in workshops, seminars, and other educational events that enhance the learning experience and professional development of fellows.
- Address any issues or conflicts that arise, providing mediation and support to ensure a positive and productive academic environment.

Instructions to the Fellowship Scholar

- Regularly meet with your faculty mentor for guidance on academic progress, research projects, and career planning. Be proactive in seeking advice and support from your mentor.
- Develop strong organizational skills. Use planners, calendars, and task management tools to keep track of assignments, project deadlines, and study schedules. Prioritize tasks to manage your time efficiently.
- Take advantage of opportunities to participate in research projects and hands-on activities. These experiences are crucial for applying your theoretical knowledge and gaining practical skills.



- Focus on improving essential professional skills such as communication, teamwork, problem-solving, and leadership. Participate in workshops and seminars that enhance these competencies.
- Actively seek networking opportunities through industry events, seminars, and meetings. Establish connections with peers, alumni, and professionals in your field to build a strong professional network.
- Seek internships, co-op programs, or part-time jobs related to your field of study. Real-world experience is invaluable for understanding industry practices and enhancing your employability.
- Uphold high ethical standards in all your academic and professional activities. Practice integrity, honesty, and responsibility. Adhere to the ethical guidelines and standards set by your institution and the engineering profession.
- Adopt a mindset of lifelong learning. Stay updated with the latest developments and trends in engineering by reading industry journals, attending conferences, and taking additional courses.

Documents to be submitted by the student to offer fellowship

- **Completed Application Form:** This is typically the standard form provided by the institution or fellowship program that includes personal information, educational background, and other relevant details.
- **Detailed CV/Resume:** A comprehensive document outlining your educational background, knowledge experience, interest in research experience, publications, presentations, awards, and other relevant achievements if any.
- **Personal Statement:** A document explaining your motivation for applying to the fellowship, your career goals, how the fellowship aligns with those goals, and what you intend to achieve through the program.
- **Recommendation Letters:** Letters from faculty mentor, employer, or professionals who can attest to your academic abilities, professional skills, and suitability for the fellowship.
- **Proposal/Description:** A detailed proposal or description of the fellowship project or study you plan to undertake during the fellowship. This should include objectives, methodology, expected outcomes, and significance of the project.
- **Enrollment Verification:** Documentation verifying your current acceptance status in the academic institution or industry where the fellowship will be conducted.



- **Funding Information:** Details about any other sources of funding or financial aid you are receiving, if applicable. Some fellowships may also require a budget proposal for the intended use of the fellowship funds.
- **Samples of Work:** Copies of the relevant work that demonstrates your capabilities and accomplishments in your field.
- **Endorsement Letter:** A letter from your current academic institution endorsing your application for the fellowship, if required.
- **Ethical Approval Documents:** If your research involves human subjects or animals, you may need to submit proof of ethical approval from the relevant ethics committee.
- **Additional Documents:** Any other documents requested by the fellowship program required by the institution.

Attendance Certification

Every month students have to get their attendance certified by the supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the faculty mentor. Regularity in attendance and submission of report will be duly considered while awarding the Internal Assessment mark.

Rubrics for Fellowship

Sl. No.	Topics	Description
1	Alignment with Objectives	Assess how well the project aligns with the stated objectives and requirements. Determine if the student has addressed the key aspects outlined in the project guidelines.
2	Depth of Research	Evaluate the depth and thoroughness of the literature review. Assess the student's ability to identify and address gaps in existing research.
3	Clarity of Objectives	Check if the student has clearly defined and articulated the objectives of the project. Ensure that the objectives are specific, measurable, achievable, relevant, and time-bound (SMART).



4	Methodology and Data Collection	Evaluate the appropriateness and justification of the research methodology. Assess the methods used for data collection and their relevance to the research questions.
5	Analysis and Interpretation	Examine the quality of data analysis techniques used. Assess the student's ability to interpret results and draw meaningful conclusions.
6	Project Management	Evaluate the project management aspects, including adherence to timelines and milestones. Assess the student's ability to plan and execute the project effectively.
7	Documentation and Reporting	Check the quality of documentation, including code, experimental details, and any other relevant materials. Evaluate the clarity, structure, and coherence of the final report.
8	Originality and Creativity	Assess the level of originality and creativity demonstrated in the project. Determine if the student has brought a unique perspective or solution to the research problem.
9	Critical Thinking	Evaluate the student's critical thinking skills in analyzing information and forming conclusions. Assess the ability to evaluate alternative solutions and make informed decisions.
10	Problem-Solving Skills	Evaluate the student's ability to identify and solve problems encountered during the project. Assess adaptability and resilience in the face of challenges.



INTERNAL MARKS - 40 Marks

As per the rubrics each topic should be considered for the Review 1 and Review 2. Equal weightage should be given for all the topics. It should be assessed by a faculty mentor and the industrial professional or research guide.

Review 1 shall be conducted after 8th week and Review 2 shall be conducted after 14th week in the semester. Average marks scored in the reviews shall be considered for the internal assessment of 40 Marks.

Scheme of Evaluation

PART	DESCRIPTION	MARKS
A	Assessment as per the rubrics.	30
B	Attendance	10
Total		40

END SEMESTER EXAMINATION - Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Board of Examinations after the completion of fellowship. The marks scored will be converted to 60 marks for the End Semester Examination.

Sl. No.	Description	Marks
A	Daily Activity Report.	20
B	Comprehensive report of the Fellowship Work.	30
C	Presentation by the student.	30
D	Viva Voce	20
Total		100



1055236374	IN HOUSE PROJECT	Periods	C
PROJECT		520	12

Introduction

Every student must do one major project in the Final year of their program. Students can do their major project in Industry or R&D Lab or in-house or a combination of any two for the partial fulfillment for the award of Diploma in Engineering.

For the project works, the Department will constitute a three-member faculty committee to monitor the progress of the project and conduct reviews regularly.

If the projects are done in-house, the students must obtain the bonafide certificate for project work from the Project supervisor and Head of the Department, at the end of the semester. Students who have not obtained the bonafide certificate are not permitted to appear for the Project Viva Voce examination.

For the projects carried out in Industry, the students must submit a separate certificate from Industry apart from the regular bonafide certificate mentioned above. For Industry related projects there must be one internal faculty advisor / Supervisor from Industry (External), this is in addition to the regular faculty supervision.

The final examination for project work will be evaluated based on the final report submitted by the project group **of not exceeding four students**, and the viva voce by an external examiner.

Objectives

Academic project work plays a crucial role in the education of Diploma in Engineering students, as it helps them apply theoretical knowledge to practical situations and prepares them for real-world engineering challenges.

- **Integration of Knowledge:** Consolidate and integrate theoretical knowledge acquired in coursework to solve practical engineering problems.
- **Skill Development:** Enhance technical skills related to the specific field of engineering through hands-on experience and application.
- **Problem-Solving Abilities:** Develop critical thinking and problem-solving abilities by addressing complex engineering issues within a defined scope.
- **Project Management:** Gain experience in project planning, execution, and management, including setting objectives, timelines, and resource allocation.



- **Teamwork and Collaboration:** Foster teamwork and collaboration by working in multidisciplinary teams to achieve project goals and objectives.
- **Research Skills:** Acquire research skills by conducting literature reviews, gathering relevant data, and applying research methodologies to investigate engineering problems.
- **Innovation and Creativity:** Encourage innovation and creativity in proposing and developing engineering solutions that may be novel or improve upon existing methods.
- **Communication Skills:** Improve communication skills, both oral and written, by presenting project findings, writing technical reports, and effectively conveying ideas to stakeholders.
- **Ethical Considerations:** Consider ethical implications related to engineering practices, including safety, environmental impact, and societal concerns.
- **Professional Development:** Prepare for future professional roles by demonstrating professionalism, initiative, and responsibility throughout the project lifecycle.

Course Outcomes

CO 1: Demonstrate the ability to apply theoretical concepts and principles learned in coursework to solve practical engineering problems encountered during the project.

CO 2: Develop and enhance technical skills specific to the field of engineering relevant to the project, such as design, analysis, simulation, construction, testing, and implementation.

CO 3: Apply critical thinking and problem-solving skills to identify, analyze, and propose solutions to engineering challenges encountered throughout the project lifecycle.

CO 4: Acquire project management skills by effectively planning, organizing, and executing project tasks within defined timelines and resource constraints.

CO 5: Improve communication skills through the preparation and delivery of project reports, presentations, and documentation that effectively convey technical information to stakeholders.



Important points to consider to select the In-house project.

- Selecting a project work in Diploma Engineering is a significant decision that can greatly influence your learning experience and future career prospects.
- Choose a project that aligns with your career aspirations and interests within the field of engineering. Consider how the project can contribute to your professional development and future opportunities.
- Ensure the project aligns with your coursework and specialization within the Diploma program. It should complement and build upon the knowledge and skills you have acquired in your studies.
- Evaluate the scope of the project to ensure it is manageable within the given timeframe, resources, and constraints. Avoid projects that are overly ambitious or impractical to complete effectively.
- Assess the availability of resources needed to conduct the project, such as equipment, materials, laboratory facilities, and access to relevant software or tools. Lack of resources can hinder project progress.
- Select a project that genuinely interests and motivates you. A project that captures your curiosity and passion will keep you engaged and committed throughout the project duration.
- Consider the availability and expertise of faculty advisors or industry mentors who can provide guidance and support throughout the project. Effective mentorship is crucial for success.
- Clearly define the learning objectives and expected outcomes of the project. Ensure that the project will help you achieve specific learning goals related to technical skills, problem-solving, and professional development.
- Look for opportunities to propose innovative solutions or explore new methodologies within your project. Projects that encourage creativity can set you apart and enhance your learning experience.
- Consider ethical implications related to the project, such as safety protocols, environmental impact, and compliance with ethical guidelines in research and engineering practices.
- Evaluate whether the project offers opportunities for collaboration with peers, experts from other disciplines, or industry partners. Interdisciplinary projects can broaden your perspective and enhance your teamwork skills.



- Consider the potential impact of your project on society or the engineering community. Projects that address significant challenges or contribute to social good can be highly fulfilling and make a meaningful difference.

By carefully considering these points, Diploma Engineering students can make informed decisions when selecting project work that not only enhances their academic learning but also prepares them for successful careers in engineering.

Duties Responsibilities of the internal faculty advisor

Each group should have an internal faculty advisor assigned by the HOD/Principal.

- The in-house project should be approved by the project monitoring committee constituted by the Chairman Board of Examinations.
- The in-house project should be selected in the fifth semester itself. Each in-house project shall have a maximum of four students in the project group.
- Provide comprehensive academic advising to help in the selection of appropriate in-house project that align with their interests and career goals.
- Offer expertise and feedback to ensure rigorous methodology, innovative approaches, and meaningful contributions to the field.
- Assist in developing technical and professional skills through hands-on projects, laboratory work, and practical applications of theoretical knowledge.
- Provide personal mentorship, fostering a supportive relationship that encourages growth, resilience, and a positive academic experience.
- Facilitate connections between students and industry professionals, alumni, and other relevant networks to enhance their professional opportunities and industry exposure.
- Ensure students have access to necessary resources, including research materials, lab equipment, software, and academic literature.
- Regularly monitor and evaluate the progress of the in-house project, providing constructive feedback and guidance to help them stay on track and achieve their goals.
- Instill and uphold high ethical and professional standards, encouraging students to practice integrity and responsibility in their work.
- Assist in preparing progress reports, writing recommendation letters, and facilitating grant applications.
- Organize and participate in workshops, seminars, and other educational events that enhance the learning experience and professional development.



- Address any issues or conflicts that arise, providing mediation and support to ensure a positive and productive academic environment.

Instructions to the students

- Regularly meet with your internal faculty advisor for guidance on academic progress, research projects, and career planning. Be proactive in seeking advice and support from your faculty advisor.
- Use planners, calendars, and task management tools to keep track of assignments, project deadlines, and study schedules. Prioritize tasks to manage your time efficiently.
- Take advantage of opportunities to participate in in-house projects and hands-on activities. These experiences are crucial for applying your theoretical knowledge and gaining practical skills.
- Focus on improving essential professional skills such as communication, teamwork, problem-solving, and leadership. Participate in workshops and seminars that enhance these competencies.
- Actively seek networking opportunities through industry events, seminars, and meetings. Establish connections with peers, alumni, and professionals in your field to build a strong professional network.
- Seek internships, co-op programs, or part-time jobs related to your field of study. Real-world experience is invaluable for understanding industry practices and enhancing your employability.
- Uphold high ethical standards in all your academic and professional activities. Practice integrity, honesty, and responsibility. Adhere to the ethical guidelines and standards set by your institution and the engineering profession.
- Adopt a mindset of lifelong learning. Stay updated with the latest developments and trends in engineering by reading industry journals, attending conferences, and taking additional courses.



Documents to be submitted by the student for an in-house project

Submit a printed report of your in-house project work along with the fabrication model / analysis report for the End Semester Examination.

Rubrics for In-House Project Work

Sl. No.	Topics	Description
1	Objectives	Clearly defined and specific objectives outlined. Objectives align with the project's scope and purpose.
2	Literature Review	Thorough review of relevant literature. Identification of gaps and justification for the project's contribution.
3	Research Design and Methodology	Clear explanation of the research design. Appropriateness and justification of chosen research methods.
4	Project Management	Adherence to project timeline and milestones. Effective organization and planning evident in the project execution.
5	Documentation	Comprehensive documentation of project details. Clarity and completeness in recording methods, results, and challenges.
6	Presentation Skills	Clear and articulate communication of project findings. Effective use of visuals, if applicable.
7	Analysis and Interpretation	In-depth analysis of data. Clear interpretation of results in the context of research questions.
8	Problem-Solving	Demonstrated ability to identify and address challenges encountered during the project. Innovative solutions considered where applicable.
9	Professionalism and Compliance	Adherence to ethical standards in research. Compliance with project guidelines and requirements.
10	Quality of Work	Overall quality and contribution of the project to the field. Demonstrated effort to produce high-quality work.



SCHEME OF EVALUATION

The mark allocation for Internal and End Semester Viva Voce are as below.

Internal Mark Split (40 Marks)*		
Review 1 (10 Marks)	Review 2 (15 Marks)	Review 3 (15 marks)
Committee: 5 Marks. Supervisor: 5 Marks	Committee: 7.5 Marks Supervisor: 7.5 Marks	Committee: 7.5 Marks Supervisor: 7.5 Marks

Note: * The rubrics should be followed for the evaluation of the internal marks during reviews.

END SEMESTER EXAMINATION - Project Exam

The performance of each student in the project group would be evaluated in a viva voce examination conducted by a committee consisting of an external examiner and the Department project supervisor and an internal examiner.

End Semester (100)*			
Record (20 Marks)	Presentation (20 Marks)	Viva Voce (20 Marks)	Model / Analysis Report (40 Marks)
External: 10 Internal: 5 Supervisor: 5	External: 10 Internal: 5 Supervisor: 5	External: 10 Internal: 5 Supervisor: 5	External: 20 Internal: 10 Supervisor: 10

The marks scored will be converted to 60 Marks.

Students who are unable to complete the project work at the end of the semester can apply for an extension to the Head of the Department, with the recommendation from the project guide for a period of a maximum of two months. For those students who extend the project work for two months, Viva Voce will be carried out and results will be declared separately. If the project report is not submitted even beyond the extended time, then students are not eligible to appear for Project Viva Voce Examination.