CO'S & CO-PO MAPPING

FOR

MASTER OF COMPUTER APPLICATION
MCA (NEW)

(W.E.F 2023-2024)

DEPARTMENT OF COMPUTER APPLICATION

INTEGRAL UNIVERSITY, LUCKNOW

INTEGRAL UNIVERSITY, LUCKNOW

VISION

- To lead the teeming millions of the world through the wilderness of ignorance and illiteracy, as "Kindly Light" (Exodus 13:21) with the resounding divine proclamation "Read : Thy Lord is the most bounteous (Quran 30:96:3)." and to educate them in the most constructive and Innovative way.

- To inculcate a spirit of confidence, self-respect and firm commitment in students along with farsighted wisdom and understanding.

- To integrate the ebullience, intellect and dynamism of youth with decency, decorum, discipline and dedication through value-based quality education.

MISSION

- To make every student a role model of intellectuals and torch bearers for others all over the world through his / her inspiring existence.

- To make India a self-reliant and dominant G-1 country, recognized for quality education, higher economic growth and valuable moral practices.

OBJECTIVES

- To harness education in the service of mankind, and to enable the students to think globally and act nationally.

- To integrate spiritual and moral values with education and to develop human potential to its totality. To develop a sense of self-reliance and to create the awareness of the same in the young generations.

- To ignite the latent potentialities of young and budding generation through cutting-edge technology and state-of-the-art academic programmers.

- To bring about innovation in education by restructuring courses and adopting novel methods of teaching and learning to target multifaceted personality development.

DEPARTMENT OF COMPUTER APPLICATIONS
MCA PROGRAMME

VISION

The Vision of the Department is:

- To develop a department where the technical aspirants can be produced to give applicable support to the society.
- To develop a qualitative interest in the students who wish to become researchers, innovators and professionals.
- To develop a qualitative interest in the students who wish to become researchers, innovators and professionals.

MISSION

The Mission of the Department is:

- To produce valued capability in the students for exercising continuous creativity, innovation and initiation.
- To develop enlightening avenues for maximizing career choices for the potential students.
- To give freedom to the students for exploring inner excellence through extra-curricular activities.

DEPARTMENT OF COMPUTER APPLICATIONS
MCA PROGRAMME

Programme Educational Objectives (PEO)

- To enhance foundation of mathematics, computer application and problem solving methodology for effective implementation in the area of s/w development.
- To effectively design, implement, improve, and manage the integrated socio-technical systems.
- To inculcate effective communication skills combined with professional & ethical attitude.
- To gain multidisciplinary knowledge through real time projects and industry internship training and providing a sustainable competitive edge in R&D and meeting industry needs.

Programme Outcomes (PO)

- **Computational knowledge:** Acquire knowledge of Computing Fundamentals, Basic Mathematics, Computing Specialization and Domain Knowledge of proper computing models from defined problems.
- **Problem analysis:** Identify, formulate review research literate and analyze complex engineering problems reading substantiated conclusions using first principles mathematics, computing science and relevant domains.
- **Design/development of solutions:** Ability to design system s/w or process as per needs and specifications.
- **Conduct investigations of complex computing problems:** Use research-based knowledge and research methods including design of experiments, analysis & interpretation of data & synthesis of information to provide valid conclusions.
- **Modern Tool Usage:** Ability to demonstrate skills to use modern s/w & h/w tools to analyze problems.
- **Professional Ethics:** Apply ethical principles and commit to professional ethics and cyber regulations.
- **Life-Long Learning:** Ability to develop confidence for self-education and life-long learning in the broadest context of technological change.
- **Project management and finance:** Ability to demonstrate knowledge & understanding of the engineering and management principles and apply them as a member & as a leader in a team to manage multidisciplinary projects.
- **Communication Efficacy:** Ability to communicate effectively in both verbal and written form.
- **Societal and Environmental Concern:** Ability to understand the impact of IT solutions in a global and societal context.
- **Innovations and entrepreneurship:** Find out right opportunity for entrepreneurship and create odd value for the betterment of an individual and society at large.

Programme Specific Outcome (PSO)

- Understand the concepts and application in the field of Computing Sciences like Web designing & development, mobile application development and Network & Communication technologies.
- Ability to test & analyze the quality of various sub-systems and to integrate them in order to evolve a larger computing system.

Integral University, Lucknow
Department of Computer Application
STUDY & EVALUATION SCHEME
Choice Based Credit System
Master of Computer Application (MCA)
w.e.f. Session 2024-25

Total Credit :- 106

Year I, Semester I

S. No.	Course Category	Subject Code	Name of the Subject	Periods				Evaluation Scheme				Subject Total
								Sessional (CA)			End Sem. Exam	
				L	T	P	C	UE	TA	Total	ESE	
1.	Core	CA451	Discrete Mathematics	3	1	0	4	40	20	60	40	100
2.	Core	CA452	Computer Organization and Architecture	3	1	0	4	40	20	60	40	100
3.	Core	CA453	Fundamentals of Computer and C Programming	3	1	0	4	40	20	60	40	100
4.	Core	CA454	UNIX and Shell Programming	3	1	0	4	40	20	60	40	100
5.	Core	CA455	Software Engineering	3	1	0	4	40	20	60	40	100
6.	Core	CA456	Operating System	3	1	0	4	40	20	60	40	100
7.	Core	CA457	Computer Organization and Architecture Lab	0	0	3	2	40	20	60	40	100
8.	Core	CA458	C Programming Lab	0	0	3	2	40	20	60	40	100
9.	Core	CA459	UNIX / LINUX Lab	0	0	2	1	40	20	60	40	100
Total				**18**	**6**	**8**	**27**	**360**	**180**	**540**	**360**	**900**

L - Lecture **T** – Tutorial **P** – Practical **C** – Credit **UE**– Unit Exams **TA** – Teacher Assessment

Sessional Total (CA) = Class Test + Teacher Assessment

Subject Total = Sessional Total (CA) + End Semester Examination (ESE)

COURSE: DISCRETE MATHEMATICS
COURSE CODE: CA451
COURSE CREDIT: 4

COURSE OBJECTIVES:

- Know the basic principle of set theory, relations, function and its operations.
- Able to Understand the concepts of groups, and elementary properties of Rings and Fields.
- Learn the logical notation and determine if the argument is or is not valid in preposition and predicate logic.
- Learn the representation of lattices with POSET.
- Learn the concepts of graphs, trees and it's traversal, and recurrence relations.

COURSE OUTCOMES (CO):
After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To understand the basic principle of set theory, relations, function and its operations.
CO2	Understand the algebraic structure related to the groups, and elementary properties of Rings and Fields.
CO3	Write an argument using logical notation and determine if the argument is or is not valid.
CO4	To understanding and representation of lattices and be able to determine their properties with Boolean algebra.
CO5	Demonstrate the problem using graphs and represent the trees traversal, and also basics of recurrence relations.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		1		2	1					
CO2	3	1		2	1	1	2		1			
CO3	1	2	3	2	2	1	2	1			1	
CO4	2	1		2		2	2	1			1	
CO5	1	3	3	2	2	2	1	2			1	

COURSE: COMPUTER ORGANIZATION AND ARCHITECTURE
COURSE
CODE: CA452
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To introduce students to the foundations of computer organization and architecture.
- To develop the ability to perform programming in an assembly language.
- Explain different types of addressing modes, Instruction Formats, CPU organization and memory organization.
- Learn the concepts of parallel processing, pipelining and inter-processor communication.
- Exemplify in a better way the I/O , Pipelined Processors and SIMD Network

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Perform basic operations with different number systems and Understand concepts of register transfer Language.
CO2	Understand the architecture and functionality of CPU and memory Organization
CO3	Understand the concept of I/O organization and Implement assembly language program for given task for 8085/8086 microprocessor
CO4	Understand the Concept of Parallel computing and its applications
CO5	Learn the concepts of pipelined processors and inter-processor communication

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		3	1	1	2					
CO2	3	1		2		2	2	1				
CO3	2	2	3	1	3	1	1	2			1	
CO4	3	1		2	1	1	2					
CO5	1	2	1	1		2	2				1	

COURSE: FUNDAMENTALS OF COMPUTER AND C PROGRAMMING
COURSE CODE: CA453
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To learn the basic concepts of Computer fundamentals.
- To learn the basic concepts and syntax of C programming.
- To be able to develop logic which help them to create programs and applications using C language.
- To learn the use of C libraries functions in C language.
- To learn file handling and basic memory allocation concepts in C language.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to understand the basic knowledge of Computer fundamental and its application in computers.
CO2	Able to understand the basic concepts of C programming language.
CO3	Able to design and develop various programming problems using C programming concepts.
CO4	Able to Implement advance C programming concepts like function, pointer, structure and union etc.
CO5	Able to understand the file handling using C Programming language.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	2	2		1	2					
CO2	3	2	1	1	2	1	3	1				
CO3	1	2	3	2	3	1	2	1			1	
CO4	1	2	3	2	2	2	1	1			1	
CO5	3	1	1			2	2	1				

COURSE: UNIX AND SHELL PROGRAMMING
COURSE CODE: CA454
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To learn basic structure and various commands of UNIX system.
- To learn and implement various concepts of shell programming.
- To learn basic concepts of process, Inter process communication in UNIX system.
- To learn basics concepts and commands of UNIX system Administration.
- To learn various Filter and Tools of UNIX system.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to understand the basic Unix architecture, commands and utilities of the UNIX operating system and to work confidently in Unix/Linux environment and open systems
CO2	Able to write simple and complex shell scripts to automate various tasks using shell programming
CO3	Understand various concepts of process, IPC and process related command in UNIX.
CO4	Able to understand UNIX system administration.
CO5	Master the students in the art of usage of simple advanced filters and tools.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		1		2	2					
CO2	1	2	3	2	3	1	1	1			1	
CO3	3	1		2		2	2					
CO4	2	1	1	2	2	1	2	1				
CO5	1	2	2	1	3	2	2				1	

COURSE: SOFTWARE ENGINEERING
COURSE CODE: CA455
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To provide the concepts of software crisis, issues, characteristics, evolution and application with respect to software engineering.
- To give fundamental aspects of software development with respect to requirement engineering, requirement analysis, design, coding, testing and maintenance.
- To give knowledge of practical implementation of software coding style and software testing strategies for software development.
- To provide practical knowledge in software design, object oriented design and software development in terms of software implementation and maintenance.
- To provide the practical knowledge for ensuring the quality and reliability of software during software development using models

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learn the concepts of software crisis, issues, characteristics, evolution and application with respect to software engineering.
CO2	Know the fundamental aspects of software development with respect to requirement engineering, requirement analysis, design, coding, testing and maintenance.
CO3	Find the practical implementation of software coding style, design and software testing strategies.
CO4	Enhance the knowledge of management of software project from initial stage to final stage for software development.
CO5	Access the practical knowledge for ensuring the quality and reliability of software during software development using models.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		1		2	2					
CO2	3	1		2	1	1	1					
CO3	1	2	3	2	3	1	2	1			1	
CO4	2	1	1		1	1	2	3				
CO5	1	2	3	3	2	2	2	1			1	

COURSE: OPERATING SYSTEM
COURSE CODE: CA456
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To study types of Operating System and Process Management.
- To learn Scheduling and Process Synchronization.
- To study Deadlock and Storage management.
- To study about Virtual Memory and File Management.
- To learn Disc Management.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Explain the types of operating system and ability to create threads and perform interposes communication.
CO2	Understand CPU scheduling and able to solve process synchronization problems.
CO3	Understand issues surrounding deadlock handling and memory management.
CO4	Explain paging and segmentation methods suitable for virtual memory. Ability to manage files and directory.
CO5	Be able to recovery and manage disk spaces. Knowledge of files systems and Android OS.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	3	1	1	2	1					
CO2	3	1		2		1	2	1				
CO3	3	2	1	1		2	1					
CO4	2	1	2	2	1	2	3	1			1	
CO5	1	2	1	3	2	2	2				1	

COURSE: COMPUTER ORGANIZATION AND ARCHITECTURE LAB
COURSE CODE: CA457
COURSE CREDIT: 1

COURSE OBJECTIVES:

- To impart basic understanding of the internal organization of 808 Microprocessor.
- To introduce the concepts of interfacing microprocessors with external devices
- To develop Assembly language programming skills.
- To Design and understand the behavior of digital circuits , Adder, subtractor decoder Multiplexers counter and flip-flop

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Build a program on a microprocessor using instruction set of 8086.
CO2	Analyze the behavior of digital circuits
CO3	Design digital circuits for basic components of computer system and applications
CO4	Describe the internal architecture and different modes of operations of a typical micro controller
CO5	Understand different addressing modes and instructions of 8086, design and develop assembly language programs using software interrupts, subroutines and macros

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	2	3	2	3	2	1				1	
CO2	1	2	1	3	3	2	2	1				
CO3	1	2	3	2	2	1	2	1			1	
CO4	3	1	1	2		2	2					
CO5	1	2	3	3	3	2	2	2			1	

COURSE: C PROGRAMMING LAB
COURSE CODE: CA458
COURSE CREDIT: 1

COURSE OBJECTIVES:

- To understand basic concepts of C programming, operators and expressions.
- To learn the Concept of Various Decision Control statements and loops.
- To understand the Concept of Arrays and String Operations.
- To understand Concept of Functions, Pointers, Structure, Union and Enumeration.
- To understand Concept of File Handling

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Simple programs to understand the concepts of data types, operations and expressions.
CO2	Familiarizing conditional and control statements.
CO3	Implementing Concept of array and String to solve problem.
CO4	Implementation of functions, pointers, operation on pointers and dynamic storage allocation.
CO5	Defining and handling structures, array of structures, union and processing data

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	3	2	3	2	1					
CO2	2	2	3	2	3	1	2	1				
CO3	1	3	3	2	2	1	1	1			1	
CO4	1	2	3	2	2	1	2	1			1	
CO5	3	1	2	2	2	1	2	1				

COURSE: UNIX / LINUX LAB
COURSE CODE: CA459
COURSE CREDIT: 1

COURSE OBJECTIVES:

- To learn basic commands of UNIX system.
- To learn various syntax of shell programming and implement various concepts of shell programming.
- To learn basic commands of process management and implement system programming.
- To learn basic commands of UNIX system Administration.
- To learn various Filter and Tools of UNIX system.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to execute various commands and utilities of the UNIX operating system.
CO2	Able to implement shell scripts and automate various daily tasks using shell programming.
CO3	Able to implement system programming.
CO4	Able to execute UNIX system administration commands.
CO5	Develop applications using concepts of UNIX system.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	2	2	3	2	2					
CO2	1	2	3	2	3	1	2					
CO3	1	2	3	1	3	2	2					
CO4	2	1	2	2	3	2	2					
CO5	1	3	3	2	3	1	2					

Integral University, Lucknow
Department of Computer Application
STUDY & EVALUATION SCHEME
Choice Based Credit System
Master of Computer Application (MCA)
w.e.f. Session 2024-25

Year Ist, Semester IInd

S. No.	Course Category	Subject Code	Name of the Subject	Periods				Evaluation Scheme				Subject Total
								Sessional (CA)			End Sem. Exam	
				L	T	P	C	UE	TA	Total	ESE	
1.	Core	CA460	Data Structure and Analysis of Algorithms	3	1	0	4	40	20	60	40	100
2.	Core	CA461	Computer Networks	3	1	0	4	40	20	60	40	100
3.	Core	CA462	Distributed System	3	1	0	4	40	20	60	40	100
4.	Core	CA463	Database Management System	3	1	0	4	40	20	60	40	100
5.	Core	CA464	Object Oriented Programming using JAVA	3	1	0	4	40	20	60	40	100
6.	Elective –I			3	1	0	4	40	20	60	40	100
7.	Core	CA471	Data Structure and Algorithms Lab	0	0	3	1	40	20	60	40	100
8.	Core	CA472	DBMS Lab	0	0	3	1	40	20	60	40	100
9.	Core	CA473	JAVA Lab	0	0	2	1	40	20	60	40	100
Total				**18**	**6**	**8**	**27**	360	180	540	360	**900**

L - Lecture **T** – Tutorial **P** – Practical **C** – Credit **UE**– Unit Exams **TA** – Teacher Assessment

Sessional Total (CA) = Class Test + Teacher Assessment

Subject Total = Sessional Total (CA) + End Semester Examination (ESE)

Elective – I

CA465 Data Warehousing and Data Mining

CA466 Data Science

CA467 ERP Systems

CA468 Storage Technology and Management

CA469 Automata Theory

CA470 Android Programming

COURSE: DATA STRUCTURE AND ANALYSIS OF ALGORITHM
COURSE CODE: CA460
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To understand basics knowledge of data structure operations, algorithms and their application.
- To understand the algorithms of Linked List and its type, Searching, Hashing and their application.
- To design and implement the algorithms of linear data structure such as Queues, Stacks, Recursion and their application.
- To understand basics of graphs, tree and their algorithms.
- To learn various design techniques of algorithms and understand the real implementation of sorting, Greedy method and dynamic programming.

COURSE OUTCOMES (CO):
After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Analyze the problem and create appropriate algorithm.
CO2	Understand basics knowledge of data structure operations like insertion, deletion etc for various data structure and their application.
CO3	Develop and implement various programs using C for linear data structure.
CO4	To understand basics of nonlinear data structure graphs, tree and their Algorithms.
CO5	To learn various Design Techniques of Algorithms and understand the real implementation of Sorting, Greedy Method and Dynamic Programming.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	3	3	2	2	2	1	1				
CO2	2	1		1		1	2					
CO3	1	1	3	2	3	1	2	1			1	
CO4	2	1		1		2	2					
CO5	2		2	2	1	1	2	1				

COURSE: COMPUTER NETWORKS
COURSE CODE: CA461
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To understand the concepts of communicating channel in order to deal with the different transmission media. To learn different about the different approaches of networking through switching modes and different multiplexing techniques.
- To learn the importance of IEEE standard to raise good results and modes to apply various protocols internally and externally in specified time domain. To deal with the problems arises due to channel allocation and ultimately to detect collisions so as to avoid them on priority basis.
- To learn different models to transfer data through physical communicating medium with the help of routing algorithms. To analyze the features of different algorithms to find a short way to approach to the destination.
- To understand significance of various layers in OSI as well as TCP/IP models to bring a data in segment form and to synchronize the interaction of source and destination using respective layers.
- To draw elementary knowledge regarding different known systems that provide various characteristics, when number of protocols are applied to secure the data.

COURSE OUTCOMES (CO):
After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	With a new approach of communication, a student shall be able to transfer data through respective medium; also he can opt various ways of networking using topologies. A student can also understand the difference between the time and frequency domain transmission in order to analyze various switching modes
CO2	For new IEEE standard, a student should overcome the previous phenomena for networking using different domains. He/ she should know the conditions regarding the channel allocations, collision detection and its avoidance
CO3	For a particular data transfer system, student shall be able to analyze which router is good for networking using different algorithms. A student shall able to differ between the approaches used in congestion control and protocols in network layer
CO4	He/she should be able to know the duties regarding respective layer. A student should be aware of the fact when to use TCP and when to use UDP for synchronization between hop points so that a student can analyze encryption and decryption techniquesfor proper data transfer
CO5	For securing data and a system, a student can evaluate different procedures and algorithms based on network security and he/she should learn about the protocols to used according to the format of data transfer

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1			1	1						
CO2	1		1	2	1							
CO3	2	3		1	1	1		1				
CO4	1	2	2	1		2	1					
CO5		1	1	2	1	2		1				

INTEGRAL UNIVERSITY LUCKNOW-INDIA

COURSE: DISTRIBUTED SYSTEM
COURSE CODE: CA462
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To understand distributed system architecture and also the limitations in designing the distributed operating systems along with its proposed solution.
- To study distributed operating system concepts for Mutual exclusion and Deadlock handling algorithms and agreement protocols.
- To study basics of agreement problem along with its solution and understand the concepts of distributed file system.
- To know and implement the algorithms for distributed shared memory management and understand the concepts of load scheduling in distributed operating system.
- To study communication in distributed system along with communication protocols in a broader sense.

COURSE OUTCOMES (CO):
After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students will attain knowledge with distributed system architecture, design and its implementation.
CO2	Learn mutual exclusion and Deadlock management in distributed system.
CO3	Learn use of agreement protocols in distributed system and distributed file system management.
CO4	Learn different resource management techniques like distributed shared memory and scheduling for distributed systems.
CO5	Learn routing algorithms and their applicability in distributed system.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	2	1								
CO2	1	2	1	1	1	1	1	1				
CO3	1	1	2	2	1	1	1					
CO4	2	2		2	1		1					
CO5	1	2	2	1	2			1				

INTEGRAL UNIVERSITY LUCKNOW-INDIA

COURSE: DATABASE MANAGEMENT SYSTEM
COURSE CODE: CA463
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To learn the basic knowledge of Database Management System and various types of data models.
- To learn the concept and syntax of ER Diagram and the extended ER features.
- To learn various constraints and writing SQL queries.
- To learn the basic structure of Oracle system.
- To learn the concept of Normalization.
- To learn the concept of Lossless decomposition and dependency preservation.
- To learn the various issues in transaction processing and recovery system.
- To learn the various techniques for concurrency control in Databases.
- To learn the concepts and applications of Object oriented DBMS (OODBMS).

COURSE OUTCOMES (CO):
After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand the basic concepts of DBMS and ER Model and How to draw ER Diagrams.
CO2	Define constraints, writing queries using SQL syntax, applying the Relational algebra and Calculus to define expressions for queries in Databases.
CO3	Understand the purpose of Normalization to solve the problem of redundancy in tables and defining various Normal forms.
CO4	Understand the concepts of transactions, their processing to become familiar with issues like data integrity, security and recovery.
CO5	Understand the various Concurrency Control techniques and concepts of Object Oriented databases.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	2	1	1	1	2					
CO2	2		1	2	2		1					
CO3	3	1	2		2	1	2	1				
CO4	2	1	1	1	1		1					
CO5	2	2		2	1	1		1				

COURSE: OBJECT ORIENTED PROGRAMMING USING JAVA

COURSE CODE: CA464
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To get familiar with Java programming and to understand the importance of Classes and objects along with constructors, Arrays and Vectors.
- To learn basics of graphical user interfaces based programming in Java using Applet, AWT and SWING that respond to different user events.
- To study the Java Database Connectivity (JDBC)to access database through Java programs.
- To study the Remote Method Invocation (RMI) based Client Server application.
- To learn the multi-tier architecture of web-based enterprise applications using Enterprise JavaBeans (EJB) and understanding of Stateful, Stateless and Entity Beans.
- To learn the server-side programming in the forms of Java Server pages (JSP) and Servlets.

COURSE OUTCOMES (CO):
After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to design and implement programs in the Java programming language that make strong use of classes and objects.
CO2	Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.
CO3	Learn to access database Connectivity (JDBC).
CO4	Understand the multi-tier architecture of web-based enterprise applications using Enterprise JavaBeans (EJB) and development of stateful, Stateless and Entity Beans.
CO5	Expected to complete a project involving the design of a fairly complex Java program that consists of a GUI and utilizes at least two of the advanced programming areas.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	2	1	1	1	2					
CO2	2		1	2	2		1					
CO3	3	1	2		2	1	2	1				
CO4	2	1	1	1	1		1					
CO5	2	2		2	1	1		1				

COURSE: DATA WAREHOUSING AND DATA MINING
COURSE CODE: CA465
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To provide the understanding of data warehousing in terms of components, architecture, models and concepts.
- To explore the knowledge of mapping between operational database, data warehousing and business analytics using various analytical tools.
- To provide knowledge of data mining used various applications such as multimedia web mining and retrieval of information for decision making in business.
- Provide the view for increasing the data quality, recognition, find & speedup data extraction and adjustable reporting.
- Provide the skill for finding the hidden pattern, co-relational study, prediction and structure the unstructured data.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understanding the concept of data warehousing in terms of components, architecture and major aspects.
CO2	Learning of proper mapping between operational database and data warehouse and to identify hidden pattern, co-relational study.
CO3	Find the ability for finding information and take decision for enhancing the business with intelligence.
CO4	Learning of various methods of data mining such Artificial Neural Network, Web mining and multimedia mining.
CO5	Get the view for increasing the data quality, recognition, find & speedup data extraction and adjustable reporting for better business decision.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		2	1	2	1					
CO2	2	1	1	3		1	1	1			1	
CO3	2	1	1	2	1		2					
CO4	1	3	2	2	1	2	2	1				
CO5	1	1		3		2	2				1	

COURSE: DATA SCIENCE
COURSE CODE: CA466
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To learn, understand, and practice basic concept of data science and data analytics.
- To conceptualize and summarize data using appropriate data modeling approach.
- To learn and implement various machine learning approach using programming language.
- To develop proficiency with statistical analysis of data.
- To apply data science concepts and methods to solve problems in real-world contexts.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Ability to analyze and identify best practices to handle data science.
CO2	Ability to identify the characteristics of datasets and apply appropriate data model to handle data for various applications.
CO3	Ability to select and implement machine learning techniques for the various applications using appropriate programming language.
CO4	Ability to implement various data analytics techniques to analyze the data.
CO5	Ability to recognize and implement various ways of selecting suitable model for text mining by using suitable mathematical and statistical tools.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		1		2	1					
CO2	3	1		2	1	1	2		1			
CO3	1	2	3	2	2	1	2	1			1	
CO4	2	1		2		2	2	1			1	
CO5	1	3	3	2	2	2	1	2			1	

COURSE: ERP SYSTEMS
COURSE CODE: CA467
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To learn the need and evolution of ERP Systems and related technologies.
- To learn ERP benefits and classification and implementation of ERP Life Cycle.
- To learn Analytical Hierarchy Process & its applications and ERP implementation approaches and its strategies.
- To learn factors affecting ERP success and effectiveness.
- To learn extend ERP and its learning and emerging issues.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Make basic use of enterprise software and its role in integrating business functions and also create reengineered business processes for successful ERP implementation.
CO2	Analyze the strategic options for ERP identification and adoption and classify different processes of the organization.
CO3	Design the ERP implementation strategies and to be able to map business processes using process mapping techniques.
CO4	To understand management concern for ERP Success and its useful guidelines for proper implementations.
CO5	To demonstrate knowledge of SAP and Oracle Apps.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	2	1		1	2				1	
CO2	1	3	1	2		1	1	1				
CO3		1	3	1	2	2	1	1			1	
CO4	2		3	1	1		2					
CO5	1		2	2	3	1					1	

COURSE: STORAGE TECHNOLOGY AND MANAGEMENT
COURSE CODE: CA468
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To study the basic concepts of storage technology and its components.
- To understand the storage system architecture and Physical/Logical disk organization.
- Study storage technologies: SAN, NAS, IP storage etc., which will bridge the gap between the emerging trends in industry and academics.
- To learn the concepts of information availability and business continuity at the time of disaster.
- To study managing and monitoring of storage through industry standards and metrics by the application of various tools.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students will analyze the limitations of the client-server architecture and evaluate the need for data protection and storage centric architectures such as Intelligent storage system.
CO2	Students will be able to do memory mapping and operations based on RAID.
CO3	Students will understand, interpret and examine various SAN, DAS, CAS, NAS technologies.
CO4	Students will understand and evaluate different SAN management strategies to fulfill business continuity requirements.
CO5	Students will classify the applications as per their requirements and select relevant solutions.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	3	1	2	1	2	1					
CO2	2		1	1	2	1	2				1	
CO3	2	2	1	2	1	2	1	1				
CO4	2	1		2		1	2	1			1	
CO5	1	1		3	1	2	1					

COURSE: AUTOMATA THEORY
COURSE CODE: CA469
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To learn the concepts of the finite automata, and automata with their output.
- Learn the concepts of regular expression and grammars.
- Able to understand the notations of CFG.
- Know the basic concept of the pushdown automata.
- Know the basic concept of the Turing machines and recursive function.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Analyze and design the finite automata, Mealy and Moore machine with their output.
CO2	Understands the regular expression, formal languages, and grammars.
CO3	Demonstrate the understanding notations of context free grammar.
CO4	To analyze and design the pushdown automata.
CO5	To understand the design of Turing machines and recursive function.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	3	3	1	2	1	1	1				
CO2	3	1		2		2	2					
CO3	1	2	1	3		1	1	1			1	
CO4	1	3	3	2	3		1	1				
CO5	3	1	1	1		2	2					

COURSE: ANDROID PROGRAMMING
COURSE CODE: CA470
COURSE CREDIT: 4

COURSE OBJECTIVES:

- This course facilitates classroom and laboratory learning.
- Letting students develop competence and confidence in android programming.
- Understand the entire Android Apps Development Cycle.
- Enable the students to independently create Android Applications.
- Access and work with databases under the Android operating system.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Use the development tools in the Android development environment.
CO2	Use the major components of Android API set to develop their own apps.
CO3	Describe the life cycles of Activities, Applications and Fragments.
CO4	Use the Java programming language to build Android apps.
CO5	Make UI-rich apps using all the major UI components.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1		1	3	2	3	2	1					
CO2	1	2	3	2	2	1	2	1				
CO3	2	1		1		2	1					
CO4	1	1	3	2	3	1		1				
CO5	2	1	1		2	1						

COURSE: DATA STRUCTURE AND ANALYSIS OF ALGORITHM LAB
COURSE CODE: CA471
COURSE CREDIT: 1

COURSE OBJECTIVES:

- To understand basics knowledge of data structure operations, algorithms and their application.
- To understand the algorithms of Linked List and its type, Searching, Hashing and their application.
- To design and implement the algorithms of linear data structure such as Queues, Stacks, Recursion and their application.
- To understand basics of graphs, tree and their algorithms.
- To learn various design techniques of algorithms and understand the real implementation of sorting, Greedy method and dynamic programming.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Analyze the problem and create appropriate algorithm.
CO2	Understand basics knowledge of data structure operations like insertion, deletion etc for various data structure and their application.
CO3	Develop and implement various programs using C for linear data structure.
CO4	To understand basics of non linear data structure graphs, tree and their Algorithms.
CO5	To learn various Design Techniques of Algorithms and understand the real implementation of Sorting, Greedy Method and Dynamic Programming.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	3	3	2	2	2	1	1				
CO2	2	1		1		1	2					
CO3	1	1	3	2	3	1	2	1			1	
CO4	2	1		1		2	2					
CO5	2		2	2	1	1	2	1				

COURSE: DBMS LAB
COURSE CODE: CA472
COURSE CREDIT: 1

COURSE OBJECTIVES:

- To explain basic database concepts like creating database, tables and Insertion, Deletion, Updating and Retrieval of data from the tables.
- To demonstrate the use of constraints, relational algebra operations and Grouping (Group by clause, Having Clause).
- To familiarize with Introduction of PL/SQL, PL/SQL character set & Data Types, Executing PL/SQL. Control structure Conditions and Loops.
- To develop an understanding of Procedures and Functions (Definition, creating, Parameters), Concept of Cursors and Trigger.
- To demonstrate the concept of Indexing, Views, Rollback, Commit, Grant and Revoke Permission.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Create Databases, tables and query a database using SQL DML/DDL commands.
CO2	Demonstrate the use of constraints, relational algebra operations and Grouping.
CO3	Develop PL/SQL programs using control statements and loops.
CO4	Develop an understanding of Procedures and Functions (Definition, creating, Parameters), Concept of Cursors and Trigger.
CO5	Understand the concept of Indexing, Views, Rollback, Commit, Grant and Revoke Permission.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	1	3	2	3	2	1					
CO2	2	1	2	1	2	1		1				
CO3	1	1	3	2	3	2	1	1			1	
CO4	2	1	2	2		1	2					
CO5	3	1		1	1	1	2					

COURSE: JAVA LAB

COURSE CODE: CA473

COURSE CREDIT: 1

COURSE OBJECTIVES:

- To introduce the object-oriented programming concepts using JAVA and apply them in solving problems.
- Gain knowledge about the principles of inheritance, polymorphism, exception handling, multithreading and also introduce the implementation of packages and Interfaces in JAVA.
- To introduce the concepts of JDBC and its applications in JAVA programming.
- To learn the design of Web applications using Applets, AWT and Swing controls using Event handling.
- To introduce the concept of Socket Programming, understanding the concept of Remote Method Invocation, Servlet Programming and JSP.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to implement Object oriented concepts in JAVA.
CO2	Able to develop JAVA applications using the concepts of inheritance, polymorphism, exception handling, multithreading and implementation of packages and Interfaces in JAVA.
CO3	Able to develop JAVA applications using JDBC.
CO4	Able to design web applications using Applets, AWT and Swings controls.
CO5	Able to develop web based applications using RMI, Java Servlet and JSP.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	2	2		2	1					
CO2		1	3	2	3	1		1			1	
CO3	1		3	2	3	2	1	2				
CO4	1	2	3	1	3	2	1	2			1	
CO5	1	1	3	1	3	1	1	1			1	

Integral University, Lucknow
Department of Computer Application
STUDY & EVALUATION SCHEME
Choice Based Credit System
Master of Computer Application (MCA)
w.e.f. Session 2024-25

Year IInd, Semester IIIrd

S. No.	Course Category	Subject Code	Name of the Subject	Periods				Evaluation Scheme				Subject Total
								Sessional (CA)			End Sem. Exam	
				L	T	P	C	UE	TA	Total	ESE	
1.	Core	CA551	Artificial Intelligence	3	1	0	4	40	20	60	40	100
2.	Core	CA552	Machine Learning with Python Programming	3	1	0	4	40	20	60	40	100
3.	Core	CA553	Web Technology	3	1	0	4	40	20	60	40	100
4.	Core	CA554	Computer Graphics and Animation	3	1	0	4	40	20	60	40	100
5.	Elective – II			3	1	0	4	40	20	60	40	100
6.	Elective –III			3	1	0	4	40	20	60	40	100
7.	Core	CAN01	Cyber Security*	3	0	0	0	40	20	60	40	100
8.	Core	CA567	Machine Learning with Python Programming Lab	0	0	3	1	40	20	60	40	100
9.	Core	CA568	Web Technology Lab	0	0	3	1	40	20	60	40	100
10.	Core	CA569	Computer Graphics Lab	0	0	2	1	40	20	60	40	100
Total				**18**	**6**	**8**	**27**	400	200	600	400	**1000**

L - Lecture **T** – Tutorial **P** – Practical **C** – Credit **CT** – Class Test **TA** – Teacher Assessment
Sessional Total (CA) = Class Test + Teacher Assessment
Subject Total = Sessional Total (CA) + End Semester Examination (ESE)

Elective – II
CA555 Cloud Computing
CA556 Advanced Concepts in Database System
CA557E-Commerce
CA558 Real Time Systems
CA559 Social Network Analysis and Evolutionary Computing
CA560 Embedded System

Elective – III
CA561 Internet of Things
CA562 Natural Language Processing
CA563 Neural Network
CA564 Soft Computing
CA565 Virtual reality
CA566 Mobile Computing

***Cyber Security: Non-Credit Course, Compulsory**

COURSE: ARTIFICIAL INTELLIGENCE
COURSE CODE: CA551
COURSE CREDIT: 4

COURSE OBJECTIVES:

- Understand the concepts of AI and searching techniques.
- To develop the logical skills of knowledge and it's representational structure.
- Understand the concepts of natural language processing.
- Study the concepts related to machine learning.
- Learn the concepts how to design the program in PROLOG and pattern recognition techniques.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Study the concepts of AI and related searching algorithms.
CO2	Develop the knowledge skills and it's representational structure in AI.
CO3	Study the concepts of natural language processing in AI.
CO4	Study the concepts of supervised/unsupervised machine learning and game technique.
CO5	Study how design the programming skill in PROLOG, and concepts of pattern recognition approaches.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	3	3	2	2	1	1					
CO2	1	2	3	1	2		1					
CO3	1	1		1	1		3					
CO4	2	1	2	3	1		1					
CO5	1	2	3	3	2		1					

COURSE: MACHINE LEARNING WITH PYTHON PROGRAMMING
COURSE CODE: CA552
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To learn and understand different Data sets in implementing the machine learning algorithms.
- Implement the machine learning concepts and algorithms using python programming.
- Implement various types of classification methods including SVM, Naive bayes, decision tree, and random forest.
- Interpret Unsupervised learning and learn to use clustering algorithms
- Implement linear and polynomial regression, understand ridge and lasso regression

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Implement procedures for the machine learning algorithms.
CO2	Design Python programs for various Learning algorithms.
CO3	Apply appropriate data sets to the Machine Learning algorithms.
CO4	Identify and apply Machine Learning algorithms to solve real world problems.
CO5	Design and develop Python programs to implement linear and polynomial regression.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		1	1	2	2					
CO2	2	2	1	3	1		1					
CO3	3	2	2	1	3	1	2					
CO4	3	1	2		1		2					
CO5	1	1	3	3	2	1						

COURSE: WEB TECHNOLOGY
CODE: CA553
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To learn basic concepts of web and web projects.
- To learn and implement interactive web pages using HTML, CSS.
- To learn basic concepts of JavaScript and design responsive web pages using HTML, CSS3 and add validation using JavaScript.
- To learn fundamental concepts of XML and implement XML in Web Applications.
- To learn basics concepts and syntax of PHP and AJAX.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to understand the basic terminology of web and concepts of web projects.
CO2	Hands on practice on HTML and CSS and learn to implement CSS and HTML in web development.
CO3	Understand the concepts and use of JavaScript in web applications.
CO4	Able to use and implement XML in web development.
CO5	Understand the use of PHP as server-side language and application of AJAX inweb development.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	3	1	1	1	2	1					
CO2	1	1	3	2	2	1	3				1	
CO3	1	2	3	2	2	1	3				1	
CO4	1	1	3	2	3	2	3				1	
CO5	1	3	1	1	1	2	1					

COURSE: COMPUTER GRAPHICS AND ANIMATION
CODE: CA554
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To study Computer Graphics and drawing algorithm.
- To learn Mathematics for Computer Graphics, Segments and Display Files and Windowing and Clipping.
- To learn use of Computer Graphics Algorithm.
- To learn Transformation (2D and 3D) and 3D Animation.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Analyze the background processes involved in computer graphics displays, understanding of Algorithms.
CO2	Use Mathematics in Vector. Create Segments and apply clipping to different shapes.
CO3	Understand and apply algorithms used in Computer Graphics.
CO4	Apply methods suitable for 2D and 3DTransformation such as Translation, Rotation, Scaling, Reflection, Shear etc.
CO5	Be able to use 3D Studio Max for Transforming Objects, Pivoting, Aligning, Snapping and Cloning Objects.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1			1	1						
CO2	1	3	1	2	1							
CO3	2	3		2	1	1						
CO4	1	2	2	1		2	1					
CO5		3	1	2	1	2						

COURSE: CLOUD COMPUTING
CODE: CA555
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To learn basic concepts, types and characteristics of cloud computing
- To learn Cloud Computing Architecture and service models.
- To learn Virtualization and its types in cloud computing.
- To learn fundamental concepts and architecture of cloud computing security.
- To learn basics of SOA and cloud-based storage

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to understand basic concepts, principles and paradigm of Cloud Computing
CO2	Able to interpret various Cloud computing models and services.
CO3	Able to identify the significance of implementing virtualization techniques.
CO4	Able to understand the need of security in Cloud computing.
CO5	Understand the concept SOA and cloud-based storage in Cloud computing.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1			1	1		1			1	
CO2	1	2	1	3	1		1					
CO3		1	3	1	2	1		1				
CO4	2	1	2	1		2	1					
CO5		1	1	2	1	2		1				

COURSE: ADVANCED CONCEPTS IN DATABASE SYSTEM
CODE: CA556
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To study Query Processing, Optimization and Database Tuning.
- To learn Extended Relational Model.
- To learn use of Distributed Database System.
- To learn Enhanced Data Model for particular databases and its application.
- To learn concept of Expert Database and Fuzzy Database System.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Analyze the background processes involved in queries and transactions, assess and apply database query optimization.
CO2	Create and use new database data types. Apply Data Log for Logic Based and Expert Database Model.
CO3	Understand issues surrounding concurrency control and recovery in distributed database systems data management.
CO4	Explain methods suitable for particular types of data such as temporal, multimedia or spatial data.
CO5	Be able to develop new methods to store and index data for expert and fuzzy databases based on knowledge of existing techniques

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	3	2	1			1					
CO2	1	2			2							
CO3	3	2	2	2			2					
CO4	1	3	2		2							
CO5	3	2	3		3		1					

COURSE: E-COMMERCE
COURSE CODE: CA557
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To give knowledge of e-commerce with its technology, need, pros & cons, model, impacts, sales life cycle along with its implementation in India.
- To offer practical knowledge of infrastructure and technologies used in e-commerce and mobile commerce.
- To provide the knowledge of security aspects used in e-commerce and mobile commerce.
- To build the knowledge for ensuring the implementation of secure information using encryption techniques and digital signature in e-commerce and mobile commerce.
- To build the concept of the process of electronic payment in e-commerce along with different technologies, policies and governments law.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Gain knowledge of e-commerce with its technology, need, pros & cons, model, impacts, sales life cycle along with its implementation in India.
CO2	Understand practical knowledge of infrastructure and technologies used in e-commerce and mobile commerce.
CO3	Learn about the knowledge of security aspects used in e-commerce and mobile commerce.
CO4	Apply knowledge for ensuring the implementation of secure information using encryption techniques and digital signature in e-commerce and mobile commerce.
CO5	Understand the concept of the process of electronic payment in e-commerce along with different technologies, policies and governments law.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		1		1						
CO2	2	2	1	2	1		1					
CO3	2		3	1	2		1					
CO4	1	2	3	2	1		1					
CO5	2	1	2	1		1	1					

COURSE: REAL TIME SYSTEMS
CODE: CA558
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To understand basics knowledge real time system and its classification.
- To learn various task scheduling mechanism.
- To learn various algorithm for task assignment and scheduling.
- To learn basic concept of fault tolerance techniques used in real time system.
- To understand real time communication in real time system.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Examine the issues in real time system and their classification.
CO2	To solve various scheduling problems and will be able to apply them in real time applications.
CO3	Develop and implement appropriate algorithm for task assignment in real time system and able to understand the possibility of scheduling a task set.
CO4	Analyze the condition of fault occurrence and apply solutions consequently.
CO5	Address the issues in real time system.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1		3	1	1						
CO2	2	1	1	3	1							
CO3	1		3	2	1	1		1				
CO4	1	3	1	2		2	1					
CO5		1	1	2	1	2		1				

COURSE: SOCIAL NETWORK ANALYSIS AND EVOLUTIONARY COMPUTING
CODE: CA559
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To learn the basic knowledge, Limitations, Development and Emergence of Social Web.
- To learn the statistical properties of Social Network Analysis, Blogs, Online communities and Web-Based networks.
- To learn Visualization of Social Networks.
- To learn the Community mining and core methods for community detection and mining.
- To learn the algorithms for Social Influence analysis.
- To learn the basics of text mining in Social Network.
- To learn the concepts of Evolutionary Computing, Evolutionary Algorithms and Evolutionary Programming.
- To learn how to work with evolutionary algorithms.
- To learn the basic concepts of Genetic Algorithms and Genetic Programming.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to understand the basic concepts of Web, Emergence of Social Web, Statistical properties and key concepts and measures in Network analysis.
CO2	Ability to define the visualization of Online Social Networks, Graph Representation, Clustering and modeling and aggregating Social Network data.
CO3	Able to detect the Communities in Social Networks, Algorithms for Social Influence analysis and expert location in Social Networks along with text and opinion mining.
CO4	Able to understand the basic concepts in Evolutionary Computing, working with evolutionary algorithms and parent selection and Survivor selection in evolutionary programming.
CO5	Able to understand the working of evolutionary algorithms, basic concepts of Genetic Algorithms and Genetic programming.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1		3	1	1						
CO2	2	1	1	3	1							
CO3	1		3	2	1	1						
CO4	1	3	1	2		2	1					
CO5		1	1	2	1	2						

COURSE: EMBEDDED SYSTEM
CODE: CA560
COURSE CREDIT: 4

COURSE OBJECTIVES:

- Understand the basic concepts and building blocks of embedded System.
- To learn the internal architecture and programming concept of 8051.
- To introduce the advanced concepts on embedded systems.
- To learn the introduction on RTOS, and aspects required in developing a new embedded processor80386, 80486.
- To introduce the microprocessor interfacing and related concepts.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	An ability to introduce the basic terminology in embedded system to meet desired needs within realistic constraints.
CO2	Describe the 8051 internal architecture and programming.
CO3	An ability to design the embedded system.
CO4	Ability to understand the advanced processor architecture and concept of RTOS.
CO5	Describe the microprocessor interfacing and various protocols.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	1										
CO2	2	3	2	3			2		1		1	
CO3	2	3	3	3			2		2			
CO4	2	3	3	2			1		1		1	
CO5	1	3	1						1		1	

COURSE: INTERNET OF THINGS
COURSE CODE: CA561
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To know the basic the concepts IOT architecture, its motivation and overview of the features involved during the process of communication over the channel. To understand the basic designing of IOT to know the requirement of general bodies or standard bodies
- To learn about the structural aspects and identification regarding the objects and services used worldwide. To understand the concept of key technologies those are used so far in IOT.
- To deal with different technological challenges in design issues those are governed with respect to the product codes. To learn the security challenges also in order to make secure environment using different integrating approaches and data link protocols
- To understand significance of software agents for representing respective objects using clustering principles. To understand the idea regarding the identity management for and by the customers with the help of different models.
- To draw elementary knowledge regarding security requirements for smart metering and automotive applications

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	As per the new technology, a student should perform data transfer operations using IOT that help the students to guide in a formal way to communicate over new IOT devises within a short span of time. He/she should be able to develop new ideas for new frameworks using basic nodal capabilities.
CO2	For a given situation, a student should be able to deal with different structural aspects of designing and he/she can shall know the use of key technologies that would be used by the students to promote the development of a coherent learning program
CO3	With the enhancement in technology, IOT deals with the challenges and unique product codes for a particular product so a student should be able to tackle the unique codes and he/she should development different approaches that can continue the legacy of an organization.
CO4	During clustering phenomena, a student should be prepared to deal with principles and policies governed according to the company rules so as toprovide better identity management using different models like isolated and federated user identity models
CO5	A student should know the basic idea of security requirements and vulnerabilities in IOT. He/she should be good enough to deal with the establishment of identity for smart applications to be used in IOT

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		2	1	1	1	1				
CO2	1	2	1	2	1		1				1	
CO3	2	1		2	1	1		1				
CO4	1	2	1	1		2	1					
CO5	2		1	2	1	2	1	1				

INTEGRAL UNIVERSITY LUCKNOW-INDIA

COURSE: NATURAL LANGUAGE PROCESSING
CODE: CA562
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To introduce the fundamental concept and techniques of Natural Language Processing
- To be able to map the appropriate techniques with the problem and solve real world problems.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Basics of text components and text processing.
CO2	To differentiate among different techniques while considering different plus and minus of each technique.
CO3	To classify text, reduce Dimensionality, use different Topic Modelling Approaches and Algorithms.
CO4	Ability to understand the advanced processor architecture and concept of RTOS.
CO5	Analyze text data from different real-world situations.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	2		1		1	1					
CO2	1	3		2		1						
CO3	1	2		1		1	1					
CO4	3		1	1								
CO5		3			2	1						

COURSE: NEURAL NETWORK
COURSE CODE: CA563
COURSE CREDIT: 4

COURSE OBJECTIVES:

- Understand the concepts of neural network and perception training Algorithm with modification.
- To develop the skills of supervised and unsupervised learning concepts.
- Understand the concepts of natural network architecture.
- Study the concepts related to SOM, and PC.
- Learn the concepts FUZZY technique and soft computing.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Study the concepts of neural network and some related algorithms.
CO2	Develop the knowledge supervised and unsupervised.
CO3	Study the concepts of architecture of neural network.
CO4	Learn the concepts of principle component and SOM.
CO5	Develop the skills on FUZZY techniques, soft computing and concepts of CVNN, CVBP.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		2		1	1					
CO2	2		2	1	1		1					
CO3	2	1		2	1	1						
CO4	3	2	1	1		2	1					
CO5	1	1	3		2		1					

COURSE: SOFT COMPUTING
CODE: CA564
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To study the concepts Neuro, Fuzzy and Soft Computing and understand the Input Space partitioning and Fuzzy Modeling.
- To learn: Derivative-based Optimization and Simulated Annealing, Random Search, Downhill Simplex Search and their application development.
- To learn Supervised Learning Neural Networks and Unsupervised Learning Neural Networks their application in the field of computer science to solve problems.
- To learn Neuro Fuzzy Modeling, Methods that Cross-fertilize ANFIS and RBFN and Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum. [
- To learn Genetic Algorithm and understand the Working Principle, Procedure of GA, Flow chart of GA, Genetic Representations, Encoding, Application of GA.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand the concepts of Neuro, Fuzzy and Soft Computing and understand the Input Space partitioning and Fuzzy Modeling.
CO2	Understand the concept of Derivative-based Optimization and Simulated Annealing, Random Search, Downhill Simplex Search and their application development.
CO3	Understand the concept of Supervised Learning Neural Networks and Unsupervised Learning Neural Networks their application in the field of computer science to solve problems.
CO4	Understand the concepts of Neuro Fuzzy Modeling, Methods that Cross-fertilize ANFIS and RBFN and Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum.
CO5	To understand the concepts of Genetic Algorithm and understand the Working Principle, Procedure of GA, Flow chart of GA, Genetic Representations, Encoding, Application of GA.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		1	1	1						
CO2	2	1	1	2	1		1			1		
CO3	2	1		1	1	1		1				
CO4	2		1	2		2	1					
CO5	2		1	2	1	2		1				

COURSE: VIRTUAL REALITY
CODE: CA565
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To give historical and modern overviews and perspectives on virtual reality.
- To give the overview of input output hardware used in VR system.
- Understand the system of human vision and its implication on perception and rendering.
- To explore the concepts of Virtual reality and develop 3D virtual environment.
- It will help students build various types of VR experiences and use Unity to develop VR applications.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Describe how VR systems work and list the applications of VR.
CO2	Understand the design and implementation of the hardware that enables VR systems to be built
CO3	Understand the concepts of content creation, interaction and iterative design.
CO4	Create 3D scenes with Unity and experiment with various user interface (UI) techniques that are used in VR applications.
CO5	Describe the importance of interaction and audio in VR systems.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1			1	1						
CO2	1		3	1	2	1	1					
CO3	2	1		2		1	1			1		
CO4		1	3		1	1						
CO5	2	1		1		1	1					

COURSE: MOBILE COMPUTING
CODE: CA566
COURSE CREDIT: 4

COURSE OBJECTIVES:

- Students to understand the concept of mobile computing paradigm, its functions and its new boundaries.
- Understanding the typical infrastructure for mobile networks through a popular GSM architecture.
- Understanding problems and solutions for different layers of mobile networks, namely MAC layers, network layers and transport layers.
- Understanding of the data delivery models and database issues in mobile environments.
- To understand the Mobile Ad-hoc Networks (MANETs) and Routing protocols.
- Understanding of the Platform/Operating Systems for Application Development and Android Application Development.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand and think to develop the new mobile computing based application.
CO2	Capable to discuss on some new methodological dispute associated to this new paradigm and can conclude with some good facts.
CO3	Understand the database issues in mobile environments and data delivery models in mobile computing.
CO4	Clever to improve mobile ad-hoc network (MANET) applications and/or procedures/protocols.
CO5	Able to develop and describe various existing or new mobile environment related protocols.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2	3	1	2	1	1	1	1	1	3	
CO2	3			3	3				2	1		
CO3	1	3	2	3		1		1				
CO4	2	1	2		3	3	3		1		2	
CO5	2	1	3	1			3		2		3	

COURSE: CYBER SECURITY
COURSE CODE: CAN01
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To provide Knowledge and concept of information system with its type and e-commerce.
- To make familiar with security, threat, web security of information system.
- To know about the security threat related to e-commerce.
- To give the basic learning about the payment system of e-commerce.
- To provide an understanding the security issues on internet with respect to transaction, client-server, network and biometric.
- To develop an understanding the different types of cyber fraud, cyber crime and cyber law.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Know about the concept of information system with its type and e-commerce.
CO2	Get familiar with security, threat, web security of information system.
CO3	Know about the security threat related to e-commerce.
CO4	Learn the payment system of e-commerce.
CO5	Understand the security issues on internet with respect to transaction, client-server, network and biometric.
CO6	Understand the different types of cyber fraud, cyber crime and cyber law.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1			1	1	1					
CO2	2	1		2	1		1					
CO3	2			1		1	1					
CO4	1	1		2		2	1					
CO5	2	1		1	1	2						

COURSE: MACHINE LEARNING WITH PYTHON PROGRAMMING LAB
COURSE CODE: CA567
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To learn and understand different Data sets in implementing the machine learning algorithms.
- Implement the machine learning concepts and algorithms using python programming.
- Implement various type of classification methods including SVM, Naive bayes, decision tree, and random forest.
- Interpret unsupervised learning and learn to use clustering algorithms.
- Implement linear and polynomial regression, understand ridge and lasso regression.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Implement procedures for the machine learning algorithms.
CO2	Design Python programs for various Learning algorithms.
CO3	Apply appropriate data sets to the Machine Learning algorithms.
CO4	Identify and apply Machine Learning algorithms to solve real world problems.
CO5	Design and develop Python programs to implement linear and polynomial regression.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1		2	3	1		1	1					
CO2	1	1	3	2		1		1				
CO3	1	2	1	3		1	1					
CO4	2	1		3	1		1	1				
CO5		1	3	2	2	1	1					

COURSE: WEB TECHNOLOGY LAB
COURSE CODE: CA568
COURSE CREDIT: 4

COURSE OBJECTIVES:

- Learn to design static web pages by using HTML elements.
- Learn to apply CSS concepts for designing HTML web pages.
- Learn to add JavaScript in web pages.
- Learn to develop basic programs based on PHP and AJAX.
- Learn to develop a web portal using HTML, CSS& JavaScript.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to design web pages by using HTML tags.
CO2	Able to apply CSS concepts for developing dynamic web pages.
CO3	Able to understand how to add validations using JavaScript in web pages.
CO4	Able to implement basic programs based on PHP and AJAX.
CO5	Able to design web applications using HTML, DHTML and JavaScript.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1		3	1	2	1	1					
CO2	1	2	2	3		1		1				
CO3	2	1		2		1		1				
CO4		1	3	2	1	1	1					
CO5		1	3	1	2		1	1				

COURSE: COMPUTER GRAPHICS LAB
COURSE CODE: CA569
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To acquaint the learners with the basic concepts of Computer Graphics.
- To learn the various algorithms for generating graphical figures.
- To get familiar with mathematics behind the graphical transformations.
- To understand and apply various methods and techniques regarding projection, curve and surfaces, clipping etc.
- To understand basic concepts of animation.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Apply and implement line drawing algorithms to draw line and circle drawing algorithms to draw Circle.
CO2	Apply and implement clipping and projection algorithm for given input.
CO3	Apply and implement 2-D transformation algorithms for given input shape.
CO4	Apply and implement algorithm for moving (animate) any 2D, 3D object along with the axis.
CO5	Apply and implement animation concepts for generating simple animation.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	1	3	2		1		1				
CO2		1	2	3		2	1					
CO3		1	3	2	1	1		1				
CO4	1		2	2		1		1				
CO5	1		2	2	2	1	1	1				

Integral University, Lucknow
Department of Computer Application

STUDY & EVALUATION SCHEME

Choice Based Credit System

Master of Computer Application (MCA)

w.e.f. Session 2021-22

Year IInd, Semester IVth

S. No.	Course Category	Subject Code	Name of the Subject	Periods				Evaluation Scheme				Subject Total
								Sessional (CA)			End Sem. Exam	
				L	T	P	C	UE	TA	Total	ESE	
1.	Elective –IV			3	1	0	4	40	20	60	40	100
2.	Elective –V			3	1	0	4	40	20	60	40	100
3.	Elective –VI			3	1	0	4	40	20	60	40	100
4.	CA588 Major Project		Dissertation / Presentation / Viva-voce			6	12		300	300	200	500
5.	Core	CA589	Advanced Technology Lab (C# & Android)	0	0	3	1	40	20	60	40	100
Total				**9**	**3**	**9**	**25**	160	380	540	360	**900**

L - Lecture **T** – Tutorial **P** – Practical **C** – Credit **CT** – Class Test **TA** – Teacher Assessment
Sessional Total (CA) = Class Test + Teacher Assessment
Subject Total = Sessional Total (CA) + End Semester Examination (ESE)

Elective – IV
- CA570 Digital Image Processing
- CA571 Human Computer Interaction
- CA572 Quantum Computing
- CA573 Green Computing and E-Waste Management
- CA574 Compiler Design
- CA575 VLSI Design/ Robotics

Elective – V
- CA576 Blockchain Computing
- CA577 Pattern Recognition
- CA578 Agile Methodology and DevOps
- CA579 Simulation and Modeling
- CA580 Big Data Visualization
- CA581 Wireless Sensor Network Systems

Elective – VI
- CA582 .NET and C#
- CA583 Mobile Application Development
- CA584 Front End Design Technique
- CA585 Open Source
- CA586 Modern Application Development
- CA587 Service Oriented Architecture

COURSE: DIGITAL IMAGE PROCESSING
CODE: CA570
COURSE CREDIT: 4

COURSE OBJECTIVES:

- Fundamental concepts of a digital image processing system.
- Concepts of image enhancement techniques.
- Understanding of various images transforms models.
- Compression techniques and Morphological concepts.
- Various segmentation techniques, and object descriptors.
- Color models and various applications of image processing.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Remember the fundamental concepts of image processing.
CO2	Capable to explain different image enhancement techniques
CO3	Understand and review image transforms model.
CO4	Analyze the basic algorithms used for image processing and image compression with morphological image processing.
CO5	Design and Synthesize Color image processing and its real world applications.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1			1	1	1					
CO2	2	2		2			1	1				
CO3	2	2		1		1						
CO4	1	3	2	1		1	1	1				
CO5			3	2	1		1					

COURSE: HUMAN COMPUTER INTERACTION
CODE: CA571
COURSE CREDIT: 4

COURSE OBJECTIVES:

- Identify and describe various HCI methodologies, including input and interaction types.
- Articulate the co-dependency of the user and the technology in an HCI system.
- Analyze how the study of interface / Interactivity / interaction influences the design of an HCI system.
- Apply some user-centered design methods to practical design problems.
- Develop basic prototypes with a range of interaction styles and technologies.
- Apply knowledge and understanding of the interaction design examples in order to analyze their situations and critically evaluate them in oral and written discussions.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Describe and apply core theories, models and methodologies from the field of HCI.
CO2	Describe what the user-centered design cycle is and explain how to practice this approach to design interactive software systems.
CO3	Analyze one after another the main features of interactive systems, and explain how to gauge the usability of digital environments, tools and interfaces.
CO4	Demonstrate a thorough understanding and solid knowledge of the principles and techniques of human-computer interaction.
CO5	Able to draw on a variety of techniques and relevant knowledge and appropriately apply them to new situations and real-life problems.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1		2	1	1		1				
CO2	3	1	1	2	1		1					
CO3	1	3		1	1	1						
CO4	2	1		1		2	1	1				
CO5	1	2		2	1	2						

COURSE: QUANTUM COMPUTING
CODE: CA572
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To introduce the fundamentals of quantum computing.
- The problem-solving approach using finite dimensional mathematics.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Basics of complex vector spaces
CO2	Quantum mechanics as applied in quantum computing
CO3	Architecture and algorithms
CO4	Fundamentals of quantum computations.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1		1		1	1	1				
CO2	2	1		1	1	2						
CO3	1	2		2		1						
CO4	2	1	2	1		1	1	1				

COURSE: GREEN COMPUTING AND E-WASTE MANAGEMENT
CODE: CA573
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To learn what is Green IT and how it can help to improve environment sustainability.
- To learn the concept of sustainable software development and energy management technique for data storage.
- To understand the concept of managing and regulating Green IT and measure the maturity of sustainable ICT world.
- To understand the basic concept of factors driving the development of IT sustainable services and greening the enterprises.
- Learn the concept of reusing and recycling Electronic waste.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to understand the environmental impact of IT and green IT.
CO2	Able to understand the basic concepts of energy efficient data storage and sustainable software development methodologies.
CO3	Able to use Green IT strategies and metrics for ICT development.
CO4	Able to illustrate various green IT services and role. Able to understand concept of greening the enterprises.
CO5	Able to understand Electronic Waste processing and impact on environment and health.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1		1	1	1						
CO2	2	1		2	1			1				
CO3	2			2	1	1		1				
CO4	3	2		1		2	1					
CO5	2	1		1	1	2		1				

COURSE: COMPILER DESIGN
CODE: CA574
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To know the fundamental concepts and techniques for compiler design and understand the different phases of compiler.
- To identify the methods and strategies for parsing techniques.
- Devise and perform syntax-directed translation schemes for compiler.
- Impart knowledge on Run-Time Environment and the life time of objects.
- Devise intermediate code generation schemes.
- Analyze the optimized code generated after the synthesis phase.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students will acquire knowledge about phases of compilation. Students will be able to understand the role of Lexical Analyzer in Compilation Process.
CO2	Studies about the various parsing techniques helps the students to understand about Parsing Process. Students will learn the difference between top down and bottom up parser.
CO3	Knowledge of Ambiguities in the context free Grammar helps students in problem analysis. Students will be able to analyze different parsing techniques used for Compilation
CO4	Students gain the ability to learn about the Intermediate code generation in compilation process. Information acquired from the fundamentals of intermediate representation leads to implementation of target code.
CO5	Understanding the various storage al location strategies helps in organization of information in the Run Time Environment of Compilation. Students will be acquiring knowledge about Instruction Level Optimization.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		1		1	1					
CO2	1	2		1	2		1					
CO3	1		1	3		1		1				
CO4		2	2	1	1		1					
CO5	2	1		1		1						

COURSE: VLSI DESIGN/ ROBOTICS
CODE: CA575
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To understand the concepts of ICs, in order to deal ICs in different era. To learn the fabrication techniques of BJT and MOS.
- To learn the importance of scaling phenomena in MOS with the help of micron and submicron technology.
- To study different types of inverters and to analyze logic circuits using MOS and CMOS technology.
- To understand significance of sequential circuits, Schmitt trigger and to know the classification of digital system in synchronous and asynchronous manner.
- To draw the Integrate systems and sub-systems with the help of PLDs and FPGA.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	With a new approach of fabrication, a student shall be able to design and analyze MOS and CMOS. A student can also understand the difference between the time and frequency domain transmission in order to analyze different circuits.
CO2	For a present scenario a student should learn about the parasitic and scaling in MOS. A student should understand the importance of inverting action using pseudo logic and universal gates circuits using CMOS technology.
CO3	A student should be able to understand the facts of logic families, their implementation for proving different logic circuits like NAND and NOR or Ex-OR.
CO4	He/she should be able to know the duties regarding respective layer. A student should be aware of the fact when to use TCP and when to use UDP for synchronization between hop points so that a student can analyze encryption and decryption techniques for proper data transfer.
CO5	For securing data and a system, a student can evaluate different procedures and algorithms based on network security and he/she should learn about the protocols to used according to the format of data transfer.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		1		1	1					
CO2	1	2		1	2		1					
CO3	1		1	3		1		1				
CO4		2	2	1	1		1					
CO5	2	1		1		1						

COURSE: BLOCKCHAIN COMPUTING
CODE: CA576
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To provide Knowledge and concept of cryptography and blockchain.
- To make familiar with Bitcoin and cryptocurrency with its various impact on blockchain.
- To know about the Ethereum and Hyperledger technology with its multiple aspects.
- To provide an understanding about the Solidity programming and Smart Contracts.
- To develop an understanding about the various applications of Blockchain.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To make capable to handle the cryptographic issues and its proper implementation in various fields.
CO2	To understand the Ethereum Virtual Machine and Bitcoin Wallets and related transactional blocks implementation.
CO3	To understand and implement the Consensus Mechanism and Hyperledger Composer.
CO4	To make capable to check the Solidity Programming and Structure of Smart Contracts and its performance.
CO5	To understand various applications of Blockchain and its various future aspects.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	3	2	2	1	1					
CO2	3		2	1		1						
CO3	2	1	3	1	2	1	1	1				
CO4	1	1	2	2		1						
CO5	3	2		2	1		1					

COURSE: PATTERN RECOGNITION
CODE: CA577
COURSE CREDIT: 4

COURSE OBJECTIVES:

- Perceive the algorithms employed in numerous phases of pattern recognition systems, together with information acquisition, pre-processing, segmentation, feature extraction, and classification.
- Perceive the techniques used acknowledge patterns, like applied mathematics approaches, information bunch, neural networks, etc.
- Information of varied applications of pattern recognition in real world, this includes reading analysis papers and getting ready shows by the scholars.
- Implement the pattern recognition programs in machine Learning Techniques.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Explain the Basics of Probability, Random Processes and Linear Algebra and define concepts of pattern recognition
CO2	Summarize, analyze, and discuss the Mathematical foundation of Statistical Patten Recognition and Linear discriminant functions in the arena of pattern Recognition.
CO3	Apply performance evaluation methods Parameter estimation methods and Sequential Pattern Recognition for pattern recognition.
CO4	Apply pattern recognition Nonparametric Techniques to real-world problems such as document analysis and recognition.
CO5	Implement simple Unsupervised Learning & Clustering techniques such as Pattern classifiers, classifier combinations.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		1		1	1					
CO2	2	2		2		2	1					
CO3		1	3	2	2	1	1	1				
CO4	2		2	2	1	1						
CO5	1	1	3	2	2	1						

COURSE: AGILE METHODOLOGY AND DEVOPS
CODE: CA578
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To give students with fundamental understanding of agile software development practices and various agile process model to create high-quality software.
- To furnish better understanding Agile product management and Agile risk management in software development.
- To allow complete examination and manifestation of Agile testing and control techniques.
- To provide basic concept of DevOps and recognizing business importance of DevOps.
- To understand DevOps capabilities in order to achieve business objectives.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Realize the importance of agile software development practices in determining the requirements for a software system.
CO2	Analyze and execute iterative software development processes to manage software development activities.
CO3	Apply a systematic understanding of Agile principles and defined practices for a specific circumstance or need.
CO4	Examine the impact of DevOps in the successful completion of software development by improving team collaboration and software quality.
CO5	Perform software process improvement by applying DevOps capabilities at enterprise level.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	2	1		1		2	2	1		1	
CO2	2	3	2	3	1		1	1			2	
CO3	1	2	3	3	2		2	1	2		2	
CO4	2	1	2	2	2		2	1			1	
CO5	1		2	2	2		3	1	2		2	

COURSE: SIMULATION AND MODELLING
CODE: CA579
COURSE CREDIT: 4

COURSE OBJECTIVES:

- Introduce concepts of system and simulation models
- Analyzing the various probability distribution functions.
- Study about various simulation models and understand the differences between them.
- Analysis of Simulation models using input analyzer, and output analyzer
- Verify, Validate and perform output analysis of a simulation model

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Describe the role of important elements of discrete event simulation and modeling paradigm.
CO2	Conceptualize real world situations related to systems development decisions, originating from source requirements and goals.
CO3	Generate and test random number variables and apply them to develop simulation models.
CO4	Analyze and develop methods to simulate any discrete system using queuing systems - Be able to work effectively with others
CO5	Develop skills to apply simulation software to construct and execute goal-driven system models.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	2	1			1					
CO2	1	2	2		1	1						
CO3			3	2	1		1					
CO4		3	2		1		1					
CO5	1		3		1	1						

COURSE: BIG DATA AND VISUALIZATION
CODE: CA580
COURSE CREDIT: 4

COURSE OBJECTIVES:

- Describe the big data with its applications in the field of industry and also elaborates the characteristics and use of big data.
- Discuss the various machine learning model such as classification and rule-based model.
- Discuss rule and classification-based model.
- Discuss various performance metrics used in the model evaluation and data visualization.
- Discuss and create the various chart based on analysis of data.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To handle the big data issues and implementation in various application in the industry.
CO2	To understand the machine learning based modelling techniques and its implementation.
CO3	To understand and implement the classification-based model such as decision tree, and Bayesian.
CO4	To check the model validity and its performance based on performance metrics and understand the data collection and visualization.
CO5	To create chart based pictorial presentation of data with animation.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1		2		1	1					
CO2	2		2	2	1	1	1					
CO3	2	1	2	1		1	1	1				
CO4	1	2	1	2	1		1					
CO5		1	3	2	2	1	1					

COURSE: WIRELESS SENSOR NETWORK SYSTEMS
CODE: CA581
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To understand the concepts of ICs, in order to deal ICs in different era. To learn the fabrication techniques of MOS with IoT applications.
- To learn the importance of WSN phenomena in networking with the help of architectures and protocols.
- To learn about single node architecture and to analyze the optimization goals along with figure of merit.
- To understand significance of Low duty cycle protocols, MAC address and routing protocols.
- To know the concept of clustering, localization and positioning.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	With a new advancement in technology, a student shall be able to and analyze IOT devices. A student can also understand the difference between the physical and logical design of IOT systems.
CO2	Using WSN one can establish a strong sensing network using secure and reliable communication. A student should understand the importance of data link protocols which is used to detect and correct the errors in data while communicating over the channel
CO3	A student should be able to understand the facts of single node architecture, their implementation for proving different logic protocols and gateways.
CO4	He/she should be able to know the duties regarding respective layer. A student should be aware of the fact when to use TCP and when to use UDP for synchronization between hop points so that a student can analyze encryption and decryption techniques for proper data transfer. Also a student will be able to learn the concept of Geographic Routing
CO5	For securing data and a system, a student can establish different procedures and algorithms based on network security and he/she should learn about the platforms and tools using programming that will be state centric.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	3	1	1	2	3	3	3	3	
CO2	1	2	3	3	2	2	1	2	2	2	2	
CO3	2	2	3	2	3	3	1	1	1	2	2	
CO4	1	3	3	2	1	2	3	3	2	2	2	
CO5	1	3	2	1	1	2	2	2	3	2	3	

COURSE: .NET FRAMEWORK AND C#
CODE: CA582
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To study the features of .NET Technologies and to understand the framework and environment.
- To learn C# programming fundamentals for console application development.
- To learn use of C# libraries and exception handling techniques.
- To learn ADO. NET and advance features of C#.
- To learn .NET assemblies and attributes.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand .NET Framework, its runtime environment and application development IDE of Visual Studio.
CO2	Understand the concept of object oriented for making programs.
CO3	Implement C# language constructs in the form of stand-alone console and window form applications.
CO4	Understand database concepts in ADO.NET and apply the knowledge to implement distributed data-driven applications.
CO5	Design, document, debug ASP.NET web forms with server and validation controls and implement ASP.NET web services.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2		3		3	1	1					
CO2	1		3				1					
CO3			3		2			1				
CO4	2		2		2			1				
CO5			3				1					

COURSE: MOBILE APPLICATION DEVELOPMENT
CODE: CA583
COURSE CREDIT: 4

COURSE OBJECTIVES:

- Student learn about modern mobile types and modern mobile operating system.
- Student learn about user interface in mobile application development.
- Student learn about data transmission standard.
- Student learn about data process and storage mechanism.
- Student will learn designing and development of mobile application development using one application development framework.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Student will be able to demonstrate their understanding of the fundamentals of Android operating systems.
CO2	Student will be able to demonstrate their skills of using Android software development tools.
CO3	Student will be able to demonstrate their ability to develop software with reasonable complexity on mobile platform.
CO4	Student will be able to demonstrate their ability to deploy software to mobile devices.
CO5	Student will be able to demonstrate their ability to debug programs running on mobile devices.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		1		2	1					
CO2	2	1			3	1	1					
CO3	2		3	1	2	1		1				
CO4	1	1	2	2	1	1	1					
CO5	1	2	1	2	2	1		1				

COURSE: FRONT END DESIGN TECHNIQUE
CODE: CA584
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To study the tags of HTML5 and CSS3 for web development and apply JavaScript for creating dynamic web pages.
- To learn the concepts and usage of Bootstrap5 for creating responsive websites.
- To learn the concepts JQuery library and its application for simplifying JavaScript programming.
- To learn about AngularJS for building mobile and desktop web applications.
- To learn how to use different tools for website development.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand the HTML5 and CSS3 tags for website designing and implement functionality through JavaScript.
CO2	Understand the advantage of using Bootstrap5 for building mobile and desktop responsive websites.
CO3	Application of JQuery library to simplify HTML DOM tree traversal and manipulation, as well as event handling, CSS animation, and Ajax.
CO4	Apply the concepts of AngularJS for developing single page mobile and web applications.
CO5	Application of web designing tools for coding, styling and animation.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3		2		3			2		1	1	
CO2	2	1	2	1	3					1		
CO3	2	1	1	2	2			1			1	
CO4	2	1	2	1	3			1		2	3	
CO5			3		3	1	1	2	1	2	3	

COURSE: OPEN SOURCE
CODE: CA585
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To learn basic concepts of open-source systems and their comparison with other systems.
- To learn the concepts of Open-Source Operating System and system administrative tasks.
- To learn and implements various concepts of PHP as open source software.
- To demonstrate the use of MySQL database in php MyAdmin and build dynamic web site using Server-side PHP Programming and MySQL.
- To understand the working of Web servers and other open-source software as a case study.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand the basic concepts of open source, working of open source.
CO2	Understand the concepts of Open-Source Operating System and apply them for daily administrative tasks.
CO3	Understand and implement the concepts of PHP as a open source system.
CO4	Develop a web application using PHP as server side scripting language and MySQL as database.
CO5	Understand latest software and frameworks used as open-source systems.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		1		1	1					
CO2	2	2		1		2	1					
CO3	3	1	2	2	1	1		1				
CO4	1		3	2	2	1						
CO5	2	1		2	2	1	1					

COURSE: MODERN APPLICATION DEVELOPMENT
CODE: CA586
COURSE CREDIT: 4

COURSE OBJECTIVES:

- Students to understand the concept of mobile applications, embedded systems, its functions and limitations.
- Understanding the requirements of mobile networks and validation process for mobile application.
- Understanding basic design of mobile applications and achieving quality constraints.
- To be able to understand the advanced design pattern for mobile application.
- To understand the Android Application Development Environment and learn technology in Androids.
- Understanding the basic knowledge of iOS and learns its technology.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Basics of embedded systems and mobile applications.
CO2	Understanding of user interfaces for mobile applications.
CO3	To understand the basic and advanced design of mobile application.
CO4	To be able to learn the development platform of Android.
CO5	To be able to learn the development platform of iOS.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1		1		1	1					
CO2	3	1		2		1		1				
CO3	2	2		1		1	1					
CO4	1	1	2	2	1			1				
CO5	1	1	2	2	2	1		1				

COURSE: SERVICE ORIENTED ARCHITECTURE
CODE: CA587
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To study the basic principles of service orientation.
- To learn Service Oriented Analysis and **Design**.
- To learn Web Services Primitive and Contemporary SOA.
- To learn Anatomy of Service Oriented Architecture.
- To study Service Layers, Business Process Design and Enterprise Applications.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Analyze the evolution, characteristics, Anatomy and services in SOA with SOA architecture.
CO2	Understand benefits of a business-centric SOA and Service modeling. Create, use and apply basics of WSDL and SOAP language.
CO3	Understand Web services framework issues and Message exchange patterns with SOAP.
CO4	Explain common principles of Service Orientation and object orientation methods suitable for SOA.
CO5	Be able to use Service Layer Abstraction to design new Business Process methods for Enterprise Applications based on SOA.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	3		2	1	1		1				
CO2	2	1	3	2	2	1	1					
CO3	2	1		1		2		1				
CO4	2	1		1		2	1	1				
CO5		1	3	2		1	1					

COURSE: MAJORT PROJECT
CODE: CA588
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To emphasize on Long-term, multidisciplinary, and student-centered learning activities.
- To promote independent learning through problem solving in a social environment.
- To engage students in rich and realistic learning experiences.
- To give each student the opportunity to participate, either alone or in a group, to build teamwork skills and professionalism.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Project based learning will increase their capacity and learning through shared cognition.
CO2	Students able to draw on lessons from several disciplines and apply them in practical way.
CO3	Learning by doing approach will promote long-term retention of material and replicable skill, as well as improve students attitudes towards learning.
CO4	Apply appropriate techniques and modern computing tools for development of complex computing activities.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	1	2		1	2					
CO2	2		3	2	2	1	2	1				
CO3	3	1	1	2		2	3	1				
CO4	1		3	1	3	1	1	2				
CO5												

COURSE: ADVANCED TECHNOLOGY LAB(C# & Android)
CODE: CA589
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To learn and understand different types of statements in C#.
- Understand and use of different graphical tools for the development of web page and website using C# programming.
- Use of data base for making dynamic websites using C# programming.
- Making students familiar with android studio.
- To learn basic tools available in android studio for application development.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand the basics of C# programming, different graphics tools and their use.
CO2	Development of static and dynamic web pages using standard tools and learn various properties of the tools.
CO3	Develop interactive and user friendly websites using front end and back end programming.
CO4	Develop simple applications using tools available in android studio.
CO5	Implement interactive graphics applications and games that use graphics tools, audio, video and animation using android studio.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	1			3	1	2				
CO2	3	1	2	3		3	2	3				
CO3	3	2	3	3	1	2	2	3		1		
CO4	2	1	3	3	2	3	2	3				
CO5	3	1	3	1	2	3	2	3		1		