

# **CO'S & CO-PO MAPPING**

**FOR**

## **BACHELOR OF COMPUTER APPLICATION (BCA)**

**(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  
BCA PROGRAMME**

**VISION**

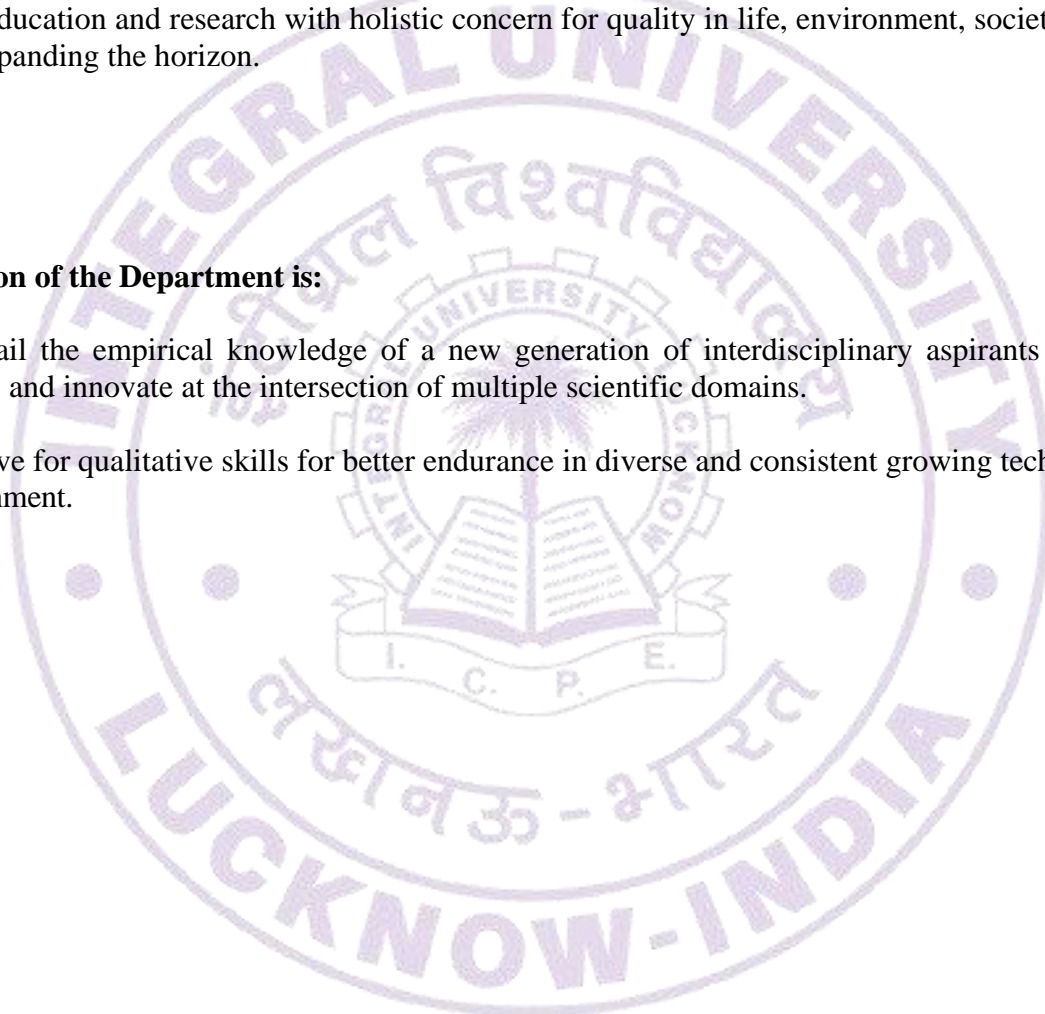
**The Vision of the Department is:**

Visualizing the department as an academic distinction recognize for its total commitment to superiority in technical education and research with holistic concern for quality in life, environment, society and ethics through expanding the horizon.

**MISSION**

**The Mission of the Department is:**

- To entail the empirical knowledge of a new generation of interdisciplinary aspirants who build bridges and innovate at the intersection of multiple scientific domains.
- To thrive for qualitative skills for better endurance in diverse and consistent growing technological environment.



**DEPARTMENT OF COMPUTER APPLICATIONS  
BCA PROGRAMME**

**Programme Educational Objectives (PEO)**

1. To acquaint students about principles of system analysis, design, development and project management.
2. To impart knowledge about various sub domains related to the field of computer science and applications.
3. To apply IT practices to model and analyze the real life problems and interpret the results.
4. To build and lead cross-functional teams, upholding the professional responsibilities & ethical values.

**Programme Outcomes (PO)**

1. Ability to demonstrate knowledge of Computer science and its applications in order to enhance basic understanding of various software technologies.
2. Ability to analyze and identify various business and technical problems to further solve problems with effective communication.
3. Ability to adapt analytical, logical and managerial skills with the technical aspects in order to design and deploy reliable software programs and application for real world problems.
4. Ability to investigate complex problems and provide computer-based solutions.
5. Ability to understand and deliver ethical, social and cultural responsibilities in professional environment as an individual and team.
6. Ability to adapt new technologies for upgrading their skills and contributing to a lifelong learning.
7. Ability to create and manage multidisciplinary projects and successfully apply software and project management principles.
8. Ability to become employable in a variety of IT companies and government sector and also seek entrepreneurship opportunities for the betterment of an individual and society at large.

**Programme Specific Outcome (PSO)**

1. Attain the ability to design and develop Computer Applications, evaluate and recognize potential skills and provide innovative solutions.
2. Explore technical knowledge in diverse areas of Computer Applications an experience and environment conducive in cultivating skills for successful career, entrepreneurship and higher studies.

**Integral University, Lucknow**  
**Department of Computer Application**  
**STUDY & EVALUATION SCHEME**  
**Choice Based Credit System**  
**Bachelor of Computer Application (BCA)**

**Total Credits = 146**

**Year I<sup>st</sup>, Semester I<sup>st</sup>**

S. No.	Course Category	Subject Code	Name of the Subject	Periods				Evaluation Scheme				Subject Total
				L	T	P	C	Sessional (CA)		End Sem Exam		
								CT	TA	Total	ESE	
1.	Foundation	MT151	Computational Mathematics	3	1	0	4	40	20	60	40	100
2.	Foundation	LN104	Essential Professional Communication	3	1	0	4	40	20	60	40	100
3.	Core	CA110	Computer Fundamentals and C Programming	3	1	0	4	40	20	60	40	100
4.	Core	CA 114	Introduction to IT Industry	3	1	0	4	40	20	60	40	100
5.	Foundation	ES115	Fundamentals of Environment Science	3	1	0	4	40	20	60	40	100
6.	Core	CA103	C Programming Lab	0	0	2	2	40	20	60	40	100
7.	Core	CA104	Computer Application Lab	0	0	2	2	40	20	60	40	100
8.	Foundation	LN152	Basic Professional Communication Lab	0	0	1	1	40	20	60	40	100
<b>Total</b>				<b>15</b>	<b>5</b>	<b>5</b>	<b>25</b>	<b>320</b>	<b>160</b>	<b>480</b>	<b>320</b>	<b>800</b>

**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)

**COURSE : COMPUTER FUNDAMENTAL AND C PROGRAMMING**

**CODE: CA110**  
**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- To learn basics of Computer fundamentals, Networks, Internet and operating system
- To understand the basics of programming paradigms and C Programming
- To be able to develop logics in order to create programs and applications using C language.
- To learn decision-making statements in order to solve problems.
- To understand the use of functions and pointer c programming.
- To learn and implement the concept of arrays, structure & union.
- After learning the programming, they can easily switch over to any other language.

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Understand the basic knowledge of Computer fundamental and its application in computers.
<b>CO2</b>	Understand the basic concepts of C programming language and able to identify the need and use of programming in real world environment.
<b>CO3</b>	Design and develop various programming problems using basic concepts of C programming.
<b>CO4</b>	Implement concept of functions, pointers, array and string to resolve real world problems.
<b>CO5</b>	Understand advance C programming concepts like structure, union and enumeration etc.

**CO-PO MAPPING:**

<b>CO</b>	<b>PO</b>											
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	1				1		1				
<b>CO2</b>		3	1	1				1				
<b>CO3</b>	1	3	1	2		2	1	3				
<b>CO4</b>	1	1	2	1			1					
<b>CO5</b>		2	3	1		3	1	2				

**COURSE : INTRODUCTION TO IT INDUSTRY**

**CODE: CA114**

**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- Primarily know the basic concept of Information Technology.
- Acquire an understanding about the components of IT and ethical considerations.
- Understand the idea of IT infrastructure and its associated challenges.
- Analyze challenges in IT project management and the Software Development Life Cycle.
- Explore roles in digital transformation and understand information flow and storage technologies.

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Learn the basic concept of Information Technology.
<b>CO2</b>	Learn the concept of IT components and Ethics.
<b>CO3</b>	Understand the concept of IT Infrastructure and its challenges.
<b>CO4</b>	Understand the IT hierarchy and various roles.
<b>CO5</b>	Able to understand the various certifications in IT Industry.

**CO-PO MAPPING:**

<b>CO</b>	<b>PO</b>											
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	1	1	1									
<b>CO2</b>	1	1	1		1							
<b>CO3</b>	1	1	1		1		1					
<b>CO4</b>	1	1	1	1	1	1	1					
<b>CO5</b>	1	1	1	1	1	1	1					

**COURSE : C PROGRAMMING LAB**

**CODE: CA103**

**COURSE CREDIT: 2**

**COURSE OBJECTIVES:**

- To implement the basic concepts and programming techniques of the C programming language.
- To implement the types of data types (characters, strings, integers, floats), and special symbols in the C programming language.
- To implement the decision-making control statements and different types of loops in the C programming language.
- To implement the functions and pointers in the C programming language.
- To implement the various operations on arrays, structures, and unions in the C programming language.

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	To identify the needs and uses of programming languages in a real-world environment
<b>CO2</b>	Implementing the basic data types, variables, and arithmetic operations in the C programming language
<b>CO3</b>	To develop a program using decision-making statements and I different types of loops in the C programming language
<b>CO4</b>	Able to design a program using functions and pointers the C programming language
<b>CO5</b>	To develop programs using arrays, structures and unions in the C programming language.

**CO-PO MAPPING:**

<b>CO</b>	<b>PO</b>											
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	3	2	3		1	3	3				
<b>CO2</b>	2	2	2	2	1		3	3				
<b>CO3</b>	2	3	3	3		3	3	3				
<b>CO4</b>	1	2	2	2	1	1	3	3				
<b>CO5</b>	2	2	2	2	1	2	3	3				



**COURSE : COMPUTER APPLICATION LAB**

**CODE: CA104**

**COURSE CREDIT: 2**

**COURSE OBJECTIVES:**

- The main objective is introduce Programming in a simple language to all undergraduate students, regardless of their specialization.
- Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used computer programming
- The focus of the subject is on introducing skill relating to computer basics, computer applications, programming, interactive Medias, Internet basics etc.

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Understands the concept of Computer Input/output devices, the concept of dynamic memory, data types, loops, functions, array, pointers, string, structures and files.
<b>CO2</b>	Accomplish creating basic documents. worksheets, presentations with their properties
<b>CO3</b>	Be able to identify computer hardware and peripheral devices
<b>CO4</b>	Utilize the Internet Web resources and evaluate on-line e-business system. Identify categories of programs, system software and applications. Describe various types of networks network standards and communication software.
<b>CO5</b>	To understand and make effective use of Linux utilities and shell scripting language to solve problems. Students will be able to understand the basic commands of Linux operating system and can write shell scripts.

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	1	2			1	1					
<b>CO2</b>	1	2	1	1	1		1					
<b>CO3</b>	3	2	2	1		1						
<b>CO4</b>	3	1	2	1	1							
<b>CO5</b>	2	1	2	1	2		1					

**Integral University, Lucknow**  
**Department of Computer Application**  
**STUDY & EVALUATION SCHEME**  
**Choice Based Credit System**  
**Bachelor of Computer Application (BCA)**

**Year I<sup>st</sup>, Semester II<sup>nd</sup>**

S. No.	Course Category	Subject Code	Name of the Subject	Periods				Evaluation Scheme				Subject Total
				L	T	P	C	Sessional (CA)			End Sem Exam	
								CT	TA	Total	ESE	
1.	Core	CA107	Data Structure using C	3	1	0	4	40	20	60	40	100
2.	Core	CA113	Cyber Crime and Cyber Law	3	1	0	4	40	20	60	40	100
3.	Core	CA115	Computer Organization & Architecture	3	1	0	4	40	20	60	40	100
4.	Foundation	LN131	Effective Communication and Media Study in English	3	1	0	4	40	20	60	40	100
5.	Foundation	MT152	Numerical and Statistical Methods.	3	1	0	4	40	20	60	40	100
6.	Core	CA108	Data Structure Lab	0	0	2	2	40	20	60	40	100
7.	Core	CA116	Computer Organization Lab	0	0	2	2	40	20	60	40	100
8.	Foundation	LN153	Advanced Professional Communication Lab	0	0	1	1	40	20	60	40	100
<b>Total</b>				<b>15</b>	<b>5</b>	<b>5</b>	<b>25</b>	<b>320</b>	<b>160</b>	<b>480</b>	<b>320</b>	<b>800</b>

**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)

**COURSE: DATA STRUCTURE USING C**

**COURSE CODE: CA107**

**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- To learn basic knowledge about data structure and arrays.
- To learn how to create and use linked list and its applications.
- To learn the importance of static and dynamic use of stack and queues.
- To learn the basic terminology of trees.
- To learn basics of sorting and searching techniques

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Able to understand basics of C programming language and arrays.
<b>CO2</b>	Able to understand basic concepts of linked list.
<b>CO3</b>	To understand the basic concepts of stack and queues through array and linked list .
<b>CO4</b>	To understand the basic knowledge of trees and graph.
<b>CO5</b>	Able to understand the concepts of sorting and searching techniques.

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	1	1		1							
<b>CO2</b>	2	2	1		1		1					
<b>CO3</b>	2	1	2		2		1					
<b>CO4</b>	3	1	1	1		1	1					
<b>CO5</b>	2	1		1		2	1					

**COURSE: CYBER CRIME & CYBER LAW**  
**CODE: CA113**  
**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- The course objective is to provide the fundamental skill to understand cyber laws.
- It enables to understand the legal frameworks.
- It helps the student understand different cyber crimes.
- It provides overview on Intellectual Property, copy rights, patents rights etc.
- Given rapid changes in technology and the corresponding changes in crime and the law

**COURSE OUTCOMES (CO):**

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

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand the various types of traditional and contemporary crime related to World of Cyber Space.
CO2	Understand the threats and affect to information system security and different types of security issues.
CO3	Understand the technological and legal issues in electronic and digital signature and way of handling the same.
CO4	Understand to analyze and assess the fundamentals of Intellectual Property Rights (IPR) and Cyber Law
CO5	Understand to IT Rules (Intermediaries Guidelines), Legal and Challenges Globally and find a way how investigate the crime as per law.

**CO-PO MAPPING:**

PO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	2	1	1	1	1	1				
CO2	3	2		1	1	2	1					
CO3	1	2	1	1	2	1	3					
CO4	1	1	1	2		2	1					
CO5	2	1	2	2		1	2	1				

## COURSE: COMPUTER ORGANIZATION & ARCHITECTURE

COURSE CODE: CA115

COURSE OBJECTIVES:

COURSE CREDIT: 4

- To understand the concept of number system, K-maps and complements.
- To learn the importance of sequential logic phenomenon in different circuit analysis with the help of architectures and protocols.
- To learn the concepts regarding microprocessor with 8 bits and 16 bits.
- To understand the basic concept of parallel computing and significance of pipelining and parallelism.
- To know about the I/O devices, interface and Handshaking phenomena, SIMD and FFT

### 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 learn and analyze base concept of different number systems. A student can also understand the concept of logical design in K map along with combinational circuits.
CO2	Using sequential logic one can establish strong circuit for parallel and serial addition using different combinational circuits. A student should understand the importance of Flip-Flop, registers and counters to design asynchronous and synchronous circuits using state diagrams.
CO3	For a microprocessor system, student should be able to deal with the internal architecture of 8 bits and 16 bit microprocessor to analyze the working operation and to know the pin configuration for the respective microprocessor. A student should be good enough to deal with interrupts internally or externally.
CO4	He/she should be able to know the concept of pipelining and parallelism in uniprocessor system for hazard detection. Understand the basic concept of Parallel computing. A students should have a basic idea of job levels that are governed by an organization on priority basis.
CO5	A student should gain knowledge of Asynchronous data transfer, serial and Parallel communication. He/she should know the Pipeline scheduling theory. For good networking, a student should be able to draw SIMD interconnection along with DIT FFT.

### CO-PO MAPPING:

CO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1		1						
CO2	1	3	1		1		1					
CO3	2	1		1	1	1						
CO4	2	1	2			2	1					
CO5		2	3	1	1	1	2					

**COURSE: DATA STRUCTURE LAB**  
**COURSE CODE: CA108**  
**COURSE CREDIT: 2**

**COURSE OBJECTIVES:**

- To impart the basic concepts of data structures and algorithms.
- To understand concepts about searching and sorting techniques
- To understand basic concepts about stacks, queues, lists, trees and graphs.
- To understand the algorithms and step by step approach in solving problems with the help off fundamental data structures.
- To strengthen the ability to identify and apply the suitable data structure for the given real-world problem.

**COURSE OUTCOMES (CO):**

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

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to analyze the time and space efficiency of the data structure and identify the appropriate data structure for given problem.
CO2	Able to understand basic concepts of linked list a and Implement operations likes searching, insertion, and deletion, traversing mechanism etc. on various data structures.
CO3	Able to understand the basic concepts of stack and queues through array and linked lists.
CO4	Able to understand the basic knowledge of trees and graph.
CO5	Implement appropriate sorting searching technique for given problem

**CO-PO MAPPING:**

PO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	2	1		1					
CO2	3	1	2		1	1						
CO3	2	1	2		1		1					
CO4	3	1	1	1		1						
CO5	1	1	3	1		2	1					

**COURSE: COMPUTER ORGANIZATION LAB**  
**COURSE CODE: CA116**  
**COURSE CREDIT: 2**

**COURSE OBJECTIVES:**

- Understanding the behavior of Logic Gates, Adders, Decoders, Multiplexers and Flip-Flops.
- Understanding the behavior of ALU, RAM, STACK and PROCESSOR from Working modules and the modules designed by the student as part of the experiment
- To enable the students to understand the functionality and implementation of computer system,
- To familiarize with the various instruction codes and formats of different CPUs.
- Knowledge of the internal working of main memory cache memory, associative memory and various modes of data transfer.

**COURSE OUTCOMES (CO):**

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

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Analyze the behavior of logic gates.
CO2	Design combinational circuits for basic components of computer system and Applications.
CO3	Analyze the operational behavior and applications of various flip-flop.
CO4	Design Arithmetic logic units and different types of memory blocks.
CO5	Ability to understand the functionality, organization and implementation of computer system and Microprocessor.

**CO-PO MAPPING:**

PO CO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	2	3	2	1	3				
CO2	2	3	2	2	3	2	1	3				
CO3	2	3	2	2	3	2	2	1				
CO4	2	3	2	2	3	2	2	1				
CO5	2	3	2	2	3	2	1	2				

**Integral University, Lucknow**  
**Department of Computer Application**  
**STUDY & EVALUATION SCHEME**  
**Choice Based Credit System**  
**Bachelor of Computer Application (BCA)**

**Year II<sup>nd</sup>, Semester III<sup>rd</sup>**

S. No.	Course Category	Subject Code	Name of the Subject	Periods				Evaluation Scheme				Subject Total
				L	T	P	C	Sessional (CA)			End Sem. Exam	
								CT	TA	Total	ESE	
1.	Core	CA203	Object Oriented Programming Concepts using C++	3	1	0	4	40	20	60	40	100
2.	Core	CA204	Fundamental of Database Management System	3	1	0	4	40	20	60	40	100
3.	Core	CA221	Web Development	3	1	0	4	40	20	60	40	100
4.	Core	CA222	Discrete Mathematical Structure	3	1	0	4	40	20	60	40	100
5.	Elective - I	CA218	Data Compression and Multimedia	3	1	0	4	40	20	60	40	100
		CA224	Graph Theory & Application									
6.	Core	CA206	C++ Lab	0	0	2	2	40	20	60	40	100
7.	Core	CA207	DBMS Lab	0	0	2	2	40	20	60	40	100
8.	Core	CA223	Web Development Lab	0	0	1	1	40	20	60	40	100
<b>Total</b>				<b>15</b>	<b>5</b>	<b>5</b>	<b>25</b>	<b>320</b>	<b>160</b>	<b>480</b>	<b>320</b>	<b>800</b>

**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)



**COURSE: OBJECT ORIENTED PROGRAMMING CONCEPTS USING C++**

**CODE: CA203**

**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- To learn object oriented programming paradigms and various object oriented modeling.
- To learn basic concepts, structure syntax of C++.
- To learn & implement various programming problems in C++.
- To learn & implement advanced programming concepts in C++
- To learn error handling technique in C++ and improve problem solving ability.

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Know basic knowledge of object oriented modeling and its application in computer science.
<b>CO2</b>	Understand basic concepts & structure of object oriented programming language using C++.
<b>CO3</b>	Design and develop various programming problems using basic concepts of C++.
<b>CO4</b>	Learn and implement advance programming concepts of C++ like Inheritance, operator overloading, etc.
<b>CO5</b>	Learn and implement exception handling mechanism for debugging in C++.

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3		1		1		1					
<b>CO2</b>	3	1	2			1	1					
<b>CO3</b>		2	3	1	1	2	2					
<b>CO4</b>	1	1	3	1		2	2					
<b>CO5</b>	1	1	3	1		1	2					

**COURSE: FUNDAMENTAL OF DATABASE MANAGEMENT SYSTEM**

**COURSE CODE: CA204**

**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 various issues in transaction processing.
- To learn the recovery system and basics of concurrency control system.

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Able to understand the basic concepts of DBMS, Difference between DBMS and File Processing System, applications of DBMS and various DBMS Models.
<b>CO2</b>	Able to understand the basic concepts of ER Model and How to draw ER Diagrams.
<b>CO3</b>	Ability to define various constraints and writing queries using SQL syntax.
<b>CO4</b>	Applying the Relational algebra and Calculus to define expressions for queries and understanding various Normal forms used for Normalization approach.
<b>CO5</b>	Acquainted with the basic issues while implementing the concept of Transaction and recovery.

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	1			1	1						
<b>CO2</b>	3	1	2			1	1	2				
<b>CO3</b>		2	3	1	1	2	2					
<b>CO4</b>	1	3	2	2		2	1					
<b>CO5</b>		2	2	1	1	1		1				

## COURSE: WEB DEVELOPMENT

COURSE CODE: CA221

COURSE CREDIT: 4

### COURSE OBJECTIVES:-

- To learn web development fundamentals and client server architecture with language of internet & www.
- To learn HTML structure to create Web pages and tells the browser how to display them.
- To learn CSS (Cascading Style Sheets) for giving. style and layout to web pages.
- To learn basics of client-side Java Script for controlling the behavior of different elements of HTML.
- To learn Document Object Model (DOM) and its programming interface for web document.

### COURSE OUTCOMES (CO):

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

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Know about web development fundamentals and client server architecture with web browsers, internet & www.
CO2	Understand HTML Hyper Text Markup Language used to create Web pages and tells the browser how to display them.
CO3	Able to understand CSS (Cascading Style Sheets) used to style and layout web pages.
CO4	Hands on practice on client-side Java Script for controlling the behavior of different elements of HTML.
CO5	Implement Document Object Model (DOM) to accomplish programming interface for web documents.

### CO-PO MAPPING:

PO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		1			1		1				
CO2	3	1	1	1	1							
CO3	3	1	1					1				
CO4	2	1	2	1		2						
CO5	1	1	3			2	1					

**COURSE: DISCRETE MATHEMATICS**  
**COURSE CODE: CA222**  
**COURSE CREDIT: 4**

**COURSE OBJECTIVE :-**

- To learn web development fundamentals and client server architecture with language of internet & www.
- To learn HTML structure to create Web pages and tells the browser how to display them.
- To learn CSS (Cascading Style Sheets) for giving. style and layout to web pages.
- To learn basics of client-side Java Script for controlling the behavior of different elements of HTML.
- To learn Document Object Model (DOM) and its programming interface for web document.

**COURSE OUTCOMES (CO):**

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

COURSE OUTCOME (CO)	DESCRIPTION
<b>CO1</b>	Know about web development fundamentals and client server architecture with web browsers, internet & www.
<b>CO2</b>	Understand HTML Hyper Text Markup Language used to create Web pages and tells the browser how to display them.
<b>CO3</b>	Able to understand CSS (Cascading Style Sheets) used to style and layout web pages.
<b>CO4</b>	Hands on practice on client-side Java Script for controlling the behavior of different elements of HTML.
<b>CO5</b>	Implement Document Object Model (DOM) to accomplish programming interface for web documents.

**CO-PO MAPPING:**

PO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	1			1	1		1				
<b>CO2</b>	3	1	2	1		1	1					
<b>CO3</b>	2	2	1			2						
<b>CO4</b>	2	1	1	1		2						
<b>CO5</b>	1	1	1			1	1					

**COURSE: DATA COMPRESSION AND MULTIMEDIA SYSTEM**

**CODE: CA218**

**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- Explain digital audio, perceptual audio coding and MPEG audio compression standard.
- Describe different lossless and lossy image and video compression techniques and standards.
- To understand the concept of scalar and vector quantization.
- To learn and understand technical aspect of multimedia systems.
- To understand the standards available for audio, video and text applications.

**COURSE OUTCOMES (CO):**

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

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Describe and apply various techniques for text compression and also evaluate performance of the coding techniques.
CO2	Understand the operation of scalar and vector quantizer.
CO3	Describe different lossless and lossy image and video compression techniques and standard.
CO4	Developed understanding of technical aspect of multimedia Systems
CO5	Understand various file formats for audio, video and text media.

**CO-PO MAPPING:**

CO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3		1		2					
CO2	3	1	1			1						
CO3	2	2	1	1		2						
CO4	1	1	3			1	2	2				
CO5		3	1	2	1	1						

## COURSE: GRAPH THEORY AND APPLICATION

CODE: CA224

COURSE CREDIT: 4

### COURSE OBJECTIVES:

- To study the basic concepts of graph and solve the different problems.
- To learn concepts of graph theory and their application in the field of computer science.
- To study the basic concepts vector representation of graph and introduction to matrix representation of graph.
- To study the basic concepts colouring of graph, chromatic number of graph and chromatic polynomial of a graph.
- To learn the directed graph and introduction to matrix representation.

### COURSE OUTCOMES (CO):

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

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand the basic concepts of graph theory and all of the relevant theorems covered in the course.
CO2	Understand the basic concepts of Trees, Spanning trees and relevant algorithm.
CO3	Understand the basic concepts Vector space, Matrix and the relevant theorems covered in the course.
CO4	Understand the Coloring concepts and relevant theorem covered in the course.
CO5	Understand the s concept of a directed graph. and related matrix.

### CO-PO MAPPING:

CO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	2	1							
CO2	2	3	1	2	1		1					
CO3	3		2			1	1					
CO4	2	1	1	1		1						
CO5	2	1	3	1		2	1					

**COURSE: C++ LAB**

**CODE: CA206**

**COURSE CREDIT: 2**

**COURSE OBJECTIVES:**

- To explain basic concepts and techniques of C++.
- To explain concepts and techniques to implement overloading.
- To explain concepts and techniques to implement functions
- Demonstrate the significance of constructors and destructor and inheritance.
- To explain concepts and techniques to implement polymorphism, exception handling and searching, sorting

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	To develop a program using classes and objects.
<b>CO2</b>	Able to design a program for operator overloading and function overloading.
<b>CO3</b>	To develop a program using friend function, inline function and static member function
<b>CO4</b>	To develop a program using constructors and destructor and inheritance
<b>CO5</b>	To develop a program for polymorphism using virtual function, exception handling and searching, sorting

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	1	1	3		1	1						
<b>CO2</b>	1	1	3	2		1	1					
<b>CO3</b>	2	1	3	1	1	2	1					
<b>CO4</b>	1	2	3	2		1	1					
<b>CO5</b>	2	1	3	1	1	1						

**COURSE: DBMS LAB**  
**COURSE CODE: CA207**  
**COURSE CREDIT: 2**

**COURSE OBJECTIVES:**

- To explain basic database concepts and how to implement the DDL and DML commands in SQL.
- To demonstrate the use of constraints, relational algebra operations and Grouping (Group by clause, Clause).
- To familiarize with use of Aggregate function in queries, concept of granting permissions (Grant, Revoke),
- To develop an understanding of essential DBMS concepts such as joins, union, intersection and also
- Various concept of Sub-query, Data constraints (Unique Key, Primary Key, Foreign Key).
- To demonstrate the concept of creating Views, Indexes and Introduction to PL/SOL

**COURSE OUTCOMES (CO):**

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

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Creating and altering Databases, tables, and writing a query using SQL DML DDL commands.
CO2	Implementing the constraints like Primary key, Foreign key, Unique Key, Null, Not null and various relational algebra operations.
CO3	Using Aggregate functions in SQL with the concept of Grant and Revoke commands.
CO4	Implementing the various joins, sub-queries, set theory commands and Data constraints.
CO5	Using the commands to create Views, Indexes and PL/SQL basics.

**CO-PO MAPPING:**

PO	PO											
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3		1	1						
CO2	2		2	1		2	1					
CO3	3	1	2	1	1	2						
CO4	2	2	3	1		2	2					
CO5	1		3	1	1	1	1					



**COURSE: WEB DEVELOPMENT LAB**

**CODE: CA223**

**COURSE CREDIT: 1**

**COURSE OBJECTIVES:**

- To learn and apply the basic tags of HTML for creating web pages.
- To learn and create web pages using the multimedia tags of HTML..
- To learn hyperlink and frame tag and create web pages using them.
- To learn JavaScript scripting language and make validations on web pages using JavaScript.
- To learn and design websites using client-side scripting and document object model

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Able to create web page(S) using HTML tags.
<b>CO2</b>	Able to create web page(s) using HTML, CSS.
<b>CO3</b>	Able to create web page(s) using HTML, CSS and JavaScript
<b>CO4</b>	Able to implement Client Side and Server-Side validations of web page using JavaScript
<b>CO5</b>	Able to implement client-side scripting using document object model.

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	1	1	3		1		1					
<b>CO2</b>	2	1	3	1		1	1					
<b>CO3</b>	2	2	3	1	1	1						
<b>CO4</b>	1	1	3	2			1					
<b>CO5</b>	2	1	3	2			2					

**Integral University, Lucknow**  
**Department of Computer Application**  
**STUDY & EVALUATION SCHEME**  
**Choice Based Credit System**  
**Bachelor of Computer Application (BCA)**

**Year II<sup>nd</sup>, Semester IV<sup>th</sup>**

S. No.	Course Category	Subject Code	Name of the Subject	Periods				Evaluation Scheme				Subject Total
				L	T	P	C	Sessional (CA)			End Sem Exam	
								CT	TA	Total	ESE	
1.	Core	CA210	Software Engineering and Project Management	3	1	0	4	40	20	60	40	100
2.	Core	CA213	Principles of Operating System	3	1	0	4	40	20	60	40	100
3.	Core	CA214	JAVA Programming	3	1	0	4	40	20	60	40	100
4.	Core	CA225	Full Stack Web Development -I	3	1	0	4	40	20	60	40	100
5.	Core	CA226	Data Communication and Computer Networks	3	1	0	4	40	20	60	40	100
6.	Core	CA216	JAVA Programming Lab	0	0	2	2	40	20	60	40	100
7.	Core	CA227	Operating System Lab	0	0	2	2	40	20	60	40	100
8.	Core	CA228	Full Stack Web Development -I Lab	0	0	1	1	40	20	60	40	100
<b>Total</b>				<b>15</b>	<b>5</b>	<b>5</b>	<b>25</b>	<b>320</b>	<b>160</b>	<b>480</b>	<b>320</b>	<b>800</b>

**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)

**COURSE: SOFTWARE ENGINEERING AND PROJECT MANAGEMENT**  
**COURSE CODE: CA210**  
**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- To develop knowledge of phases in software development
- To develop good quality software and able to maintain quality of software
- To know the team required for project management.
- To develop knowledge of tools available for software development.
- Knowledge of testing and maintain robustness of software

**COURSE OUTCOMES (CO):**

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

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To understand about designing model and practical implementation.
CO2	To take decision of project planning on the basis of cost evaluation.
CO3	To understand risk identification and management.
CO4	To use various tools for software design development.
CO5	To understand importance of quality of software.

**CO-PO MAPPING:**

PO	PO											
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2		1		1	1				
CO2	1	2	1	1		2		1				
CO3	3	2		1	1	1						
CO4		1	3		1	2	2	1				
CO5	2	1	1	1		2						

**COURSE: PRINCIPLES OF OPERATING SYSTEM**

**CODE: CA213**

**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- To understand various operating system types, Architecture design of OS and their services.
- To study process management concepts and various scheduling algorithm.
- To understand process synchronization concepts and dead lock handling mechanism.
- To learn various memory management schemes.
- To study various disk scheduling algorithm and Process Management in UNIX.

**COURSE OUTCOMES (CO):**

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

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Know different OS types and basic component of OS Architecture.
CO2	Analyze issues in process management and evaluations of various scheduling algorithms.
CO3	Understand process synchronization problem and provide solution for critical section problem and deadlock management.
CO4	Analyze and implement various memory management techniques.
CO5	Understand various disk scheduling algorithm and Process Management in UNIX.

**CO-PO MAPPING:**

PO CO	PO											
	PO1	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		1				
CO4	1	2	2	1		2	1					
CO5		3	1	2	1	2		1				

**COURSE: JAVA PROGRAMMING**  
**CODE: CA214**  
**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- To learn the various features of Java and comparing with C++.
- To learn the Java environment for writing programs and Java program structure.
- To learn the various Objects oriented features with Java.
- To learn the Array, String, Exception Handling concept.
- To learn the concepts of Thread, Package, Applet and implementing them in creating a web page.

**COURSE OUTCOMES (CO):**

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

COURSE OUTCOME (CO)	DESCRIPTION
<b>CO1</b>	Able to understand the features of Java Programming Language with Syntax and structure of Java Programs and how to use various operators in Java.
<b>CO2</b>	Able to understand that how to implement the Object oriented features by writing Java programs.
<b>CO3</b>	Ability to define Arrays, Strings, Vectors, Packages etc. in Java and implementing the Exception handling Mechanism in Java.
<b>CO4</b>	Ability to understand the different concepts to create and use Threads and Packages in Java.
<b>CO5</b>	Ability to understand the different concepts of applets and adding them to a HTML File.

**CO-PO MAPPING:**

PO	PO											
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	1		1	1							
<b>CO2</b>	2		1		1	2		2				
<b>CO3</b>	2	1	3	1		1	2	1				
<b>CO4</b>	1	1	2	1		3	1	2				
<b>CO5</b>	1	1	2	1		2	1					

## COURSE: FULL STACK WEB DEVELOPMENT-I

CODE: CA225

COURSE CREDIT: 4

- To understand how Mern Stack makes things perform.
- To build applications mainly using the JavaScript language only.
- Enabled student with comprehensive understanding of MERN Stack, encompasses MongoDB, Express.js, React and Node.js.
- To learn how to design user-friendly interfaces with React, develop server-side application with Node.js and manage data using MongoDB.
- Students will learn about the most advanced web-app development environment with immense exposure on practicality.

### COURSE OUTCOMES (CO):

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

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to understand HTMLS Basics and its applications in Full Stack web development
CO2	Designed to enable responsive development of mobile-first websites
CO3	Understand Features of ECMA Script 6 and in what way ES6 makes JavaScript coding easier and more maintainable
CO4	Able to understand and use the AngularJS Framework
CO5	Able to understand and use the React Framework

### CO-PO MAPPING:

CO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1		1							
CO2	3	1	1	1		1						
CO3	2	2	3	1		2						
CO4	3	1	1		1	1						
CO5	3	1	1	1		1						

**COURSE: DATA COMMUNICATION AND COMPUTER NETWORKS**

**COURSE CODE: CA226**

**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- Build an understanding of the fundamental concepts of Data communication. Familiarize the student with the basic taxonomy and terminology of signals.
- To learn about the Modulation and Data Encoding methods. To study about the Multiplexing Techniques and different switching technique.
- Get knowledge about the Network and its application. Study about the different Network Topologies. Introduce the student to OSI Model, preparing the student for entry Advanced courses in computer networking.
- To understand the concept of TCP/IP protocol suite. Build an understanding of the various data link layer protocol and its applications.
- Understanding of the various the various internetworking devices. To study the IEEE 802 Project,

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Build an understanding of the fundamental concepts of Data communication. Familiarize the student with the basic taxonomy and terminology of signals.
<b>CO2</b>	To learn about the Modulation and Data Encoding methods. To study about the Multiplexing Techniques and different switching technique.
<b>CO3</b>	Get knowledge about the Network and its application. Study about the different Network Topologies. Introduce the student to OSI Model, preparing the student for entry Advanced courses in computer networking.
<b>CO4</b>	To understand the concept of TCP/IP protocol suite. Build an understanding of the various data link layer protocol and its applications.
<b>CO5</b>	Understanding of the various the various internetworking devices. To study the IEEE 802 Project,

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	2	2	1	1	1			1				
<b>CO2</b>	3	1	2	1		1	1					
<b>CO3</b>	2	2	1	1		2						
<b>CO4</b>	3	2	1	1		1						
<b>CO5</b>	1	3	2	1		2	1					

## COURSE: JAVA PROGRAMMING LAB

COURSE CODE: CA216

COURSE CREDIT: 2

### COURSE OBJECTIVES:

- To learn the object oriented concepts and apply them in solving problems in java.
- To learn the concepts of Inheritance and Polymorphism.
- To learn the concepts of Packages and Interfaces in Java.
- To learn the concepts of Exception handling and Multithreading.
- To learn the concepts of Graphical User Interface using Applets and AWT Controls

### COURSE OUTCOMES (CO):

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

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to implement classes objects, members of a class and relationships among them needed for a specific problem.
CO2	Able to i implement programs using concepts of Inheritance and Polymorphism.
CO3	Able to implement the concepts of Packages and Interfaces in Java.
CO4	Able to develop Java Programs using the concepts of Exception Handling and Multithreading.
CO5	Able to develop the GUI based web applications using Applets and various AWT controls.

### CO-PO MAPPING:

CO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	1	1		1					
CO2	2	1	3		1	1						
CO3	1	1	2	1		2	2					
CO4	1	1	3	1		1	1					
CO5	2	1	3	1		2	1					



**COURSE: OPERATING SYSTEM LAB**

**COURSE CODE: CA227**

**COURSE CREDIT: 2**

**COURSE OBJECTIVES:**

- To describe the UNIX Operating System and commands..
- To differentiate between Internal and External Commands.
- To Write a Shell Script for specific problem definition.
- To apply specific UNIX fork() command.
- To Demonstrate User Input and working with Conditional Statements and Loops.
- To demonstrate the Use of string Operations

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	To familiarize the Students with the UNIX Operating System commands.
<b>CO2</b>	To gain an understanding of important aspects related to the Shell Programming.
<b>CO3</b>	To make student learn fundamentals of System Programming.
<b>CO4</b>	To develop the ability to implement loops.
<b>CO5</b>	To give a Comprehensive Introduction to perform String operations

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	2		1	1		1					
<b>CO2</b>	3	1	1			1	2					
<b>CO3</b>	2	2	1	1	1		1					
<b>CO4</b>	1	2	3	1		1	1					
<b>CO5</b>	2	1		1	2	1						

**COURSE: FULL STACK WEB DEVELOPMENT-I LAB**

**COURSE CODE: CA228**

**COURSE CREDIT: 1**

**COURSE OBJECTIVES:**

- To learn and apply the basic tags of HTMLS for creating web pages.
- To learn and create responsive web page(s) using Bootstrap.
- To learn and implement Client-Side scripting using JavaScript.
- To learn and implement Client-Side scripting using AngularJS framework
- To learn and create web-based projects using ReactJS

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Able to create web page (s) using HTML5 tags.
<b>CO2</b>	Able to create responsive web page(s) using Bootstrap.
<b>CO3</b>	Able to implement Client-Side scripting using JavaScript.
<b>CO4</b>	Able to implement Client-Side scripting using AngularJS framework
<b>CO5</b>	Able to create web-based projects using ReactJS

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	1	1	3			1						
<b>CO2</b>	2		3	1	1	2	1					
<b>CO3</b>	2	1	3	1		1	2					
<b>CO4</b>	1	1	3		1	2						
<b>CO5</b>	1	2	3	1		2						

**Integral University, Lucknow**  
**Department of Computer Application**  
**STUDY & EVALUATION SCHEME**  
**Choice Based Credit System**  
**Bachelor of Computer Application (BCA)**

**Year III<sup>rd</sup>, Semester V<sup>th</sup>**

S. No.	Course Category	Subject Code	Name of the Subject	Periods				Evaluation Scheme			Subject Total	
								Sessional (CA)				End Sem. Exam
				L	T	P	C	CT	TA	Total		ESE
1.	Core	CG301	Career Development Course	3	1	0	0	40	20	60	40	100
2.	Core	CA301	Computer Graphics and Multimedia Application	3	1	0	4	40	20	60	40	100
3.	Core	CA324	Algorithm Analysis and Design	3	1	0	4	40	20	60	40	100
4.	Core	CA325	Full Stack Web Development-II	3	1	0	4	40	20	60	40	100
5.	Core	CA326	Introduction to Mobile Application Development	3	1	0	4	40	20	60	40	100
6.	Elective – II	CA307	Image Processing									
		CA327	Introduction to Internet of Things	3	1	0	4	40	20	60	40	100
		CA328	Data Analytics and Visualization									
7.	Core	CA312	Computer Graphics and Multimedia Application Lab	0	0	2	2	40	20	60	40	100
8.	Core	CA329	Full Stack Web Development-II Lab	0	0	2	2	40	20	60	40	100
9.	Core	CA330	Mobile Application Development Lab	0	0	1	1	40	20	60	40	100
<b>Total</b>				<b>18</b>	<b>6</b>	<b>5</b>	<b>25</b>	<b>360</b>	<b>180</b>	<b>540</b>	<b>360</b>	<b>800</b>

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**

CA307 Image Processing

CA327 Introduction to Internet of Things

CA328 Data Analytics and Visualization

**COURSE: CAREER DEVELOPMENT COURSE**

**CODE: CG301**

**COURSE CREDIT: 0**

**COURSE OBJECTIVES:**

- The primary purpose of an aptitude test is to determine your capability. Instead of looking at what you know, it looks at your learning capacity, and your ability to work with new information in an effective manner. This gives a strong indication of how well you're likely to perform in a particular setting, be it educational or professional.

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Analyzing power needed to solve problems.
<b>CO2</b>	Analytical and Mental Ability for Solving problems.
<b>CO3</b>	Information processing capabilities, creative thinking ability, and evaluation skills.
<b>CO4</b>	Awareness on various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
<b>CO5</b>	Basic numerical ability to solve everyday tasks in a more effective manner.

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	1	1	2	1	1	1	1	3				
<b>CO2</b>	1	1	2	1	1	1	1	3				
<b>CO3</b>	1	1	2	1	1	1	1	3				
<b>CO4</b>	1	1	1	1	1	1	1	3				
<b>CO5</b>	1	1	1	1	1	1	1	3				

**COURSE: COMPUTER GRAPHICS AND MULTIMEDIA APPLICATION**  
**CODE: CA301**  
**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- To learn the principles of hardware and software behind the graphical environment. To learn about the design and implementation of graphical object by understanding basic algorithms for scan conversion of different graphical primitives and filling their inner areas.
- To learn about transformation and modeling of original primitive and their clipped version into dimensional space by understanding the different algorithms.
- To learn projecting any graphical primitive from higher dimensional space to 2-D space.
- To learn the various aspects of rendering visible surfaces.
- To learn the creation of animated objects and their images by knowing various aspects of media and learn the concept of audio, images and videos. Also, to learn minimization of memory requirements for graphical objects by rendering objects and surfaces and compressing Images.

**COURSE OUTCOMES (CO):**

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

COURSE OUTCOME (CO)	DESCRIPTION
<b>CO1</b>	Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
<b>CO2</b>	Implement the various algorithms for scan conversion and filling of basic objects and their comparative analysis.
<b>CO3</b>	Apply geometric transformations on original and clipped graphics objects and their application in composite form in 2D and 3D.
<b>CO4</b>	Apply projection techniques for improving the object appearance from 3D scene on 2D screen.
<b>CO5</b>	Implement interactive graphics applications and games that use animation techniques, audio, video by minimizing memory requirements through compression techniques.

**CO-PO MAPPING:**

PO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	1	2		1		1					
<b>CO2</b>		2	3	1	1	1	2					
<b>CO3</b>		2	3		1	3	1	2				
<b>CO4</b>		1	2	3	1		2	1				
<b>CO5</b>		1	1	3		2	1	2				

**COURSE: IMAGE PROCESSING****COURSE CODE: CA 307****COURSE CREDIT: 4****COURSE OBJECTIVES:**

- To understand basic components that constitutes an image.
- To understand concepts of filtering of image.
- To understand various processes those are applied on image.

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Digital Image Fundamentals Element of Visual Perception, A Simple Image Model, Coordinate Conventions, Image Sampling and Quantization,
<b>CO2</b>	Filtering, Smoothing and frequency domain analysis of an image.
<b>CO3</b>	Filtering in Frequency Domain: Fourier Transform and the Frequency Domain, Basics of Gaussian Low pass Filters.
<b>CO4</b>	Image Restoration Process, Least Mean Square Filtering, Blind Image Restoration, Pseudo Inverse, Singular Value Decomposition
<b>CO5</b>	Color Image Processing, Color Segmentation. Morphological Image Processing, Morphological Algorithms: Boundary Extraction, Region Filling.

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	2	1	2		1		1					
<b>CO2</b>	1	2	1	1		2						
<b>CO3</b>	1	2	2	1		2	1					
<b>CO4</b>		1	3		1	1	2					
<b>CO5</b>	1	1	3	1		1	2					

## COURSE: ALGORITHM ANALYSIS AND DESIGN

CODE: CA324

COURSE CREDIT: 4

### COURSE OBJECTIVES:

- To study the concepts of complexity of algorithms and understand the analysis of algorithms based on input size.
- To learn advanced data structure and their fundamentals for application development.
- To learn use of greedy and dynamic programming techniques and their application in the field of computers science to solve problems.
- To learn algorithms for graph theory problem like spanning tree problem, single source shortest path and advance features of graph application in field of computer science.
- To learn string matching algorithms and, P, NP problem in computer science domain

### COURSE OUTCOMES (CO):

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

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand the algorithms and notation, including order notation, and how to analyze the complexity of the algorithms
CO2	Understand the concept of hashing and sorting.
CO3	Compare, contrast, and apply the key algorithmic design paradigms: divide and conquer, greedy method, dynamic programming techniques.
CO4	Understand the concepts of Graph algorithms to solve problem using Greedy method as well as dynamic programming techniques.
CO5	To understand the concepts of Randomized, and exact vs. approximate. Implement, empirically compare, and apply fundamental algorithms and string matching, P, NP and NP complete real-world problems

### CO-PO MAPPING:

CO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2		1		1					
CO2	3	1				2						
CO3		2	3	1	1	2	2					
CO4	3	2	2	1		1	1					
CO5	2	1	2	1		2	1					



## COURSE: FULL STACK WEB DEVELOPMENT-II

COURSE CODE: CA 325

COURSE CREDIT: 4

### COURSE OBJECTIVES:

- Enable students to develop a complete web application from the scratch that includes Front-end, Backend and Data-exchange technologies.
- Able to understand Node.JS fundamentals and its applications in web development and ability to develop web applications using NodeJS.
- Able to create, read, update, and read (CRUD) operations on the MongoDB database.
- Build strong foundations (ex: OOPS) in entry level engineers / working professionals thereby making them job ready as per latest industry requirements. Enable them to learn new technologies by applying foundation paradigms
- By the end of the course students will be become an industry-ready engineer who can be readily deployed in a project.

### COURSE OUTCOMES (CO):

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

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to equip learners with a comprehensive understanding of the NoSQL database MongoDB.
CO2	Gain familiarity with what Express is and how it fits in with Node, what functionality it provides, and the main building blocks of an Express application.
CO3	Able to understand the NodeJS framework and create server-side applications
CO4	Create and run Node.js script from command line and build web applications using general-purpose document database
CO5	Hands-on experience necessary to build rich, full stack web applications using the MERN stack.

### CO-PO MAPPING:

CO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1		1	1	1				
CO2	3	1	1		1	1						
CO3	2	1	2	1		1		1				
CO4	1	2	3	2	1	1	1	1				
CO5	3	2	1		1	1	2					

**COURSE: INTRODUCTION TO MOBILE APPLICATION DEVELOPMENT**

**CODE: CA326**

**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- Learn about the features and installation of Flutter.
- Learn about the basic programming constructs of Dart.
- Develop simple mobile applications in Flutter using Dart language.
- Develop mobile applications using database Connections.

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Understand the fundamentals of the Flutter framework
<b>CO2</b>	Build simple Flutter application using simple widgets and layouts
<b>CO3</b>	Build Animation on Flutter
<b>CO4</b>	Develop Flutter applications using Dart packages
<b>CO5</b>	Construct Flutter application using database.

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	1		1		2						
<b>CO2</b>	2	1	3		1	1	1					
<b>CO3</b>	2		3	1	2	1						
<b>CO4</b>	1	1	2	2	1		1					
<b>CO5</b>	1	2	2	2		1	1					

## COURSE: INTRODUCTION TO INTERNET OF THINGS

CODE: CA327

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 design 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 develop knowledge in Industrial Internet of Things (IIoT) fundamentals.
- To gain conceptual understanding of networking and wireless communication protocols used in IoT deployments.
- To Understand the various Internet of Medical Things (IoMT)..

### 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 to provide better identity management using different models like isolated and federated user identity models
CO5	A student should know the basic idea about Internet of Medical Things (IoMT) and its applications in healthcare industry. He/she should be good enough to deal with the establishment of identity for smart applications to be used in IOT

### CO-PO MAPPING:

CO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1		2	1	1	1					
CO2	1	2	1	2	1		1					
CO3	2	1		2	1	1						
CO4	1	2	1	1		2	1					
CO5	2		1	2	1	2	1					

**COURSE: DATA ANALYTICS AND VISUALIZATION**

**CODE: CA328**

**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- Explain various data handling methods and basic understanding of python.
- Data wrangling using pandas and visual presentation of data
- To understand the concept of basic statistics and probability
- To learn and understand the SQL for data analysis
- To understand the standard technical tool available for data analysis

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Describe and apply various techniques for data collection and processing
<b>CO2</b>	Understand the Pandas and Matplotlib libraries
<b>CO3</b>	Understand basics of descriptive and inferential statistics and probability theory
<b>CO4</b>	Develop understanding of SQL for data analysis
<b>CO5</b>	Understand PowerBI tool for data analysis and visualization

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>		1	3		1		2					
<b>CO2</b>	3	1				1						
<b>CO3</b>	2		1	1		1						
<b>CO4</b>		1				1	2	3				
<b>CO5</b>		3	1	2	1	1						

**COURSE: COMPUTER GRAPHICS AND MULTIMEDIA APPLICATION LAB**

**CODE: CA312**

**COURSE CREDIT: 2**

**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 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*

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

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	1	2	3		1	1	1					
<b>CO2</b>	2	1	3			1	1					
<b>CO3</b>	1	2	3	2	1	1						
<b>CO4</b>	2	1	3	1		1	1					
<b>CO5</b>	2	1	2	1	1	1						

**COURSE: FULL STACK WEB DEVELOPMENT-II LAB****CODE: CA329****COURSE CREDIT: 2****COURSE OBJECTIVES:**

- To learn and apply the features of NoSQL database MongoDB.
- To learn and build an express application using NodeJS.
- To learn and develop web applications using NodeJS.
- To learn and build web applications using general-purpose document database.
- To learn and create web-based projects using NodeJS, Bootstrap and MongoDB..

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Able to create web application using NoSQL database MongoDB
<b>CO2</b>	Able to create express application using Express JS and NodeJS.
<b>CO3</b>	Able to create server-side application using NodeJS framework
<b>CO4</b>	Able to develop web application using NodeJS and MongoDB
<b>CO5</b>	Able to create web-based projects using NodeJS, Bootstrap and MongoDB

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	1	1	2									
<b>CO2</b>	1		3	1	1	2						
<b>CO3</b>	2	2	3	1		1	1					
<b>CO4</b>	1	1	3		1	2	1					
<b>CO5</b>	1	2	3	1		1	2					

**COURSE: MOBILE APPLICATION DEVELOPMENT LAB****CODE: CA330****COURSE CREDIT: 1****COURSE OBJECTIVES:**

- To incorporate widgets and state into your app.
- To use Flutter's tools to enhance your development process.
- To customize your app with Material Design, themes, assets, and more.
- To make your app interactive with text input, gestures, and more.
- To retrieve local and real-time data from the web.

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Understand principles and best practices of mobile application development using flutter framework
<b>CO2</b>	Develop cross-platform (iOS and Android) mobile application development using the Flutter framework
<b>CO3</b>	Explore concepts such as stateful and stateless widgets; material design; themes; assets; text input; gestures; retrieving local and real-time data
<b>CO4</b>	Employ best practices for developing mobile applications
<b>CO5</b>	Develop multimedia applications in Android

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	1		1		2						
<b>CO2</b>	2	1	3		1	1	1					
<b>CO3</b>	2		3	1	2	1						
<b>CO4</b>	1	1	2	2	1		1					
<b>CO5</b>	1	2	2	2		1	1					

**Integral University, Lucknow**  
**Department of Computer Application**  
**STUDY & EVALUATION SCHEME**  
**Choice Based Credit System**  
**Bachelor of Computer Application (BCA)**

**Year III<sup>rd</sup>, Semester VI<sup>th</sup>**

S. No.	Course Category	Subject Code	Name of the Subject	Periods				Evaluation Scheme				Subject Total
								Sessional (CA)			End Sem. Exam	
				L	T	P	C	CT	TA	Total	ESE	
1.	Core	CG302	Career Development Course	3	1	0	0	40	20	60	40	100
2.	Core	CA314	Introduction to Open Source Environment	3	1	0	4	40	20	60	40	100
3.	Core	CA331	Fundamentals of Machine Learning with Python	3	1	0	4	40	20	60	40	100
4.	Core	CA332	Fundamentals of Artificial Intelligence	3	1	0	4	40	20	60	40	100
5.	Elective - III	CA316	Management Information System	3	1	0	4	40	20	60	40	100
		CA317	E-Governance									
		CA318	Fundamentals of E-Commerce									
		CA319	ERP Systems									
		CA333	Basics of Cloud Computing									
		CA334	Data Mining									
6.	Core	CA321	Project Lab	0	0	3	3	40	20	60	40	100
7.	Core	CA323	Open-Source Lab	0	0	1	1	40	20	60	40	100
8.	Core	CA335	Fundamentals of Machine Learning with Python Lab	0	0	1	1	40	20	60	40	100
<b>Total</b>				<b>15</b>	<b>5</b>	<b>5</b>	<b>20</b>	<b>320</b>	<b>160</b>	<b>480</b>	<b>320</b>	<b>700</b>



**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 - V**

CA316 Management Information System

CA317 E-Governance

CA318 Fundamentals of E-Commerce

CA319 ERP Systems

CA320 AI and Expert Systems

**COURSE: CAREER DEVELOPMENT COURSE**

**CODE: CG302**

**COURSE CREDIT: 0**

**COURSE OBJECTIVES:**

The course on soft skills aims at preparing young minds into professionals of tomorrow and to make them aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Identify strategies to improve interpersonal relationships
<b>CO2</b>	Job Application Resume writing
<b>CO3</b>	Learn about positive Body language
<b>CO4</b>	Students will be better prepared for before, during and after the Interview.
<b>CO5</b>	Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	1	1	1	1	1	1	2	3				
<b>CO2</b>	1	1	1	1	1	1	2	3				
<b>CO3</b>	1	1	1	1	1	1	2	3				
<b>CO4</b>	1	1	1	1	1	1	2	3				
<b>CO5</b>	1	1	1	1	1	1	2	3				

**COURSE: INTRODUCTION TO OPEN-SOURCE ENVIRONMENT**

**CODE: CA314**

**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- To learn basic concepts, syntax and uses of PHP as server-side scripting language.
- To learn and implement PHP script and Arrays.
- To learn and implement decision making, looping and object-oriented features supported by PHP
- To learn various tools and implement forms in PHP
- To demonstrate the use of MySQL database in phpMyAdmin and build dynamic web site using server-side PHP Programming and MySQL

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Able to understand the basic concepts, syntax and uses of PHP as general purpose language.
<b>CO2</b>	Able to understand basic of PHP as scripting Language and implement Arrays in PHP.
<b>CO3</b>	Able to understand and implement decision making, looping and other object oriented features supported by PHP.
<b>CO4</b>	Students able to understand latest framework supported by PHP and implement forms using PHP.
<b>CO5</b>	Students able to develop a web application using PHP and MySQL as database.

**CO-PO MAPPING:**

<b>CO</b>	<b>PO</b>											
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3		1		1		1					
<b>CO2</b>	3	1	2	1		2	1					
<b>CO3</b>	2	1	2		1	2	1					
<b>CO4</b>	1	1	2	1		3	1	2				
<b>CO5</b>		1	3		1	2	2	3				

**COURSE: MANAGEMENT INFORMATION SYSTEM**

**CODE: CA316**

**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- To learn the basic knowledge and fundamentals of Information System and various types of Information System.
- To learn the concepts of Management Information System and Decision Support Systems.
- To learn the overall perspective of Planning and Control in an Organization.
- To learn how internet, E-Commerce and other technologies help in business processes.
- To learn the management of Information Technologies in organizations.
- To learn the role of various advance concepts in managing the business.

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Able to understand the basic concepts of Information Systems and applying the same to solve the business problems.
<b>CO2</b>	Able to develop the knowledge of Management Information system and how it differs from other Information systems.
<b>CO3</b>	Able to define Control and Planning process in an Organization with the characteristics and nature of control process.
<b>CO4</b>	Able to use various technologies like Internet, Intranet, Extranet and E-Commerce in business operations and for Managerial decision support.
<b>CO5</b>	Acquainted with the facing challenges in management and using various advance systems such as ERP,SCM,CRM etc.

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	2	1	1	1							
<b>CO2</b>	3	1	2			1	1					
<b>CO3</b>	2	2	1	1	1							
<b>CO4</b>		1	2		1	3	1					
<b>CO5</b>	1	2	2	1		1	1					

**COURSE: E-GOVERNANCE**  
**CODE: CA317**  
**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- To learn Concept of E-Governance and E-Kranti framework.
- To provide an idea of using various open-source software's and Framework for Adoption of Open Source Software in E-Governance Systems.
- To learn basic concept of Policy on Open Application Programming Interfaces (APIs) for Government of India and Email Policy of Government of India.
- To learn basics concept of Policy on Use of IT Resources of Government of India and Policy on Collaborative Application Development by Opening the Source Code of Government Applications.
- To learn basics concept of Application Development & Re-Engineering Guidelines for Cloud Ready Applications.

**COURSE OUTCOMES (CO):**

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

COURSE OUTCOME (CO)	DESCRIPTION
<b>CO1</b>	Able to understand basics of E-Governance and E-Kranti framework.
<b>CO2</b>	Able to understand various open-source software's and Framework for adoption of Open Source in E-Governance Systems.
<b>CO3</b>	To understand the basic concepts of Policy on Open Application Programming Interfaces (APIs) and for Government of India and Email Policy of Government of India
<b>CO4</b>	To understand the basics concept of Policy on Use of IT Resources of Government of India and Policy on Collaborative Application Development by Opening the Source Code of Government Applications.
<b>CO5</b>	Able to understand basics concept of Application Development & Re-Engineering Guidelines for Cloud Ready Applications.

**CO-PO MAPPING:**

PO CO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	1	1	1	1		1					
<b>CO2</b>	3	1	2	1		2	1					
<b>CO3</b>	1	1	2		2		1					
<b>CO4</b>	1	1	3		1	2	2					
<b>CO5</b>	2	1	2	1		1						

**COURSE: FUNDAMENTALS OF E-COMMERCE**

**COURSE CODE: CA318**

**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- To provide knowledge of e-commerce with its technology, benefits, limitations and impact on business.
- To enhance practical knowledge for different applications of e-commerce such as e-banking, e-learning and e-shopping etc.
- To give knowledge for architecture framework and security aspects in e-commerce.
- To offer knowledge of encryption techniques used in e-commerce.
- To construct the concept of process of electronic payment in e-commerce along with its risk.
- To give the implementation knowledge about Electronic Data Interchange with respect to architecture and standards.
- To provide the practical knowledge of security issues in Electronic Data Interchange.
- To develop business skill and techniques for digital marketing.

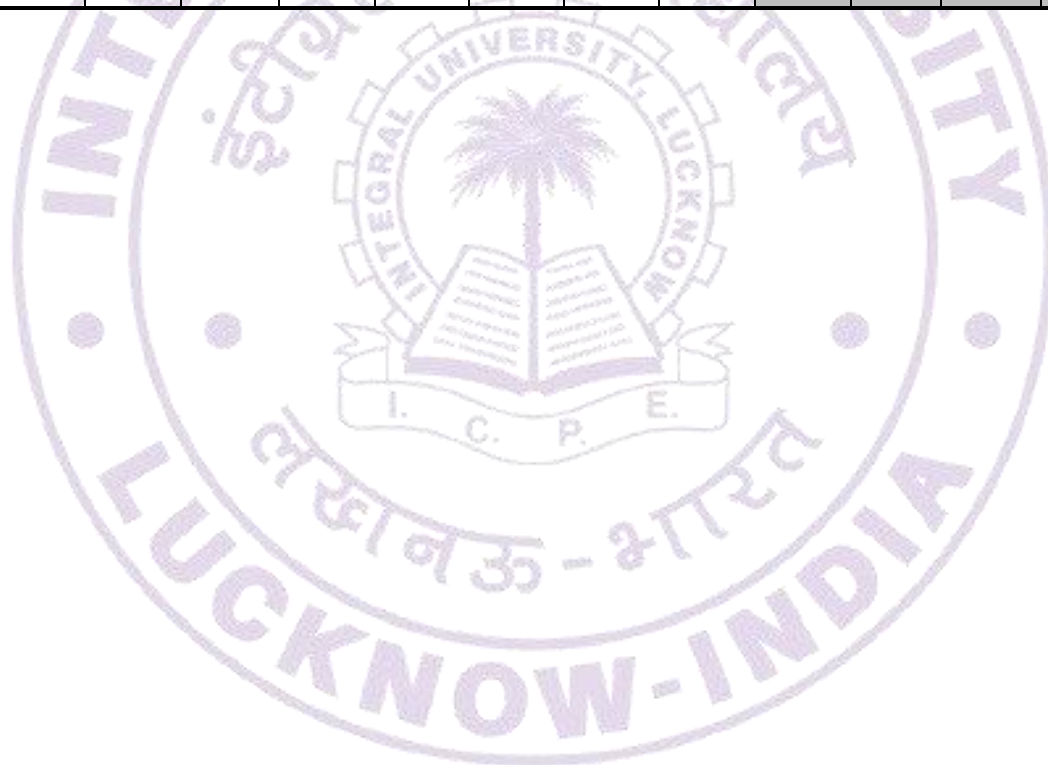
**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Gain knowledge of e-commerce with its technology, benefits, limitations, impact on business.
<b>CO2</b>	Understand practical knowledge of applications of e-commerce such as e-banking, e-learning and e-shopping etc.
<b>CO3</b>	Learn about the knowledge of architecture framework and security aspects in e-commerce
<b>CO4</b>	Apply knowledge of encryption techniques used in e-commerce.
<b>CO5</b>	Understand the concept of process of electronic payment in e-commerce along with its risk.
<b>CO6</b>	Implementation knowledge about Electronic Data Interchange with respect to architecture and standards.
<b>CO7</b>	Apply practical knowledge of security issues in Electronic Data Interchange.
<b>CO8</b>	Establish business skill and techniques for digital marketing.

**CO-PO MAPPING:**

PO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	1	1		1		1					
C02	2	1	1			3	1					
C03	2	2	1	1		2						
C04		1	2		1	3	1	1				
C05	3	1	2	1		1	1					
C06	1	1	3	1	2							
C07		1	2		1	3	1					
C08	1	2	2	1	2	1						



**COURSE: ERP SYSTEMS (ENTERPRISE RESOURCE PLANNING)**  
**CODE: CA319**  
**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- To learn the basic concepts of Enterprise Resource Planning.
- To learn different technologies used in ERP.
- To learn the concepts of ERP Manufacturing Perspective and ERP Modules.
- To study and understand the ERP life cycle.
- To learn the different tools used in ERP.

**COURSE OUTCOMES (CO):**

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

COURSE OUTCOME (CO)	DESCRIPTION
<b>CO1</b>	Able to understand the basic knowledge of Enterprise Resource Planning.
<b>CO2</b>	Abel to Identify different technologies used in Enterprise Resource Planning.
<b>CO3</b>	Abel to understand and apply the concepts of ERP Manufacturing Perspective and ERP Modules.
<b>CO4</b>	Discuss the benefits, Success and Failure Factors of an ERP Implementation.
<b>CO5</b>	Abel to understand and implement the ERP life Cycle. Apply different tools and Software used in ERP.

**CO-PO MAPPING:**

PO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3		1		1							
<b>CO2</b>	2	3	1	2		1		1				
<b>CO3</b>	2	1	2	1		2	1					
<b>CO4</b>	1	1	2		1		1					
<b>CO5</b>	2	1	3	1		2	2	1				



**COURSE: FUNDAMENTALS OF MACHINE LEARNING WITH PYTHON**  
**CODE: CA331**  
**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- Primarily know the basic structure of python programming language.
- Learn and implement Machine learning based libraries with python.
- Understand the concept of Machine learning and its types.
- Implement the basic concepts of various algorithms of Machine learning.

**COURSE OUTCOMES (CO):**

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

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learn the basic concept of Machine learning and types of Machine learning
CO2	Learn the concept and implementation of Supervised learning and Unsupervised learning.
CO3	Understand the concept of Bayesian Learning and learn basic concept of python programming
CO4	Learn to write the programs on control and looping structure and implement data structure.
CO5	Learn python function declaration and implement the various machine learning based libraries used by Python

**CO-PO MAPPING:**

PO	PO											
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3	1		1		2				
CO2	1		2	1		1		1				
CO3	2	1	2	1		1		1				
CO4	1	1	1					1				
CO5	1	1	2			1		2				

**COURSE: FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE**

**CODE: CA332**

**COURSE CREDIT: 4**

**COURSE OBJECTIVES:**

- Understand the concepts of AI, production system and its characteristics.
- Understand the concepts of searching techniques.
- To develop the logical skills of knowledge and its representational structure.
- Understand the concepts of natural language processing.
- Learn the concepts how to design the expert systems

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Study the concepts of AI, production system and its characteristics.
<b>CO2</b>	Develop the searching techniques in AI.
<b>CO3</b>	Develop the knowledge skills and its representational structure in AI
<b>CO4</b>	Study the concepts of natural language processing in AI.
<b>CO5</b>	Study how design the expert systems.

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	2	3	2	2	1		1					
<b>CO2</b>	1	2	3	1	1		2					
<b>CO3</b>	1	1		1		1	1					
<b>CO4</b>	2	1	1	1		1	1					
<b>CO5</b>	1	1	3	2		2	1					

## COURSE: BASICS OF CLOUD COMPUTING

CODE: CA333

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:

CO	PO											
	PO1	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: DATA MINING****CODE: CA334****COURSE CREDIT: 4****COURSE OBJECTIVES:**

- Explain Objective of Data Mining, Issues. Matrices, applications and trends
- Describe Statistical approach, similarity measures, decision trees, NN, genetic algorithms.
- Classification of Statistical, Distance, and Decision based algorithms.
- To understand different types of data mining algorithms.
- Detail Description of Association based rules and their comparison.

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	To understand basics of Data mining concepts and their applications with trends.
<b>CO2</b>	To understand importance of decision tree, Neural Network and Genetics algorithm.
<b>CO3</b>	To learn classification-based algorithm and their implementations.
<b>CO4</b>	To Learn various Data mining Techniques algorithms.
<b>CO5</b>	Describe Data Mining Association rules measurements and quality of rules.

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	1	1	3				2					
<b>CO2</b>	3	1	1			1						
<b>CO3</b>	2	2	1	1		2						
<b>CO4</b>	1	1	3			1	2	2				
<b>CO5</b>		3	1	2	1	1						

**COURSE: PROJECT LAB****CODE: CA321****COURSE CREDIT: 3****COURSE OBJECTIVES:**

- To offer students a glimpse into real world problems, able to gather and document the requirement of real world.
- To developed a prototype so that student can overcome the gap of academic and industry.
- To enable students to create very precise specifications of the IT solution to be designed and able to implement solution using programming language.
- To create awareness among the students of the characteristics of several domain areas where IT can be effectively used.
- To improve the team building, communication and management skills of the students.

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Identify the problem related to the project work, analyze and Design project documentation.
<b>CO2</b>	Implement the solution for the chosen problem using the concepts and techniques in the curriculum
<b>CO3</b>	Gain practical insights of testing and coding and practical insights of selected technology.
<b>CO4</b>	Experience the actual work environment in an IT organization, Explore career opportunities in the IT sector.
<b>CO5</b>	Explore the maximum possible ways to create and handle the software project in different technology

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	1	3	2	2	1		1					
<b>CO2</b>	2	1	3	1		2	1					
<b>CO3</b>	3	1	1	2	1	1						
<b>CO4</b>	2	1	2	1		1	1					
<b>CO5</b>	3	1		1	1		2					

## COURSE: OPEN-SOURCE LAB

CODE: CA323

COURSE CREDIT: 1

### COURSE OBJECTIVES:

- The ability to demonstrate knowledge of computer science and its applications to enhance the understanding of software technologies.
- Ability to analyze and identify various business and technical problems to further solve problems with effective communication.
- Ability to adapt analytical, logical and managerial skills with the technical aspects in order to design and deploy reliable software programs and application for real world problems.
- Ability to investigate complex problems and provide computer-based solutions.
- Ability to understand and deliver ethical, social and cultural responsibilities in professional environment as an individual and team.
- Ability to adapt new technologies for upgrading their skills and contributing to a lifelong learning.
- Ability to create and manage multidisciplinary projects and successfully apply software and project management principles.

### COURSE OUTCOMES (CO):

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

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand, analyze and apply the role of languages like HTML, DHTML, CSS, JavaScript and PHP.
CO2	Analyze a web page and identify its elements and attributes.
CO3	Create web pages using HTML, DHTML and Cascading Style Sheets.
CO4	Create dynamic web pages using JavaScript, XML.
CO5	Build web applications using PHP.

### CO-PO MAPPING:

PO CO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		1		1		1					
CO2	3	1	2	1		2	1					
CO3	2	1	2		1	2	1					
CO4	1	1	2	1		3	1	2				
CO5		1	3		1	2	2	3				

**COURSE: FUNDAMENTALS OF MACHINE LEARNING AND  
PYTHON LAB**

**CODE: CA335**

**COURSE CREDIT: 1**

**COURSE OBJECTIVES:**

- Primarily know the basic structure of python programming language.
- Learn and implement Machine learning based libraries with python.
- Understand the concept of Machine learning and its types.
- Implement the basic concepts of various algorithms of Machine learning.

**COURSE OUTCOMES (CO):**

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

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Student will able to write basic programming structure of Python using conditional statements.
<b>CO2</b>	Ability to write and implement programs on data structure of Python.
<b>CO3</b>	Explore and implement program on basic machine learning.
<b>CO4</b>	Understand and explore Machine learning algorithms.
<b>CO5</b>	Able to write the programs on Machine learning algorithms.

**CO-PO MAPPING:**

<b>PO</b>	<b>PO</b>											
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	1	1	3			1		1				
<b>CO2</b>	2	1	2	1		1		1				
<b>CO3</b>	1		2	1		1		2				
<b>CO4</b>	1		3	2		2		2				
<b>CO5</b>	2	1	3	1		1		2				