KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

COIMBATORE – 641 029

DEPARTMENT OF COMPUTER SCIENCE (UG)

CURRICULUM AND SCHEME OF EXAMINATIONS (CBCS)

(2024 - 2025 onwards)

KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

Coimbatore – 641029

Vision:

Developing the total personality of every student in a holistic way by adhering to the principles of Swami Vivekananda and Mahatma Gandhi.

Mission:

- Imparting holistic and man-making education with emphasis on character, culture and value - moral and ethical.
- Designing the curriculum and offering courses that transform its students into value added skilled human resources.
- Constantly updating academic and management practices towards total qualitymanagement and promotion of quality in all spheres.
- Extending the best student support services by making them comprehensive and byevolving a curriculum relevant to student community and society at large.
- Taking steps to make education affordable and accessible by extending scholarships to the meritorious and economically disadvantaged students.
- Motivating the teachers in such a way that they become the role models in promotingHigher Education.

DEPARTMENT OF COMPUTER SCIENCE

Vision:

To inculcate Human, Moral and ethical values in the young minds of the students and thereby improving the total personality of the students.

Mission:

To produce employable graduates to cater the needs of various industries.

PROGRAMME OUTCOMES (PO)

PO1	Understand the basic concepts, fundamental principles and scientific theories that are needed for higher learning and research.
PO2	Identify, formulate and analyze the complex situations to arrive acceptable solutions by applying domain specific knowledge, acquired through the programme.
PO3	Learn moral and ethical values and commit to professional ethics and responsibilities in the associated disciplines. Exercise social concern with the ability to act with awareness of issues in diversified domains to participate in the national development.
PO4	Ability to design, implement and evaluate a computational system to meet the desired needs within realistic constraints.
PO5	Realize the need for self and life-long learning to move along with the scientific and technological developments.
PO6	Ability to communicate and engage effectively with diverse stakeholders.
PO7	Analyze the impacts of computing on individuals, organizations and society
PO8	Acquire skills of observing and drawing logical inferences from the scientific facts.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1	Impart the core knowledge in the areas such as Software Engineering, Data Communication, Networking and Security, Database Management, Web Technology, Operating System, Artificial Intelligence and other emerging areas in Computer Science.
PSO2	Provide well trained professionals to industries by enhancing the programming skills and new computing technologies through theoretical and practical knowledge.
PSO3	Train to solve real world problems by selecting appropriate techniques and best logic.
PSO4	Enhance the ability to design and develop software applications, to understand the basic concepts of hardware and to comprehend and apply mathematical and accounting principles
PSO5	Make use of Computer Science techniques to one's own work as a member or a leader in a team to arrive conclusions and carryout projects.

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

COIMBATORE – 641 029

Course Name: B.Sc COMPUTER SCIENCE (UA)

Curriculum and Scheme of Examination under CBCS

(Applicable to the students admitted during the Academic Year 2024-2025)

Semester	Part	Subject Code	Title of the Paper	Instruction hours/cycle	Exam. Marks			Duration of Exam (hours)	Credits
					CIA	ESE	TOTAL		
I	I	24TML101	Language I@	6	25	75	100	3	3
	II	24ENG101	English - I	6	25	75	100	3	3
	III	24USC101	Core Paper 1 - C Programming	5	25	75	100	3	5
	III	24USC1CL	Core Practical 1 - C Programming Lab	5	40	60	100	3	4
	III	24USC1A1	Allied Paper 1 - Discrete Mathematics and Statistics	6	25	75	100	3	5
	IV	24EVS101	Environmental Studies **	2	-	50	50	3	2
			Total	**30**	**-**	**-**	**550**	**-**	**22**
II	I	24TML202	Language II@	6	25	75	100	3	3
	II	24ENG202	English – II	6	25	75	100	3	3
	III	24USC202	Core Paper 2 - Data Structures using C++	5	25	75	100	3	5
	III	24USC2CM	Core Practical 2 - Data Structures using C++ Lab	5	40	60	100	3	4
	III	24USC2A2	Allied Paper 2 - Operations Research	6	25	75	100	3	5
	IV	24VED201	Value Education - Moral and Ethics**	2	-	50	50	3	2
			Total	**30**	**-**	**-**	**550**	**-**	**22**
III	I	24TML303	Language III@	6	25	75	100	3	3
	II	24ENG303	English – III	6	25	75	100	3	3
	III	24USC303	Core Paper 3 - Java Programming	4	25	75	100	3	5
	III	24USC3CN	Core Practical 3 - Java Programming Lab	4	40	60	100	3	2
	III	24USC3A3	Allied Paper 3 - Business Accounting	6	25	75	100	3	5
	IV	24UGC3S1	Skill Based Subject 1 - Cyber Security	2	100	-	100	3	3
	IV	24TBT301/ 24TAT301/ 24UHR3N1	Basic Tamil*/ Advanced Tamil**/ Non-major elective- I**	2	-	75	75	3	2
			Total	**30**	**-**	**-**	**675**	**-**	**23**
IV	I	24TML404	Language IV@	6	25	75	100	3	3
	II	24ENG404	English –IV	6	25	75	100	3	3
	III	24USC404	Core Paper 4 - .Net Framework	4	25	75	100	3	4
	III	24USC4CO	Core Practical 4 - .Net Lab	5	40	60	100	3	4
	III	24USC4A4	Allied Paper 4 - Digital Principles and Computer System Architecture	5	25	75	100	3	5
	IV	24USC4SL	Skill Based Subject 2 - Mobile Application Development Lab	2	40	60	100	3	3
	IV	24TBT402/ 24TAT402/ 24USG4N2	Basic Tamil* / Advanced Tamil**/ Non-major elective- II**	2	-	75	75	3	2
			Total	**30**	**-**	**-**	**675**	**-**	**24**
V	III	24USC505	Core Paper 5 - Software Engineering and Testing	6	25	75	100	3	4
	III	24USC506	Core Paper 6 - Operating Systems	6	25	75	100	3	4
	III	24USC507	Core Paper 7 - Database Management System	5	25	75	100	3	4
	III	24USC5CP	Core Practical 5 - Database Management System Lab	6	40	60	100	3	2
	III	24USC5E1	Major Elective Paper - 1	5	25	75	100	3	5
	IV	-	**EDC**	2	100	-	100	3	3
	-	**24USC5IT**	**Internship Training ******	Grade					
			Total	**30**	**-**	**-**	**600**	**-**	**22**
VI	III	24USC608	Core Paper 8 - Computer Networks	4	25	75	100	3	3
	III	24USC609	Core Paper 9 - Python Programming and IoT	5	25	75	100	3	3
	III	24USC610	CorePaper10 – Artificial Intelligence and Machine Learning	5	25	75	100	3	4
	III	24USC6CQ	Core Practical 6 – Python Programming and IoT Lab	5	40	60	100	3	3
	III	24USC6E2	Major Elective Paper - 2	5	25	75	100	3	5

	III	24USC6Z1	Project and Viva-voce ***	4	20	80	100	3	5
	IV	24UB16S3	Skill Based Subject 3 – Basics of IPR	2	40	60	100	2	3
			Total	**30**	**-**	**-**	**700**	**-**	**26**
	V	23NCC **$**/NSS/YRC /PYE/ECC/RRC/ WEC101#	Cocurricular Activities*	-	50	-	50	-	1
			Grand Total	**-**	**-**	**-**	**3800**	**-**	**140**

Note:

CBCS – Choice Based Credit system, CIA– Continuous Internal Assessment, ESE– End of Semester Examinations

$ For those students who opt NCC under Cocurricular activities will be studying the prescribed syllabi of the UGC which will include Theory, Practical & Camp components. Such students who qualify the prescribed requirements will earn an additional 24 credits.

@ Hindi/Malayalam/ French/ Sanskrit – 24HIN/MLM/FRN/SAN101 - 404

***** - No End-of-Semester Examinations. Only Continuous Internal Assessment (CIA)

******- No Continuous Internal Assessment (CIA). Only End-of-Semester Examinations (ESE)

*** Project Report – 60 marks; Viva voce – 20 marks; Internal-20 marks

**** The students shall undergo Internship training / field work for a minimum period of 14 working days at the end of the fourth semester during summer vacation and submit the report in the fifth semester which will be evaluated for 100 marks by the concerned guide and followed by an Internal Viva voce by the respective faculty or HOD as decided by the department. According to their marks, the grades will be awarded as given below.

Marks %	Grade
85 – 100	O
70 – 84	D
60 – 69	A
50 – 59	B
40 – 49	C
< 40	U (Reappear)

Major Elective Papers (2 papers are to be chosen from the following 6 papers)

1. Data Mining and Warehousing
2. Network Security
3. Advanced Robotics and its Applications
4. Introduction to Data Science
5. Cloud Computing
6. Computing Intelligence

Non-Major Elective Papers

1. Human Rights
2. SOGIESC Studies
3. Consumer Affairs

Sub. Code & Title of the Extra Departmental Course (EDC):

24USC5XL – WEB DEVELOPMENT LABORATORY

 # List of Cocurricular Activities:

1. National Cadet Corps (NCC)
2. National Service Scheme (NSS)
3. Youth Red Cross (YRC)
4. Physical Education (PYE)
5. Eco Club (ECC)
6. Red Ribbon Club (RRC)
7. Women Empowerment Cell (WEC)

Note: In core/ allied subjects, no. of papers both theory and practical are included wherever applicable. However, the total credits and marks for core/allied subjects remain the same as stated below.

Tally Table:

S.No.	Part	Subject	Marks	Credits
1.	I	Language – Tamil/Hindi/Malayalam/ French/ Sanskrit	400	12
2.	II	English	400	12
3.	III	Core – Theory/Practical	1600	60
	III	Allied	400	20
		Electives/Project	300	15
4.	IV	Basic Tamil / Advanced Tamil (OR) Non-major electives	150	4
		Skill Based subject	300	9
		EDC	100	3
		Environmental Studies	50	2
		Value Education	50	2
5.	V	Cocurricular Activities	50	1
		Total	**3800**	**140**

- 25 % CIA is applicable to all subjects except JOC, COP and SWAYAM courses which are considered as extra credit courses.
- 100 % CIA for Cyber Security and EDC paper.
- The students who complete any **MOOC on learning platforms like SWAYAM, NPTEL, Course era, IIT Bombay Spoken Tutorial etc.,** before the completion of the 5th semester and the course completion certificate should be submitted through the HOD to the Controller of Examinations. Extra credits will be given to the candidates who have successfully completed.
- An **Onsite Training** preferably relevant to the course may be undertaken as per the discretion of the HOD.
- Students who successfully complete **Naan Mudhalvan** courses in 3rd and 5th semester will be given 2 extra credits for each course. They are asked to submit the marks to Controller of Examinations through and undersigned by the HOD.

Semester	Naan Mudhalvan Course Title
III	Cloud Architecture
V	E-Commerce

Components of Continuous Internal Assessment

Components		**Marks**	**Total**
Theory			
CIA I	75	(75+75 = 150/10) 15	25
CIA II	75		
Assignment/Seminar		5	
Attendance		5	
Practical			
CIA Practical		25	40
Observation Notebook		10	
Attendance		5	
Project			
Review		15	20
Regularity		5	
Components		Marks	

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1-Remembering; **K2**-Understanding; **K3**-Applying; **K4**-Analyzing; **K5**-Evaluating

1. ESE Theory Examination:

(i) CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 10	A (Answer all)	10 x 1 = 10	MCQ	75
K1 – K5 Q11 to 15	B (Either or pattern)	5 x 5 = 25	Short Answers	
K2 – K5 Q16 to 20	C (Either or pattern)	5 x 8 = 40	Descriptive / Detailed	

2. ESE Practical Examination:

Knowledge Level	Section	Marks	Total
K3	Experiments	50	60
K4	Record Work	10	
K5			

3. ESE Project Viva Voce:

Knowledge Level	Section	Marks	Total
K3	Project Report	60	80
K4	Viva voce	20	

Semester – I

Sub. Code: 24USC101

Programme Code:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Core Paper 1 - C Programming**			
Batch **2024 - 2025**	Hours/Week **5**	Total Hours **75**	Credits **5**	Employability/ Skill Development

Course Objectives

1. To gain adequate knowledge on the need of programming languages and problem-solving techniques.
2. To develop an in-depth understanding of functional and logical concepts of C Programming.
3. To get exposure to problem-solving through C programming.

Course Outcomes (CO)		
K1 to K5	CO1	Remember various programming constructs and to develop C programs.
	CO2	Understand the fundamentals of C programming.
	CO3	Apply the right data representation formats based on the requirements of the problem.
	CO4	Analyze the different Operations on arrays, functions, pointers, structures, Unions and files.
	CO5	Evaluate the concepts learnt through implementing and testing of the Programs that are developed.

Syllabus

UNIT I	**(15 Hours)**

C Language with Ancient IKS - Introduction to C – Overview of Compilers and Interpreters – Structure of C Program - Programming Rules - Character Set – Keywords – Variables – Data types – Type Conversion – Constant and Volatile Variables. Operators and Expressions: Priority of operators – Arithmetic, Relational, Logical, Assignment, Increment / Decrement, Conditional, Bitwise and Special Operators. I/O in C: Formatted, Unformatted, Library Functions.

UNIT II	**(15 Hours)**

Decision Statements: if, if / else, switch, break, continue, goto. Loop Control Statements: Introduction – for, nested for loops - while, do - while statements.

UNIT III	**(15 Hours)**

Arrays: Introduction – Definition –1D, 2D, 3D or Multi-Dimensional Arrays – Strings: Standard Functions – Application of Strings. Pointers: Features – Declaration – Pointer and Arrays – Array of Pointers – Pointers to Pointers – Pointers and Strings –Void Pointers.

UNIT IV	**(15 Hours)**

Functions: Definition- Declaration – Types of Functions – Call by Value – Call by reference – Recursion-Pointer to Function. **Storage Class: Automatic, External, Static, Register variables*.** Structure and Union: Introduction – Declaration and initialization – **Union***

UNIT V	**(15 Hours)**

Files: Streams and File Types - Steps for File Operations – File I/O – Other File Function – Command Line Arguments – Application of Command Line Arguments. Programming embedded systems in C: Introduction - What is an embedded system? - Which programming language should you use? – Which operating system should you use? – How do you develop Embedded software?

*Self-study and questions for examinations maybe taken from the self – study portions also.
Teaching Methods:
Chalk and Talk / Smart Class Room / Powerpoint presentation / Seminar / Quiz / Discussion / Flipped Class / peer Learning / Experiential Learning / Blended Learning.
Text Book:
1. Ashok N Kamthane (2002), "**Programming with ANSI and Turbo C"**, 1st Edition, Pearson Education Publications.
Reference Books:
1. E. Balagurusamy(1998), "Programming in ANSI C", TMH publications. 2. Henry Mullish & Herbert L Cooper (1996), "The Spirit of C", Jaico Publication House.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	H
CO4	S	S	H	H	H
CO5	S	S	S	H	H

S – Strong **H** – High **M** – Medium **L** – Low

Sub. Code: 24USC1CL

Programme Code:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Core Practical 1 – C Programming Lab**			
Batch **2024 - 2025**	Hours/Week **5**	Total Hours **75**	Credits **4**	Employability/ Skill Development

Course Objectives

1. To understand the field of programming using C language.
2. To familiarize the fundamental syntax and semantics of C language.
3. To enhance the analyzing and problem-solving skills and use the same for writing programs in C.

Course Outcomes (CO)		
K1 to K5	CO1	Develop programming skills using the fundamentals and basics of C Language.
	CO2	Develop programs using the basic elements like control statements, Arrays and Strings.
	CO3	Enable effective usage of arrays, structures, functions and pointers.
	CO4	Implement files and command line arguments.
	CO5	Evaluate the ideas and concepts using testing of the programs.

LIST OF PRACTICAL PROBLEMS

1. Write a program to find the sum and average for a given set of numbers.
2. Write a program to generate 'n' prime numbers.
3. Write a program to find the biggest number among a set of numbers.
4. Write a Program to Arrange Numbers in Ascending Order.
5. Write a Program to find the largest number in the array.
6. Write a Program to Multiplication of two numbers using function (Return with arguments)
7. Write a Recursive function to calculate factorial value.
8. Write a program to find the number of palindromes in a given sentence.
9. Write a function to perform
   i. String Copy
   ii. String Concatenation
   iii. String Reverse.

10. Write a Program to access members of a structure using pointers, we use the -> operator.
11. Write a Program access the union members by using the (.) dot operator.
12. Write a generalized program to perform Matrix Addition.
13. Write a program to print the student's mark sheet assuming roll no, name, marks in 5 subjects in a structure. Create an array of structures and print the marksheet in the university pattern.
14. Write a program to display the content of an array using pointers.
15. Write a program which takes a file as command line argument and copy it to another file.

Guide lines to the distribution of marks for Practical Examinations:

CIA: Total marks – 40 [Practical – 25, Observation - 10, Attendance – 5]

ESE: Two Questions will be given for each student. (3 Hours/60marks)

Record:10Marks

Particulars	Program1 (Marks)	Program2 (Marks)
Algorithm	5	5
Program Coding	15	15
Result	5	5

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	H
CO4	S	S	H	H	H
CO5	S	S	H	H	S

S – Strong **H** – High **M** – Medium **L** – Low

Semester – II

Sub. Code: 24USC202

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Core Paper 2 - Data Structures using C++**			
Batch	Hours/Week	Total Hours	Credits	Employability/ Skill Development
2024-2025	**5**	**75**	**5**	

Course Objectives

1. To impart the basic concepts of data structures and algorithms.
2. To acquaint the student with the basics of the various data structures and make the students knowledgeable in the area of data structures.
3. This course also gives insight into the various algorithm design techniques.

Course Outcomes (CO)		
K1 to K5	CO1	To introduce the concepts of Data structures and to understand simple linear data structures.
	CO2	Learn the basics of stack data structure, its implementation and application.
	CO3	Use the appropriate data structure in context of solution of given problem and demonstrate a familiarity with major data structures.
	CO4	To introduce the basic concepts of algorithms.
	CO5	To give clear idea on algorithmic design paradigms like Dynamic Programming, Back tracking, Branch and Bound.

Syllabus

UNIT I **(15 Hours)**

Beginning with C++: What is C++? – Applications of C++-Structure of C++Program. Tokens, Expressions and Control structures: Token – Keywords –Identifiers and constants –Basic datatypes– User defined datatypes–Derived datatypes– Operators in C++-Scope resolution operator–Operator overloading–Operator precedence– Control structures.

UNIT II **(15 Hours)**

Functions in C++: The Main function – Function Prototyping – Call by Reference – Call by value – Inline functions – Function overloading – Friend and virtual functions. Classes and Objects: Specifying a class – Defining member functions - Array of object – Friendly function. Constructor and Destructor:Constructors–Copy constructor–Dynamic constructor– Destructor.

UNIT III **(15 Hours)**

Operator overloading and type Conversions: Defining operator overloading – Overloading Unary operator - Overloading Binary operators – Type Conversion. Inheritance: Defining derived classes– Single inheritance–Multilevel inheritance–Multiple inheritance–Hierarchical inheritance–Hybrid inheritance. Pointers: Pointers to objects–this pointer-pointer to derived classes–virtual functions.

UNIT IV **(15 Hours)**

Introduction and Overview: Data structures–Data structure Operations. Arrays, Records and Pointers: Linear arrays–Traversing Linear arrays–Inserting and deleting. Linked list: Linked list– Representation of linked list in memory–Traversing linked list–Searching a linked list –Inserting into a linked list– Deletion from a linked list.

UNIT V **(15 Hours)**

Stacks, Queues, Recursion: Stacks – Array representation of stacks – linked representation of stacks – Recursion. Queues: Linked representation of Queues – Deques – Priority queues. Sorting: Insertion sort–Merge sort –Selection sort – Radix sort.

*Self-study and questions for examinations maybe taken from the self-study portions also.

Teaching Methods:

ChalkandTalk/PowerPointpresentation/Seminar/Brainstorming/Assignment/GoogleClassroom/ Quiz/ Discussion.

Text Book:

1. E. Balagurusamy, "Object Oriented Programming with C++", 3rd Edition, TataMcGraw Hill publishing Company Ltd,2007.
2. Seymour Lipschutz, G.A. Vijayalakshmi Pai, "Data Structures", Tata McGraw Hill Publishing Company Limited, 2006.

E–References:

1.Web resources from NDLI Library, E-content from open source libraries.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	H
CO2	S	H	S	M	S
CO3	S	H	M	H	H
CO4	S	S	S	S	S
CO5	S	S	S	H	H

S–Strong **H** –High **M**–Medium **L**–Low

Sub. Code: 24USC2CM

Programme Code: **09**	**B.Sc. Computer Science**			
Title of the Paper:	**Core Practical 2- Data Structures using C++ Lab**			
Batch	Hours/Week	Total Hours	Credits	Employability/Skill Development
2024-2025	**5**	**75**	**4**	

Course Objectives

1. To learn the basic concepts of Data Structures.
2. To learn about the concepts of Searching and Sorting.
3. To study about the linear and non-linear Data Structures.
4. To study about the linear and non-linear Data Structures.
5. To learn about the concepts of ADT including List, stack and Queues.

Course Outcomes (CO)		
K1 to K5	CO1	Analyze the algorithm's/program's efficiency in terms of time andspace complexity.
	CO2	Solve the given problem by identifying the appropriate Data Structure.
	CO3	Solve problems in linear and non-linear Data Structures.
	CO4	Develop programs using various searching methods.
	CO5	Solve the problems using Linked List.

LIST OF PRACTICAL PROBLEMS

1. Write a C++ Program to array representation.
2. Write a C++ Program to implement stack and perform push& pop operation.
3. Write a C++ Program to implement queue to insert & delete item.
4. Write a C++ Program to create singly linked list.
5. Write a C++ Program to create doubly linked list.
6. Write a C++ Program to perform circular queue.
7. Write a C++ Program to perform insertion sort.
8. Write a C++ Program to perform merge sort.
9. Write a C++ Program to perform radix sort.
10. Write a C++ Program to perform selection sort.

Teaching Methods:

Program Demonstration and Hands on training using LCD Projector.

Guide lines to the distribution of marks for Practical Examinations:

CIA: Total marks – 40 [Practical – 25, Observation 10, Attendance–5].

ESE: Two Questions will be given for each student. (3 Hours/60marks)

Record:10 Marks

Particulars	**Program1 (Marks)**	**Program2 (Marks)**
Algorithm	5	5
Program Coding	15	15
Result	5	5

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	S	H
CO2	M	S	H	S	S
CO3	H	S	H	H	H
CO4	H	S	H	S	H
CO5	L	H	S	S	S

S–Strong **H** –High **M**–Medium **L**–Low

Semester – III

Sub.Code: 24USC303

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Core Paper 3 - Java Programming**			
Batch **2024-2025**	Hours/Week **4**	Total Hours **60**	Credits **5**	Employability/ Skill Development

Course Objectives

1. To gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
2. To understand the fundamentals of object-oriented programming in Java, including managing classes, objects, invoking methods and exception handling mechanisms.
3. To know the concepts of inheritance, packages, interfaces and multithreading areintroduced.

Course Outcomes (CO)		
K1 to K5	CO1	Remember the fundamentals of programming such as variables, conditional statements and iterative execution statements.
	CO2	Understand the concepts of arrays, strings, packages and multithreading.
	CO3	Apply the concepts of applet programming, graphics programming and files.
	CO4	Analyze a software application using the Java programming language
	CO5	Evaluate the concepts learnt through implementing and testing of the programs that are developed.

Syllabus	
UNIT I	**(12 Hours)**
Java Language with Ancient IKS - JAVA Evolution: History–Features–How Java differs from C and C++ - Java and Internet- Java and WWW–Web Browsers. Overview of Java Language: Introduction–Simple Java program– Structure– Java Tokens –Statements-Java virtual Machine.	
UNIT II	**(12 Hours)**
Constants-variables–Datatypes–Operators and Expressions. Decision Making and Branching: If, If-else, elseif ladder, Switch, Conditional operator Decision Making and Looping: While, do, for–jumps in loops-labeled loops. Classes, Objects and Methods.	
UNIT III	**(12 Hours)**
Arrays, Strings and Vectors - Interfaces: Multiple Inheritance- Packages: Putting classes together *–Multi Threaded Programming.	
UNIT IV	**(12 Hours)**
Managing Errors and Exceptions–Applet programming–Graphics programming*.	
UNIT V	**(12 Hours)**
Files: Introduction–concept of streams–Stream classes–Using streams–I/O Classes-File class–I/O Exceptions–creation of files-Reading/Writing characters/Bytes - Handling primitive datatypes–Random Access Files.	

*Self-study and questions for examinations may be taken from the self-study portions also.
Teaching Methods:
Chalk and Talk /Smart Class Room / Powerpoint presentation /Seminar/ Quiz/ Discussion/ Flipped Class / peer Learning/ Experiential Learning/Blended Learning.
Text Book:
1.E. Balagurusamy(2000), "Programming with Java – A Primer", TMH Publications,2nd Edition
Reference Books:
1. Patrick Naughton and Herbert Schildt (2000),"The Complete ReferenceJava2", 3rd Edition, TMH Publications. 2. C.Xavier (2000), "Programming with Java 2", Scitech Publications.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M
CO2	S	S	S	S	S
CO3	S	H	S	S	H
CO4	H	S	H	S	M
CO5	S	S	S	S	M

S–Strong **H**–High **M**–Medium **L** –Low

Sub.Code: 24USC3CN

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Core Practical 3 - Java Programming Lab**			
Batch **2024-2025**	Hours/Week **4**	Total Hours **60**	Credits **2**	Employability/ Skill Development

Course Objectives

1. To understand the object-oriented programming principles implemented through JAVA programs.
2. To know the event-driven programming methods, including creating and manipulatingobjects, classes, graphics concepts and applet programming.
3. To design, code, debug and implement JAVA programs.

Course Outcomes (CO)		
K1 to K5	CO1	Apply the fundamentals of Java programming language in software development.
	CO2	Examine the basics of Java programming, multi-threaded programs and Exception handling.
	CO3	Analyze and use Java in a variety of applications.
	CO4	Illustrate a software application using the Java programming language.
	CO5	Evaluate the ideas and concepts using testing of the programs.

LIST OF PRACTICAL PROBLEMS

1. Write a program, which creates and displays a message on the window.
2. Write a program to draw several shapes in the created window.
3. Write a program to create an applet and draw gridlines.
4. Write a java program to create a frame with two buttons called father and mother. When we click the father button the name of the father, his age and designation must appear. When we click mother similar details of mother appear.
5. Write a java program to create four text fields for the name, street, city and pin code with suitable labels. Also add a button called my details, when you click the button your name, street, city and pin code must appear in the text fields.
6. Write a Java program to create a frame with three text fields for name, age and qualification and a text field of multiple line for address.
7. Write a Java program to demonstrate multiple selection list box.
8. Write Java program to create a menu bar and pull-down menus.
9. Write a Java program to create a window when we press M or m the window displays Good Morning A or a the window displays Good Afternoon E or e the window displays Good Evening N or n the window displays Good Night.
10. Write a program to move different shapes (Circle, Ellipse, Square, Rectangle) according to the arrow key pressed.
11. Write a program to draw circle, ellipse, square, rectangle at the mouse click position.
12. Write a program to handle the divide by zero exception.
13. Write a program to create an exception called payout of bounds and throw the

exception.

14. Write a program to explain the multithreading with the use of multiplication tables. Three threads must be defined. and each one must create one multiplication table; they are 5 tables, 7 tables and 13 table.
15. Write a program to illustrate thread priority. Create three threads and assign three different priorities.

Teaching Methods:
Program Demonstration and Hands on training using LCD Projector.

Guide lines to the distribution of marks for Practical Examinations:

CIA: Total marks – 40 [Practical – 25, Observation-10, Attendance–5].

ESE: Two Questions will be given for each student. (3 Hours / 60 marks)

Record:10 Marks

Particulars	**Program1 (Marks)**	**Program2 (Marks)**
Algorithm	5	5
Program Coding	15	15
Result	5	5

Mapping

PSO / CO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	S	S	S	H	H
CO2	S	S	H	S	S
CO3	S	H	H	S	S
CO4	S	S	S	M	S
CO5	S	S	M	S	S

S–Strong **H** –High **M**–Medium **L**–Low

Semester – IV

Sub.Code:24USC404

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Core Paper 4 - .Net Framework**			
Batch	Hours/Week	Total Hours	Credits	Employability/ Skill Development
2024-2025	**4**	**60**	**4**	

Course Objectives

1. To develop ASP .NET Web application using standard controls.
2. To create rich database applications using ADO.NET.
3. To implement file handling operations.
4. To utilize ASP .NET security features for authenticating the website.
5. To handles SQL Server DatabaseusingADO.NET.

Course Outcomes (CO)		
K1 to K5	CO1	To identify and understand the goals and objectives of the .NET frame work and ASP .NET with C# language.
	CO2	To develop web application using various controls.
	CO3	To analyze C# programming techniques in developing web applications.
	CO4	To assess a Web application using Microsoft ADO .NET.
	CO5	To develop a software to solve real-world problems usingASP.NET.

Syllabus	
UNIT I	**(12 Hours)**
Overview of .NET framework: Common Language Runtime (CLR), Framework Class Library-C# Fundamentals: Primitive types and Variables– Operators- Conditional statements -Looping Statements–Creating and using Objects–Arrays–String operations.	
UNIT II	**(12 Hours)**
Introduction to ASP.NET-IDE-Languages supported Components-Working with Web Forms – Webform standard controls: Properties and its events–HTML controls-List Controls: Properties and its events.	
UNIT III	**(12 Hours)**
Rich Controls: Properties and its events – validation controls: Properties and its events–File Stream classes - File Modes – File Share – Reading and Writing to files – Creating, Moving, Copying andDeleting files – File uploading.	
UNIT IV	**(12 Hours)**
ADO .NET Overview – Database Connections – Commands – Data Reader – Data Adapter-Data Sets –Data Controls and its Properties-Data Binding.	
UNIT V	**(12 Hours)**
Grid View control: Deleting, editing, Sorting and Paging.XML classes–Web form to manipulate XML files - Website Security - Authentication - Authorization – Creating a Web application.	

*Self-study and questions for examinations may be taken from the self-study portions also.

Teaching Methods:

Chalk and Talk/ Smart Class Room/ Powerpoint presentation/ Seminar/ Quiz/ Discussion/

Flipped Class /peer Learning/Experiential Learning/Blended Learning.

Text Book:

1. Svetlin Nakov, Veselin Kolev& Co, Fundamentals of Computer Programming with C#, Faber publication, 2019.
2. Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill2015.

Reference Books:

1. Herbert Schildt, The Complete Reference C# .NET, Tata McGraw-Hill, 2017.
2. Kogent Learning Solutions, C#2012 Programming Covers .NET 4.5 Black Book, Dream tech pres,2013.
3. Anne Boehm, Joel Murach, Murach'sC#2015, Mike Murach & Associates Inc.2016.
4. Denielle Otey, Michael Otey, ADO .NET: The Complete reference, McGrawHill,2008.
5. Matthew MacDonald, BeginningASP.NET 4 in C# 2010, APRESS,2010.

E–References:

1.Web resources from NDL Library, E-content from open-source libraries.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	S	H
CO2	M	H	H	S	H
CO3	H	S	H	S	H
CO4	H	H	H	S	H
CO5	L	M	S	S	S

S–Strong **H** –High **M**–Medium **L**–Low

Sub.Code:24USC4CO

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Core Practical 4 - .Net Lab**			
Batch **2024-2025**	Hours/Week **5**	Total Hours **75**	Credits **4**	Employability/ Skill Development

Course Objectives

1. To develop ASP .NET Web application using standard controls.
2. To create rich database applications using ADO.NET.
3. To implement file handling operations.
4. To utilize ASP .NET security features for authenticating the website.
5. To handles SQL Server Database using ADO .NET.

Course Outcomes (CO)		
K1 to K5	CO1	To identify and understand the goals and objectives of the .NET framework and ASP .NET with C# language.
	CO2	To develop web application using various controls.
	CO3	To analyze C# programming techniques in developing web applications.
	CO4	To assess a Web application using Microsoft ADO .NET.
	CO5	To develop a software to solve real-world problems using ASP.NET.

LIST OF PRACTICAL PROBLEMS

1. Create an exposure of Web applications and tools
2. Implement the Html Controls
3. Implement the Server Controls
4. Web application using Web controls.
5. Web application using List controls.
6. Web Page design using Rich control. Validate user input using Validation controls. Working with File concepts.
7. Web application using Data Controls.
8. Data binding with Web controls
9. Data binding with Data Controls.
10. Database application to perform insert, update and delete operations.
11. Database application using Data Controls to perform insert, delete, edit, paging and sorting operation.
12. Implement the Xml classes.
13. Implement Authentication–Authorization.
14. Ticket reservation using ASP .NET controls.
15. Online examination using ASP .NET controls.

Teaching Methods:

Program Demonstration and Hands on training using LCD Projector.

Guidelines to the distribution of marks for Practical Examinations:

CIA: Total marks–40 [Practical –25, Observation-10, Attendance–5].

ESE: Two Questions will be given for each student. (3 Hours / 60 marks)

Record: 10 Marks

Particulars	Program1 (Marks)	Program2 (Marks)
Algorithm	5	5
Program Coding	15	15
Result	5	5

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	S	H
CO2	M	S	H	S	S
CO3	H	S	H	H	H
CO4	H	S	H	S	H
CO5	L	H	S	S	S

S–Strong **H** –High **M**–Medium **L**–Low

Semester – V

Sub.Code: 24USC505

Programme Code:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Core Paper 5 - Software Engineering and Testing**			
Batch	Hours/Week	Total Hours	Credits	Employability/ Skill Development
2024-2025	**6**	**90**	**4**	

Course Objectives

1. To understand the basic software engineering methods and practices.
2. To familiarize the techniques for developing software systems.
3. To enrich the knowledge about object-oriented design and software testing approaches.

Course Outcomes (CO)		
K1 to K5	CO1	Remember the basic concepts of software engineering
	CO2	Understand the software engineering models in developing software applications.
	CO3	Apply the object-oriented design in various projects
	CO4	Analyze the various software testing approaches
	CO5	Evaluate the Software testing Plan and Reporting.

Syllabus

UNIT I	**(18 Hours)**

Introduction–The Evolving Role of Software–Software–Software Myths–Software Engineering Technology – Software Process Models–Waterfall model - Incremental process model–Evolutionary process models.

UNIT II	**(18 Hours)**

Requirements Engineering: Requirements engineering tasks – Developing use cases– Negotiating requirements–Validating requirements. Building the Analysis model: Requirement Analysis–Data Modeling Concepts– Flow Oriented Modeling.

UNIT III	**(18 Hours)**

Design Engineering: Design Concepts– Design Model. Creating an Architectural Design: what Is software architecture-Mapping Data Flow into a Software Architecture Quality Management-Quality Concepts– Software Quality Assurance.

UNIT IV	**(18 Hours)**

Testing: Verification and Validation. Types of Testing: White Box Testing - Black Box Testing – Integration Testing and its Types – Scenario Testing – Functional Testing – Non-Functional Testing – Acceptance Testing.

UNIT V	**(18 Hours)**

Performance Testing: Introduction–Factors Governing Performance Testing–Methodology for Performance Testing. Regressing Testing: What is Regression Testing–Types of Regression Testing–Test Planning*, Execution and Reporting*.

*Self-study and questions for examinations may be taken from the self-study portions also.

Teaching Methods:

Chalk and Talk/ Smart Class Room/ Powerpoint presentation/ Seminar/ Quiz/ Discussion/ Flipped Class / peer Learning/ Experiential Learning/ Blended Learning.

Text Book:

1. Roger S Pressman (2010),"SoftwareEngineering",6thEdition,TMH Publishers [UnitI,II&III].
2. Srinivasan Desikan & Gopalswamy Ramesh (2006), "Software TestingPrinciples and Practices", Pearson Education. [Unit IV & V].

Reference Books:

1. Ian Somerville (2001), "SoftwareEngineering",6th Edition, Pearson Education Publication.
2. William E.Perry (2006),"Effective Methods for Software Testing", 3rd Edition,Wiley, India.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	H	S	M
CO2	H	S	S	S	S
CO3	S	H	H	S	S
CO4	S	S	S	M	S
CO5	S	S	H	S	H

S–Strong **H**–High **M**–Medium **L** –Low

Sub.Code: 24USC506

Programme Code: **09**	**B.Sc. Computer Science**			
Title of the Paper:	**Core Paper 6 - Operating Systems**			
Batch	Hours/Week	Total Hours	Credits	Employability/ Skill Development
2024-2025	**6**	**90**	**4**	

Course Objectives

1. To gain knowledge on the basic operating system concepts.
2. To attain an in-depth understanding of process concepts, deadlock and memory management.
3. To get an exposure to scheduling algorithms, devices and information management.

Course Outcomes (CO)		
K1 to K5	CO1	Remember the basic concepts of operating system.
	CO2	Understand the concepts like interrupts, deadlock, memory management andFile management.
	CO3	Apply the different algorithms used for representation, scheduling, allocation in DOS and UNIX operating system.
	CO4	Analyze the need for scheduling algorithms.
	CO5	Evaluate the storage management policies with respect to different storage Management techniques.

Syllabus

UNIT I **(18 Hours)**

Introduction and Definition of OS - Process Concept: Definition of Process – Process States – Process State Transition–Interrupt Processing–Interrupt Classes-Context Switching Deadlock: Introduction-Deadlock Prevention-Deadlock Avoidance–Deadlock Detection– Deadlock Recovery-Indefinite Postponement.

UNIT II **(18 Hours)**

Storage Management Real Storage: Real Storage Management Strategies–Contiguous Vs Non-Contiguous Storage Allocation – Single User Contiguous Storage Allocation – Fixed Partition Multiprogramming –Variable Partition Multiprogramming, Multiprogramming with Storage Swapping. Virtual Storage Organization: Evolution and Basic Concepts – Definition of Paging and Segmentation-Virtual Storage Management Strategies- Page Replacement Strategies– Locality.

UNIT III **(18 Hours)**

Processor Management Job and Processor Scheduling: Preemptive Vs Non-Preemptive Scheduling- Priorities– Deadline Scheduling- FIFO– RR– Quantum Size– SJF- SRT–HRN. Distributed Computing: Classification of Sequential and Parallel Processing–Array Processors – Dataflow Computers-Multiprocessing–Fault Tolerance.

UNIT IV **(18 Hours)**

Device and Information Management Disk Performance Optimization: Operation of Moving Head Disk Storage–Need for Disk Scheduling -Seek Optimization–FCFS–SSTF– SCAN –RAM Disks– Optical Disks. File and Database Systems: File System–Functions– Organization–Allocating and Freeing Space–File Descriptor– Access Control Matrix.

UNIT V	(18 Hours)
Case Studies: Linux: History of Linux–Overview of Linux: Linux Goals–Interfaces to Linux – The Shell – Linux Utility Programs – Kernel Structure – Processes: Fundamental Concepts - Memory Management: Fundamental Concepts- File System: Fundamental Concepts-Security: Fundamental Concepts. Windows Vista: History – System Structure: The Kernel Layer- Processes and Threads: Fundamental Concepts*-Caching in Windows Vista–Security: Fundamental Concepts*.	
*Self-studyand questions for examinations maybe taken from the self-study portions also.	
Teaching Methods:	
Chalk and Talk / Smart Class Room/ Powerpoint presentation/ Seminar/ Quiz/ Discussion /Flipped Class / peer Learning/ Experiential Learning/ Blended Learning.	
Text Book:	
1. H.M.Deitel (2003),**"Operating Systems",** Second Edition, Pearson Education Publ.(Unit I–Unit IV) 2. Andrew S. Tanenbaum (2006), "**Modern Operating System",** Third Edition Prentice Hall of India Pvt. Ltd., Delhi. (Unit V)	
Reference Books:	
1. Achyut S Godbole (2002), **"Operating Systems",** TMH Publications. 2. Abraham Silberschatz, Galvin, Gagne, (2004), **Operating Systems Concepts,** Sixth Edition,John Wiley & Sons.	

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	H
CO2	H	S	S	S	S
CO3	S	S	H	S	H
CO4	S	H	S	S	M
CO5	S	H	S	S	M

S–Strong **H**–High **M**–Medium **L** –Low

Sub.Code:24USC507

Programme Code:**09**	**B.Sc. Computer Science**			
Title of the Paper	**Core Paper 7- Database Management System**			
Batch	Hours/Week	Total Hours	Credits	Employability/ Skill Development
2024-2025	**5**	**75**	**4**	

Course Objectives

1. To understand the different issues involved in the design of a database system.
2. To know the essential DBMS concepts such as: database security, integrity and normalization.
3. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling and designing a DBMS.

Course Outcomes (CO)		
K1 to K5	CO1	Remembered an independence, data models for database systems, Database schema and database instances.
	CO2	Understand and use data manipulation language to query and manage a database.
	CO3	Analyze and design a real database application.
	CO4	Apply normalization concepts for designing a good database with integrity constraints.
	CO5	Evaluate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization.

Syllabus	
UNIT I	**(15 Hours)**
Introduction: Purpose of Database Systems - View of Data - Data Models – Database Languages - Transaction Management - Storage Management Database Administrator - Database Users– Overall System Structure. Entity Relationship Model: Basic concepts - Keys - Entity RelationshipDiagram, Weak Entity sets, Extended E-R Features: Specialization, generalization.	
UNIT II	**(15 Hours)**
Relational Model: Relational Algebra- Views. SQL: Background- Basic Structure-Set Operations- Aggregate Functions- Null values -Derived Relations-Views-Modification of the Database-Joined Relations-Data Definition Language.	
UNIT III	**(15 Hours)**
Integrity Constraints: Domain Constraints- Referential Integrity-Assertions-Triggers. Functional Dependencies– Relational Database Design: Pitfalls–Decomposition-Normalization using Functional Dependencies.	
UNIT IV	**(15 Hours)**
Object Oriented Databases: New Database Applications-Object Oriented Data Model-Object Oriented Languages -Persistent Programming Languages. Database System Architecture: Centralized Systems- Client/ Server Systems–Parallel Systems-Distributed Systems- Network Types.	
UNIT V	**(15 Hours)**
New Applications: Decision Support Systems- Data Analysis-Data Mining-Data Warehousing - Spatial and Geographic Databases – Multimedia Databases - Mobility andPersonalDatabases*-Information-RetrievalSystems-DistributedInformationSystems.	

*Self-study and questions for examinations may be taken from the self-study portions also.

Teaching Methods:

Chalk and Talk/ Smart Class Room / Powerpoint presentation/ Seminar/Brainstorming/ Assignment/ Google Classroom/ Quiz/ Discussion/ Flipped Class.

Text Book:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan (1997), "Database System Concepts", Third Edition, Tata McGraw Hill International Editions.

Reference Books:

1. Alexis Leonand Mathews Leon (1999)," Database Management Systems", VikasPublications.
2. Elmasri Navathe (2006), "Database Management Systems", Pearson Education Publications, Fourth Edition.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	H	S	H
CO2	H	S	S	M	S
CO3	S	H	S	S	S
CO4	S	S	M	H	S
CO5	S	H	S	S	S

S–Strong **H** –High **M**–Medium **L**–Low

Sub.Code: 24USC5CP

Programme Code: **09**	**B.Sc. Computer Science**			
Title of the Paper: **Core Practical 5 - Database Management System Lab**				
Batch **2024-2025**	Hours/Week **6**	Total Hours **90**	Credits **2**	Employability/ Skill Development

Course Objectives

1. To learn and understand DDL&DML
2. To learn and understand DCL.
3. To implement Basic SQLcommands.
4. To execute PL/SQLprograms.
5. To develop GUI applications in any platform.

Course Outcomes (CO)		
K1 to K5	CO1	Implement DDL and DML commands.
	CO2	Implement DCLcommands.
	CO3	Analyze PL/SQL programs
	CO4	Understand PL/SQL programs.
	CO5	Develop GUI applications in their known platform.

LIST OF PRACTICALPROBLEMS

1. Create Table using Data Definition Language (DDL).
2. ModifyTable using Data Manipulation Language (DML).
3. Store and Retrieve data through Data Control Language (DCL).
4. Implement Constraints and Built-in functions in various tables.
5. Perform Joins and Group-by functions.
6. Implement Simple Programs in PL/SQL.
7. Create PL/SQL programs using functions.
8. Create PL/SQL programs using Cursor.
9. Create PL/SQL programs using triggers.
10. Developing GUI applications.
    a. Student Information System.
    b. InventoryManagement.
    c. Payroll Processing

Teaching Methods:

Program Demonstration and Hands on training using LCD Projector.

Guidelines to the distribution of marks for Practical Examinations:

CIA: Total marks–40 [Practical – 25, Observation-10, Attendance–5].

ESE: Two Questions will be given for each student. (3 Hours / 60 marks)

Record:10 Marks

Particulars	**Program1 (Marks)**	**Program2 (Marks)**
Algorithm	5	5
Program Coding	15	15
Execution &viva voce	5	5

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	S	H
CO2	M	S	H	S	S
CO3	H	S	H	H	H
CO4	H	S	H	S	H
CO5	L	H	S	S	S

S–Strong **H** –High **M**–Medium **L**–Low

Semester – VI

Sub.Code: 24USC608

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Core Paper 8 - Computer Networks**			
Batch	Hours/Week	Total Hours	Credits	Employability/ Skill Development
2024-2025	**4**	**60**	**3**	

Course Objectives

1. To understand the concept of Data communication and Computer network.
2. To get acknowledge on routing algorithms.
3. To impart knowledge about networking and inter-networking devices.
4. To gain the knowledge on Security over Network communication.

Course Outcomes (CO)

K1 to K5	CO1	To Understand the basics of Computer Network architecture, OSI and TCP/IP Reference models.
	CO2	To gain knowledge on Telephone systems and Satellite communications.
	CO3	To impart the concept of Elementary data link protocols.
	CO4	To analyze the characteristics of Routing and Congestion control algorithms.
	CO5	To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS.

Syllabus

UNIT I	**(12 Hours)**
Introduction–Network Hardware–Software–Reference Models–OSI and TCP/IP Models –Example Networks: Internet, ATM, Ethernet and Wireless LANs – Physical Layer– Theoretical Basis for Data Communication-Guided Transmission Media.	
UNIT II	**(12 Hours)**
Wireless Transmission- Communication Satellites–Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues– Error Detection and Correction.	
UNIT III	**(12 Hours)**
Elementary Data Link Protocols- Sliding Window Protocols–Datalink Layer in the Internet-Medium Access Layer–Channel Allocation Problem–Multiple Access Protocols – Bluetooth.	
UNIT IV	**(12 Hours)**
Network Layer-Design Issues-Routing Algorithms- Congestion Control Algorithms–IP Protocol–IP Addresses–Internet Control Protocols.	
UNIT V	**(12 Hours)**
Transport Layer-Services-Connection Management-Addressing, Establishing and Releasing A Connection–Simple Transport Protocol–Internet Transport Protocols (ITP)-Network Security: Cryptography.	

*Self-study and questions for examinations may be taken from the self-study portions also.

Teaching Methods:

ChalkandTalk/Powerpointpresentation/Seminar/Brainstorming/Assignment/GoogleClassroom/ Quiz/ Discussion.

Text Book:

1. A.S. Tanenbaum, "Computer Networks", 4th Edition, Prentice-Hall of India, 2008.

Reference Books:

1. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition, 2017.
2. F. Halsall, "Data Communications, Computer Networks and Open Systems", Pearson Education, 2008.
3. D. Bertsekas and R. Gallagher, "Data Networks", 2nd Edition, PHI, 2008.
4. Lamarca, "Communication Networks", Tata McGraw-Hill, 2002.

E–References:

1.Web resources from NDL Library, E- content from open source libraries.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	H
CO2	S	H	S	M	S
CO3	S	H	M	H	H
CO4	S	S	S	S	S
CO5	S	S	S	H	H

S–Strong **H** –High **M**–Medium **L**–Low

Sub.Code:24USC609

Programme Code:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Core Paper 9 - Python Programming and IoT**			
Batch	Hours/Week	Total Hours	Credits	Employability/ Skill Development
2024-2025	**5**	**75**	**3**	

Course Objectives

1. To understand the fundamentals of Python Programming and IOT
2. To get exposure to Programming Raspberry Pi with Python.
3. To acquire knowledge about IOT Enabling Technologies.

Course Outcomes (CO)		
K1 to K5	CO1	Remember the concept of operators, datatypes, looping statements in python programming.
	CO2	Understand the concepts of Input / Output operations in file.
	CO3	Apply the various protocols for IOT.
	CO4	Analyze the applications of IOT in Realtime scenario.
	CO5	Evaluate the concept of Python's web Application.

Syllabus

UNIT I **(15 Hours)**

Python with Ancient IKS - Python: Introduction - Standard Data Types – Operators - Statement and expressions – String operations - Control statements- Iteration -While statement - Built-in functions - Composition of functions-User defined functions-Parameters and Arguments-Function calls- The return statement-Python recursive function -List.

UNIT II **(15 Hours)**

Tuples- Dictionaries -Classes and Objects: Overview of OOP. Directories: mkdir(), chdir(). Exception–Modules– Packages-File Handling. Python Packages of Interest for IOT.

UNIT III **(15 Hours)**

IoT with Ancient IKS - Introduction to Internet of Things: Physical Design of IOT - Things in IOT - IOT Protocols - Logical Design of IOT – IOT Functional blocks- IOT Communication models-IOT Communication APIs-IOT Enabling Technologies, IOT Levels. Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.

UNIT IV **(15 Hours)**

IOT and M2M: M2M- Difference betweenIOTandM2M-SDN and NFV for IOT. IOT System Management with NETCONF- YANG: Need for IOT Systems Management-Simple Network Management Protocol (SNMP)-Network Operator Requirements, NETCONF, YANG, IOT Systems management with NETCONF-YANG.

UNIT V **(15 Hours)**

IOT Physical Devices & Endpoints: Basic Building Blocks of an IOT Device-IOT Physical servers and cloud offerings: Introduction to cloud storage Models and communication APIs-WAMP Auto bahn for IOT.

*Self-study and questions for examinations may be taken from the self-study portions also.

Teaching Methods:

Chalk and Talk/ Powerpoint presentation/ Seminar/ Brainstorming/ Assignment/ Google Classroom.

Text Book:

1. E. Balagurusamy (2017), "Problem Solving and Python Programming", McGraw-Hill, 1st Edition.
2. Arshdeep Bahga, Vijay Madisetti, (2016), "Internet of Things A Hands-on Approach", Universities Press (India), Private Limited.

Reference Books:

1. Gaston C. Hillar, (2016), "Internet of Things with Python", Packet Publishing.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	H	S
CO2	H	S	H	S	S
CO3	S	H	H	S	H
CO4	S	S	S	M	H
CO5	S	S	S	M	S

S–Strong **H** –High **M**–Medium **L**–Low

Sub.Code:24USC610

Programme Code:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Core Paper 10 – Artificial Intelligence and Machine Learning**			
Batch	Hours/Week	Total Hours	Credits	Employability/ Skill Development
2024-2025	**5**	**75**	**4**	

Course Objectives

1. To understand the basic concept of AI& ML.
2. To understand strength and weakness of problem solving and search algorithms.
3. To know about basic concepts of knowledge, and reasoning, Machine Learning.
4. To optimize the different linear methods of regression and classification.
5. To interpret the different supervised classification methods of support vectormachine and tree-based models.

Course Outcomes (CO)		
K1 to K5	CO1	Evaluate Artificial Intelligence (AI) methods and describe their foundations.
	CO2	Analyze and illustrate how search algorithms play vital role in problem solving, inference, perception, knowledge representation and learning
	CO3	Fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation.
	CO4	To introduce the basic concepts and techniques of machine learning and the need for Machine Learning techniques for real world problem
	CO5	To provide understanding of various Machine learning algorithms and the way to Evaluate the performance of ML algorithms.

Syllabus

UNIT I **(15 Hours)**

Foundation and History of AI, Overview of AI problems, Evolution of AI, - Applications of AI, Classification Types of AI. Artificial Intelligence vs Machine learning. Intelligent Agent: Types ofAI Agent, Concept of Rationality, nature of environment, structure of agents. Turing Test in AI.

UNIT II **(15 Hours)**

Constructing Search Trees, Stochastic Search, AO* Search Implementation, Minimax Search, Alpha-Beta Pruning Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem.

UNIT III **(15 Hours)**

Introduction to Machine Learning: History of ML Examples of Machine Learning Applications, Learning Types, ML Lifecycle, AI & ML, dataset for ML, Data Pre-processing, Training versus Testing, Positive and Negative Class, Cross-validation.

UNIT IV **(15 Hours)**

Types of Learning: Supervised, Unsupervised and Semi-Supervised Learning. **Supervised:** Learning a Class from Examples, Types of supervised Machine learning Algorithms - **Unsupervised:** Types of Unsupervised Learning Algorithm, Dimensionality Reduction: Introduction to Dimensionality Reduction, Subset Selection, and Introduction to Principal Component Analysis.

UNIT V	(15 Hours)
Supervised Learning: Regression: Linear Regression, Polynomial Regression, logistic regression, Non-linear Regression, Model evaluation methods. **Classification**–support vector machines (SVM), Naïve Bayes classification. **Unsupervised learning**: Nearest neighbor models –K-means–clustering around medoids–silhouettes–hierarchical clustering–k-d trees, Clustering trees.	
*Self-studyand questions for examinations may be taken from the self-study portions also.	
Teaching Methods:	
Chalk and Talk /Powerpoint presentation/ Seminar/ Brainstorming/ Assignment/ Google Classroom.	
Text Book:	
1. Russell, S. and Norvig, P. 2015, "Artificial Intelligence- A Modern Approach", 3rd Edition, Prentice Hall. 2. J. Gabriel, "Artificial Intelligence: Artificial Intelligence for Humans, Create Space Independent Publishing Platform", 1st Edition, 2016 3. Peter Flach: "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", Cambridge University Press, Edition 2012.	
Reference Books:	
1. Dan W Patterson, "Introduction to Artificial Intelligence & Expert Systems", PHI., 2010. 2. S. Kaushik, "Artificial Intelligence, Cengage Learning",1st Edition, 2011. 3. Ric, E., Knight, K and Shankar, B.2009, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill. 4. Luger, G.F, 2008, "Artificial Intelligence - Structures and Strategies for Complex Problem Solving", 6th Edition, Pearson. 5. Alpaydin, E. 2010, "Introduction to Machine Learning", 2nd Edition, MIT. 6. Ethem Alpaydin, "Introduction to Machine Learning", PHI, 2nd Edition - 2013. 7. Nilsson Nils J, "Artificial Intelligence: A new Synthesis" , Morgan Kaufmann Publishers Inc.San Francisco, CA,ISBN: 978-1-55-860467-4.	

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	H	S
CO2	H	S	H	S	S
CO3	S	H	H	S	H
CO4	S	S	S	M	H
CO5	S	S	S	M	S

S–Strong **H** –High **M**–Medium **L**–Low

Sub.Code:24USC6CQ

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Core Practical 6 – Python Programming and IoT Lab**			
Batch	Hours/Week	Total Hours	Credits	Employability/ Skill Development
2024-2025	**5**	**75**	**3**	

Course Objectives

1. To gain knowledge on the concepts of python programming.
2. To design IoT applications in different domains and be able to analyze their performance.
3. To know the various hardware and sensing technologies to build IoT applications.

Course Outcomes (CO)		
K1 to K5	CO1	Apply the basic concepts of python programming with IOT.
	CO2	Examine the IOT EnablingTechnologies and Domain Specific IOTs.
	CO3	Analyze Programming using microcontroller with Python.
	CO4	Illustrate the Python Packages for IOT.
	CO5	Evaluate the ideas and concepts using Python with IOT.

LIST OF PRACTICAL PROBLEMS

1. Write a python program that displays the following information: Your name, Full address, Mobile number, College name, Course subject, Marks and Percentage.
2. Write a python program to find the largest three integers using if-else and conditionaloperator.
3. Write recursive functions for the factorial of positive integer.
4. Write recursive functions for Fibonacci sequence upto given number.
5. Write a python program that writes a series of random numbers to a filefrom1to n anddisplay.
6. (i)Write a Python program for Switching LED on/off Using any micro controller.
   (ii) Write a Python program for blinking LED.
7. Write a python program on using any microcontroller to publish temperature data to MQTTbroker.
8. Write a program to send sensor data to Smartphone using Bluetooth with any microcontroller.
9. Write a Python program for sending an E-mail on switch press with any microcontroller.
10. To interface LED and Switch with any microcontroller and write a python program tocontrol an LED with as witch.
11. Write a python program to create TCP server on any microcontroller and respond with humidity data to TCP client when requested.
12. To interface motor using relay with any micro controller and write a program to turn ON/OFF motor when push button is pressed using any micro controller.
13. Write a Python program for implementation of the intrusion detection service that runs on any microcontroller.
14. Write a Python program for implementation of the Smart Parking service that runs on any micro controller.
15. Write a Python program for weather reporting both that tweets weather updates to twitter.

Teaching Methods:

Program Demonstration and Hands on training using LCD Projector.

Guide lines to the distribution of marks for Practical Examinations:

CIA: Total marks–40[Practical – 25, Observation-10, Attendance–5].

ESE: Two Questions will be given for each student. (3 Hours / 60 marks)

Record: 10 Marks

Particulars	Program1 (Marks)	Program2 (Marks)
Algorithm	5	5
Program Coding	15	15
Result	5	5

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	H	S
CO2	H	S	S	S	H
CO3	S	H	S	H	H
CO4	S	M	S	S	H
CO5	S	S	S	H	S

S–Strong **H** –High **M**–Medium **L**–Low

Sub Code:24USC6Z1

ProgrammeCode:**09**	**B. Sc., Computer Science**			
Title of the Paper:	**Project Work and Viva-Voce**			
Batch **2024-2025**	Hours/Week **4**	Total Hours **60**	Credits **5**	Employability/ Skill Development

Course Objectives

1. To understand and select the task-based core skills.
2. To get knowledge about analytical skill for solving the selected task.
3. To get confidence for implementing the task and solving the real time problems.

Course Outcomes (CO)

K3 to K5	CO1	Apply the domain specific knowledge and define the project.
	CO2	Analyze the achievable goals and choose the right software for project development
	CO3	Estimate the resources and create the project schedule
	CO4	Test the deliverables
	CO5	Evaluate the project results.

MARKDISTRIBUTION:

	Marks
Project Report*	**60**
Viva–Voce*	**20**
Internal	**20**

*Both Internal & External Examiners shall evaluate Project &Viva-Voce jointly.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	H	H	H
CO2	M	H	H	H	H
CO3	H	H	H	M	M
CO4	S	S	H	M	M
CO5	S	S	H	H	S

S– Strong **H** –High **M**–Medium **L**–Low

Sub.Code:24USC4A4

Programme Code:**09**	**B.Sc. Computer Science**			
Title of the Paper: **Allied Paper 4 -Digital Principles and Computer System Architecture**				
Batch **2024-2025**	Hours/Week **5**	Total Hours **75**	Credits **5**	Employability/ Skill Development

Course Objectives

1. To know the basics of computer hardware and how software interacts with computer hardware.
2. To familiarize with different numbering methods like binary, octal, and hexadecimal.
3. To understand the concepts of memory hierarchy and compare different methods for computer architecture.

Course Outcomes (CO)		
K1 to K5	CO1	Remember basic structure of computer, numbering methods, arithmetic and logical operations performed by computers.
	CO2	Understand various data transfer techniques in digital computer and control unit operations.
	CO3	Apply performance issues in processor and memory design of a digital computervarious data representations.
	CO4	Analyze architectures and computational designs and computer Architecture concepts related to design of modern processors, memories and I/O's.
	CO5	Evaluate the performance of commercially available computers.

Syllabus	
UNIT I	**(15 Hours)**
Number Systems and Codes-Binary Number System: Binary to Octal, Decimal, Hexadecimal Conversions – Decimal Number System: Decimal to Binary, Octal, Hexadecimal Conversions –Octal Number System: Octal to Binary, Decimal, Hexadecimal Conversions -Hexadecimal Number System: Hexadecimal to Binary, Octal, Decimal Conversions–ASCII Code–Excess – 3 Code– Gray Code.	
UNIT II	**(15 Hours)**
Digital Logic: The Basic Gates –AND, OR, NOT–Universal Logic Gates: NAND and NOR – ND OR-Invert Gates. Combinational Logic Circuits: Boolean Laws and Theorems –Sum-of-Products Method-Truth Table to Karnaugh Map–Pairs, Quads and Octets–Karnaugh Simplification - Don' Care Conditions-Product-of-Sums Method.	
UNIT III	**(15 Hours)**
Multiplexers – De-multiplexers – 1-of-16 Decoders – BCD-Decimal Decoders - Encoders – Flip-flops: RS Flip-flops- Edge-triggered RS Flip-flops - Edge-triggered D Flip-flops – Edge -triggered JK Flip-flops.	
UNIT IV	**(15 Hours)**
Central Processing Unit: General Register Organization – Stack Organization – Instruction Formats – Addressing Modes. Input–Output Organization: Peripheral Devices * - Input- Output Interface– Asynchronous Data Transfer (strobe control & handshaking) – Priority Interrupt– Direct Memory Access–Input–Output Processor–Serial Communication.	

UNIT V	(15 Hours)
Memory Organization: Memory Hierarchy–Main Memory–Cache Memory–Virtual Memory. Multiprocessors: Characteristics of Multiprocessors*- Inter connection Structures.	
*Self-study and questions for examinations maybe taken from the self-study portions also.	
Teaching Methods:	
Chalk and Talk/ Smart Class Room/ Powerpoint presentation/ Seminar/ Quiz/ Discussion/Flipped Class /peer Learning/Experiential Learning/Blended Learning.	
Text Book:	
1. Albert Malvino, Donald P. Leach (1995), **"**Digital Principles and Applications", 3rd Edition, McGraw Hill Company [Unit I, II, III]. 2. M. Morris mano (1999), "Computer system Architecture", 3rd Edition, Pearson Education Publications, [Unit IV, V].	
Reference Books:	
1. T. C. Bartee (2003), "Digital computer Fundamentals", 6th Edition, Tata McGraw Hill. 2. John P. Hayes (1998), "Computer Architecture and Organization", 3rd Edition, Tata McGraw Hill Publishers Pvt Ltd.	

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	H
CO2	S	S	H	S	S
CO3	H	M	S	H	H
CO4	S	S	S	S	M
CO5	S	S	S	H	S

S–Strong **H** –High **M**–Medium **L**–Low

MAJOR ELECTIVE PAPERS

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper	**Major Elective - Data Mining and Warehousing**			
Batch **2024-2025**	Hours/Week **5**	Total Hours **75**	Credits **5**	Employability/ Skill Development

Course Objectives

1. To provide the knowledge on Data Mining and Warehousing concepts and techniques.
2. To study the basic concepts of cluster analysis.
3. To study a set of typical clustering methodologies, algorithms, and applications.

Course Outcomes (CO)		
K1 to K5	CO1	To understand the basic concepts and the functionality of the various data Mining and data warehousing component
	CO2	To know the concepts of Data mining system architectures.
	CO3	To analyze the principles of association rules.
	CO4	To get analytical idea on Classification and prediction methods.
	CO5	To Gain knowledge on Cluster analysis and its methods.

Syllabus	
UNIT I	**(15 Hours)**
Introduction: Data mining–Functionalities–Classification–Introduction to Data Warehousing– Data Preprocessing: Preprocessing the Data–Data cleaning–Data Integration and Transformation – Data Reduction.	
UNIT II	**(15 Hours)**
Data Mining, Primitives, Languages and System Architecture: Data Mining– Primitives–Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Concept Description, Data Generalization and Summarization, Analytical Characterization, Mining Class Comparison– Statistical Measures.	
UNIT III	**(15 Hours)**
Mining Association Rules: Basic Concepts– Single Dimensional Boolean Association Rules from Transaction Databases, Multilevel Association Rules from transaction databases–Multi-dimension Association Rules from Relational Database and Data Warehouses.	
UNIT IV	**(15 Hours)**
Classification and Prediction: Introduction–Issues–Decision Tree Induction–Bayesian Classification of Back Propagation. Classification based on concepts from Association Rule Mining – Other Methods. Prediction –Introduction–Classifier Accuracy.	
UNIT V	**(15 Hours)**
Cluster Analysis: Introduction– Types of Data in Cluster Analysis, Petitioning Methods–Hierarchical Methods-Density Based Methods–GRID Based Method–Model based Clustering Method.	
*Self-study and questions for examinations maybe taken from the self-study portions also.	

Teaching Methods:
Chalk and Talk / Powerpoint presentation /Seminar/ Brainstorming/ Assignment/ Google Classroom / Quiz/ Discussion.
Text Book:
1. Hanand M. Kamber, "Data MiningConcepts and Techniques", 2001, Harcourt India Pvt.Ltd, New Delhi.
Reference Books:
1. K. P. Soman, Shyam Diwakar, V. Ajay, "Insight into Data Mining Theory and Practice", Prentice Hall of India Pvt. Ltd, New Delhi. 2. Parteek Bhatia, "Data Mining and Data Warehousing: Principles and Practical Techniques", Cambridge University Press, 2019.
E–References:
1. Web resources from NDL Library, E-content from open source libraries.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	H
CO2	S	H	S	M	S
CO3	S	H	M	H	H
CO4	S	S	S	S	S
CO5	S	S	S	H	H

S–Strong **H** –High **M**–Medium **L**–Low

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper	**Major Elective - Network Security**			
Batch **2024-2025**	Hours/Week **5**	Total Hours **75**	Credits **5**	Employability/ Skill Development

Course Objectives

1. To study the number theory used for network security.
2. To understand the design concept of cryptography and authentication.
3. To develop experiments on algorithm used for security.

Course Outcomes (CO)		
K1 to K5	CO1	To understand the basic concepts and the functionality of the various network Security attacks, services.
	CO2	To know the concepts of network security.
	CO3	To analyze the principles of Public key cryptography and RSA.
	CO4	To get analytical idea on Authentication applications.
	CO5	To Gain knowledge on Intrusion detection system.

Syllabus

UNIT I	**(15 Hours)**

Model of network security– Security attacks, services and attacks– OSI security architecture – Classical encryption techniques–SDES–Block cipher Principles DES–Strength of DES– Block cipher design principles–Block cipher mode of operation–Evaluation criteria for AES –RC4-Differentialandlinearcryptanalysis–Placementofencryptionfunction–traffic confidentiality.

UNIT II	**(15 Hours)**

Number Theory – Prime number – Modular arithmetic – Euclid's algorithm - Fermet's and Euler's theorem – Primality – Chinese remainder theorem – Discrete logarithm – Public key cryptography and RSA–Key distribution–Key management–Diffie Hellman key exchange– Elliptic curve cryptography.

UNIT III	**(15 Hours)**

Authentication requirement–Authentication function–MAC–Hash function– Security of hash function and MAC–SHA-HMAC–CMAC-Digital signature and authentication protocols– DSS.

UNIT IV	**(15 Hours**

Authentication applications–Kerberos–X.509 Authentication services- E- mail security–IP security-Web security.

UNIT V	**(15 Hours**

Intruder–Intrusion detection system–Virus and related threats–Counter measures–Firewalls Design principles–Trusted systems–Practical implementation of cryptography and security.

*Self-study and questions for examinations may be taken from the self- study portions also.

Teaching Methods:
ChalkandTalk/Powerpointpresentation/Seminar/Brainstorming/Assignment/GoogleClassroom/Quiz/ Discussion.
Text Book:
1. William Stallings, "Cryptography & Network Security", Pearson Education, 4th Edition 2010.
Reference Books:
1. Charlie Kaufman, Radia Perlman, Mike Speciner, "Network Security, Private communication in public world", PHI, 2nd Edition, 2002. 2. Bruce Schneier, Neils Ferguson, "Practical Cryptography", Wiley Dream Tech India Pvt Ltd, 1st Edition, 2003. 3. Douglas R Simson "Cryptography – Theory and practice", CRC Press, 1st Edition,1995.
E–References:
1. Web resources from NDL Library, E-content from open source libraries.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	H
CO2	S	H	S	M	S
CO3	S	H	M	H	H
CO4	S	S	S	S	S
CO5	S	S	S	H	H

S–Strong **H** –High **M**–Medium **L**–Low

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper	**Major Elective - Advanced Robotics and its Applications**			
Batch **2024-2025**	Hours/Week **5**	Total Hours **75**	Credits **5**	Employability/ Skill Development

Course Objectives

1. To make the students familiar with the various drive systems of robots, sensors and their applications in robots.
2. To introduce the parts of robots, basic working concepts and types of robots.

Course Outcomes (CO)		
K1 to K5	CO1	Describe the different physical forms of robot architectures.
	CO2	Kinematically model simple manipulator and mobile robots.
	CO3	Mathematically describe a kinematic robot system.
	CO4	Analyze manipulation and navigation problems using knowledge of Coordinate frames, kinematics, optimization, control, and uncertainty.
	CO5	Program robotics algorithms related to kinematics, control, optimization, and uncertainty.

Syllabus

UNIT I **(15 Hours)**

Introduction: Introduction, brief history, components of robotics, classification, workspace, work envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.

UNIT II **(15 Hours)**

Actuators and sensors: Types of actuators, stepper- DC- servo- and brush less motors-model of a DC servo motor- types of transmissions- purpose of sensor-internal and external sensor-common sensors-encoders tachometers-strain gauge-based force torque sensor-proximity and distance measuring sensors-Kinematics of robots: Representation of joints and frames, frames transformation, homogeneous matrix, D-H matrix, Forward and inverse kinematics: two-link planar (RR) and spherical robot (RRP). Mobile robot Kinematics: Differential wheel mobile robot.

UNIT III **(15 Hours)**

Localization: Self-localizations and mapping-Challenges in localizations–IR based localizations – vision- based localizations–Ultrasonic based localizations - GPS localization systems.

UNIT IV **(15 Hours)**

Path Planning: Introduction, path planning-overview-road map path planning-cell decomposition path planning potential field path planning-obstacle avoidance-case studies Vision system: Robotic vision systems-image representation-object recognition-and categorization-depth measurement- image data compression-visual inspection-software considerations.

UNIT V **(15 Hours)**

Application: Ariel robots-collision avoidance robots for agriculture- mining-exploration-underwater-civilian-and military applications -nuclear applications -space applications- Industrial robots-Artificial Intelligence in robots- Application of robots in material handling- Continuous arc welding-spot welding-spray painting-assembly operation-cleaning-etc.

*Self-study and questions for examinations may be taken from the self-study portions also.

Teaching Methods:

ChalkandTalk/Powerpointpresentation/Seminar/Brainstorming/Assignment/GoogleClassroom/ Quiz/ Discussion.

Text Book:

1. Richared D. Klafter. Thomas Achmie lewski and Mickael Negin, "Robotic Engineering and Integrated Approach", Prentice Hall India-New Delhi-2001.
2. Saeed B. Nikku, "Introduction to Robotics, Analysis, Control and Applications", Wiley-India, 2nd Edition 2011.

Reference Books:

1. "Industrial Robotic Technology- Programming and Application" by M. P. Grooveret.al, McGraw hill 2008.
2. "Robotics Technology and Flexible Automation" by S.R. Deb, THH-2009.

E–References:

1.Web resources from NDL Library, E-content from open source libraries.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	H
CO2	S	H	S	M	S
CO3	S	H	M	H	H
CO4	S	S	S	S	S
CO5	S	S	S	H	H

S–Strong **H** –High **M**–Medium **L**–Low

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper	**Major Elective -Introduction to Data Science**			
Batch **2024-2025**	Hours/Week **5**	Total Hours **75**	Credits **5**	Employability/ Skill Development

Course Objectives

1. To introduce the concepts, techniques and tools in Data Science
2. To understand the various facets of data science practice, including data collection and integration, exploratory data analysis, predictive modeling, descriptive modeling and Effective communication.

Course Outcomes (CO)		
K1 to K5	CO1	To describe what Data Science is, what Statistical Inference means, identify probability distributions, fit a model to data and use tools for basic analysis and communication.
	CO2	To describe what Data Science is, what Statistical Inference means, identify probability distributions, fit a model to data and use tools for basic analysis and communication.
	CO3	To describe what Data Science is, what Statistical Inference means, identify probability distributions, fit a model to data and use tools for basic analysis and communication.
	CO4	To describe what Data Science is, what Statistical Inference means, identify Probability distributions, fit a model to data and use tools for basic analysisand communication.
	CO5	To describe what Data Science is, what Statistical Inference means, identify probability distributions, fit a model to data and use tools for basic analysis and communication.

Syllabus	
UNIT I	**(15 Hours)**
Benefits and uses–Facets of data–Data science process–Bigdata eco system and data science.	
UNIT II	**(15 Hours)**
The Data science process: Overview–research goals-retrieving data-transformation– Exploratory DataAnalysis –Model building.	
UNIT III	**(15 Hours)**
Algorithms: Machine learning algorithms–Modeling process–Types–Supervised– Unsupervised-Semi-supervised.	
UNIT IV	**(15 Hours)**
Introduction to Hadoop: Hadoop framework–Spark–Replacing Map Reduce–NoSQL–ACID – CAP – BASE – types.	
UNIT V	**(15 Hours)**
Case Study: Prediction of Disease- Setting research goals-Data retrieval–preparation- exploration-Disease profiling-presentation and automation.	
*Self-study and questions for examinations maybe taken from the self-study portions also.	

Teaching Methods:

Chalk and Talk/Powerpoint presentation/Seminar/Brainstorming/Assignment/Google Classroom/Quiz/ Discussion.

Text Book:

1. Davy Cielen, Arno D.B. Meysman, Mohamed Ali, "Introducing Data Science", Manning publications, 2016.

Reference Books:

1. Roger Peng, "The Art of Data Science", 2016.
2. Murtaza Haider, "Getting Started with Data Science – Making Sense of Data with Analytics", IBM press, E-book.
3. Davy Cielen, Arno D.B. Meysman, Mohamed Ali, "Introducing Data Science: Big Data,Machine Learning, and More, Using Python Tools", Dream tech Press 2016.
4. Annalyn Ng, Kenneth Soo, "Numsense! Data Science for the Layman: No Math Added", 2017, 1st Edition.
5. Cathy O' Neil, Rachel Schutt, "Doing Data Science Straight Talk from the Frontline",O'Reilly Media 2013.
6. Lillian Pierson, "Data Science for Dummies",2017, 2nd Edition.

E–References:

1.Web resources from NDL Library, E-content from open source libraries.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	H
CO2	S	H	S	M	S
CO3	S	H	M	H	H
CO4	S	S	S	S	S
CO5	S	S	S	H	H

S–Strong **H** –High **M**–Medium **L**–Low

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper	**Major Elective - Cloud Computing**			
Batch **2024-2025**	Hours/ Week **5**	Total Hours **75**	Credits **5**	Employability/ Skill Development

Course Objectives

1. To impart fundamental concepts of Cloud Computing.
2. To impart a working knowledge of the various cloud service types and their uses and pitfalls.
3. To enable the students to know the common features and differences in the service offerings of the three major Cloud Computing service providers, namely Amazon, Microsoft and Google.
4. To provide know-how of the various aspects of application design, benchmarking and security on the Cloud.

Course Outcomes (CO)		
K1 to K5	CO1	To understand the concepts and technologies involved in Cloud Computing.
	CO2	To understand the concepts of various cloud services and their implementation in the Amazon, Microsoft and Google cloud computing platforms.
	CO3	To understand the aspects of application design for the Cloud.
	CO4	To understand the concepts involved in benchmarking and security on the Cloud.
	CO5	To understand the way in which the cloud issued in various domains.

Syllabus

UNIT I **(15 Hours)**

Introduction to Cloud Computing: Definition of Cloud Computing–Characteristics of Cloud Computing– Cloud Models–Cloud Service Examples–Cloud-based Services and Applications - **Cloud Concepts and Technologies:** Virtualization–Load balancing – Scalability and Elasticity– Deployment–Replication–Monitoring– Software Defined Networking Network Function Virtualization – MapReduce–Identity and Access Management–Service Level Agreements– Billing.

UNIT II **(15 Hours)**

Cloud Services : Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine-Windows Azure Virtual Machines. Storage Services: Amazon Simple Storage Service- Google Cloud Storage - Windows Azure Storage - **Database Services:** Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store – Windows Azure SQL Database - Windows Azure Table Service - **Application Services:** ApplicationRuntimesandFrameworks-QueuingServices-EmailServices-NotificationServices Media Services- **Content Delivery Services:** Amazon Cloud Front- Windows Azure Content Delivery Network - **Analytics Services:** Amazon Elastic MapReduce - Google MapReduce Service -Google Big Query - Windows Azure HDInsight - Deployment and Management Services: Amazon Elastic Bean stack- Amazon CloudFormation Identity and Access Management Services: Amazon Identify and Access Management- Windows Azure Active Directory-Open Source Private Cloud Software: Cloud Stack– Eucalyptus-OpenStack.

UNIT III	(15 Hours)
Cloud Application Design: Introduction – Design Consideration for Cloud Applications – Scalability–ReliabilityandAvailability–Security–MaintenanceandUpgradation–Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), REST full Web Services –Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).	
UNIT IV	**(15 Hours)**
Cloud Application Benchmarking and Tuning: Introduction to Benchmarking – Steps in Benchmarking–Workload Characteristics–Application Performance Metrics–Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping- **Cloud Security:** Introduction–CSA Cloud Security Architecture– Authentication (SSO)–Authorization–Identity and Access Management–**Data Security:** Securing data at rest, securing data in motion–Key Management–Auditing.	
UNIT V	**(15 Hours)**
Case Studies: Cloud Computing for Healthcare–Cloud Computing for Energy Systems-Cloud Computing for Transportation Systems- Cloud Computing for Manufacturing Industry -Cloud Computing for Education.	
*Self-study and questions for examinations may be taken from the self-study portions also.	
Teaching Methods:	
Chalk and Talk/Power point presentation/Seminar/Brainstorming/Assignment/Google Classroom/ Quiz/ Discussion.	
Text Book:	
1. Arshdeep Bahga, Vijay Madisetti, "Cloud Computing–A Hands on Approach", Universities Press(India) Pvt. Ltd., 2018.	
Reference Books:	
1. Anthony T Velte, Toby J Velte, Robert Elsen peter, "Cloud Computing: A Practical Approach", Tata McGraw-Hill, 2013. 2. Barrie Sosinsky, "Cloud Computing Bible", Wiley India Pvt. Ltd., 2013. 3. David Crookes, "Cloud Computing in Easy Steps", Tata McGraw Hill, 2012. 4. Dr. Kumar Saurabh, "Cloud Computing", Wiley India, 2nd Edition 2012.	
E–References:	

1.Web resources from NDL Library, E-content from open source libraries.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	H
CO2	S	H	S	M	S
CO3	S	H	M	H	H
CO4	S	S	S	S	S
CO5	S	S	S	H	H

S–Strong **H** –High **M**–Medium **L**–Low

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper	**Major Elective - Computing Intelligence**			
Batch **2024-2025**	Hours/Week **5**	Total Hours **75**	Credits **5**	Employability/ Skill Development

Course Objectives

1. To provide strong foundation on fundamental concepts in Computing Intelligence.
2. To apply basic principles of Artificial Intelligence and solutions that require problem solving, influence, perception, knowledge representation and learning.

Course Outcomes (CO)		
K1 to K5	CO1	Describe the fundamentals of artificial intelligence concepts and searching techniques.
	CO2	Develop the fuzzy logic sets and membership function and de-fuzzification techniques.
	CO3	Understand the concepts of Neural Network and analyze and apply the learning techniques.
	CO4	Understand the artificial neural networks and its applications.
	CO5	Understand the concept of Genetic Algorithm and Analyze the optimization problems using GAs.

Syllabus

UNIT I **(15 Hours)**

Introduction to AI: Problem formulation–AI Applications–Problems–State Space and Search–Production Systems–Breadth First and Depth First–Travelling Salesman Problem –Heuristic search techniques: Generate and Test–Types of Hill Climbing.

UNIT II **(15 Hours)**

Fuzzy Logic Systems: Notion of fuzziness – Operations on fuzzy sets – T-norms and other aggregation operators –Basics of Approximate Reasoning – Compositional Rule of Inference – Fuzzy Rule Based Systems–Schemes of Fuzzification–Inferencing–Defuzzification–Fuzzy Clustering–fuzzy rule-based classifier.

UNIT III **(15 Hours)**

Neural Networks: What is Neural Network, learning rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Backpropagation (BP)Networks, Backpropagation Learning, Variation of Standard Backpropagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.

UNIT IV **(15 Hours)**

Artificial Neural Networks: Fundamental Concepts–Basic Models of Artificial Neural Networks–Important Terminologies of ANNs–McCulloch-Pitts Neuron–Linear Separability –Hebb Network.

UNIT V **(15 Hours)**

Genetic Algorithm: Introduction – Biological Background – Genetic Algorithm Vs Traditional Algorithm–Basic Terminologies in Genetic Algorithm–Simple GA–General Genetic Algorithm –Operators in Genetic Algorithm.

*Self-study and questions for examinations may be taken from the self-study portions also.

Teaching Methods:

Chalk and Talk/Power point presentation/Seminar/Brain storming/Assignment/Google Classroom/ Quiz/ Discussion.

Text Book:

1. S.N. Sivanandam and S.N. Deepa, "Principles of Soft Computing", 2nd Edition, Wiley India Pvt. Ltd.
2. Stuart Russell and Peter Norvig, "Artificial Intelligence A Modern Approach", 2nd Edition, Pearson Education in Asia.
3. S. Rajasekaran, G.A. Vijayalakshmi, "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications", PHI.

Reference Books:

1. F. Martin, Mcneill, and Ellen Thro, "Fuzzy Logic: A Practical approach", AP Professional, 2000.ChinTengLin, C.S. George Lee,"Neuro-Fuzzy Systems", PHI.
2. ChinTeng Lin,C. S. George Lee, "Neuro-Fuzzy Systems", PHI.

E–References:

1.Web resources from NDL Library, E-content from open source libraries.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	H
CO2	S	H	S	M	S
CO3	S	H	M	H	H
CO4	S	S	S	S	S
CO5	S	S	S	H	H

S–Strong **H** –High **M**–Medium **L**–Low

Sub.Code: 24UGC3S1

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Skill Based Subject 1 - Cyber Security**			
Batch	Hours/Week	Total Hours	Credits	Employability/ Skill Development
2024-2025	**2**	**30**	**3**	

Course Objectives

1. The course introduces the basic concepts of Cyber Security.
2. To develop an ability to understand about various modes of Cyber Crimes and Preventive measures.
3. To understand about the Cyber Legal laws and Punishments.

Course Outcomes (CO)		
K1	CO1	To Understand the Concepts of Cybercrime and Cyber Frauds
K2	CO2	To Know about Cyber Terrorism and its preventive measures
K3	CO3	To Analyze about the Internet, Mobile Phone and E-commerce security issues.
K4	CO4	To Understand about E-mail and Social Media Issues
K5	CO5	To Describe about various legal responses to Cybercrime.

Syllabus	
UNIT I	**(6 Hours)**
Introduction to Cyber Security: Definition of Cyber Security-Why is Cyber Security important? Layers of Cyber Security-Evolution of Cyber Security. Cyber hacking- Cyber fraud: Definition-Different modes of cyber fraud- Cyber fraud in India. Cyber pornography.	
UNIT II	**(6 Hours)**
Cyber Terrorism: Modes of cyber terrorism. Cybercrime: What is Cybercrime? Cybercrime preventive methods - Preventive steps for individuals & organizations - Kinds of cybercrime - Malware and its types– Cyberattacks.	
UNIT III	**(6 Hours)**
Internet Mobile Phone and E-commerce Security issues: Datatheft-Punishment of data theft-Theft of internet hours-Internet safety tips for children & parents. Mobile phone privacy-E-Commercesecurity issues.	
UNIT IV	**(6 Hours)**
Email and Social media issues: Aspects of Social Media - The Vicious Cycle of unhealthy social media use- Modifying social media use to improve mental health. Computer Virus - Antivirus– Firewalls.	
UNIT V	**(6 Hours)**
Cyber Forensics and Digital Evidence: What does Digital Footprint Mean -Web Browsing and Digital Footprints-Digital Footprint examples–How to Protect Your Digital Footprints-How to erase your Footprints? - Browser Extensions and Search Engine Deletion - Cyber Crime and Cyber Laws – Common Cyber Crimes and Applicable Legal Provisions: A Snapshot – Cyber Law (IT Law) in India–TheInformationTechnologyActofIndia2000-CyberLaw and Punishments in India-Cyber Crime Prevention guide to users – Regulatory Authorities.	

*Self-study and questions for examinations may be taken from the self-study portions also.

Teaching Methods:

Chalk and Talk/ Smart Class Room/ Power point presentation/ Seminar/ Quiz/ Discussion/ Flipped Class /peer Learning/Experiential Learning/Blended Learning.

Text Book:

1. "Cyber Security", Text Book prepared by "Kongunadu Arts and Science College,Coimbatore-29, 2022.

Reference Books:

1. Mayank Bhushan, Rajkumar Singh Rathore, Aatif Jamshed, "Fundamental of Cyber Security", BPB Publications,1st Edition, 2017.
2. Anand Shinde, "Introduction to Cyber Security-Guide to the world of Cyber Security", Notion Press, 2021.
3. Paul Grishman, "Cyber Terrorism-The use of the Internet for Terrorist Purpose",Axis Publication,1st Edition, 2010.
4. Shilpa Bhatnagar, "Encyclopaedia of Cyber and Computer Hacking", Anmol Publications,1st Edition,2009.

E–References:

1. http://deity.gov.in/-Department of Electronics and Information Technology, Govt. of India.
2. http://cybercellmumbai.gov.in/-Cybercrimeinvestigationcell
3. http://ncrb.gov.in/ -National Crime Records Bureau
4. http://catindia.gov.in/Default.aspx-CyberAppellateTribunal
5. http://www.cert-in.org.in/-IndianComputerEmergencyResponseTeam
6. http://cca.gov.in/rw/pages/index.en.do-ControllerofCertifyingAuthorities
7. www.safescrypt.com-Safescrypt
8. www.nic.in–National Informatics Centre
9. https://www.kaspersky.com/resource-center/definitions/what-is-a-digital-footprint
10. https://geekflare.com/digital-footprint/

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	M	S	H
CO2	H	S	S	H	S
CO3	M	H	M	S	H
CO4	S	H	H	M	H
CO5	S	H	M	S	H

S–Strong **H**–High **M**–Medium **L** –Low

Sub.Code:24USC4SL

Programme Code:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Skill Based Subject 2- Mobile Application Development Lab**			
Batch	Hours/Week	Total Hours	Credits	Employability/ Skill Development
2024-2025	**2**	**30**	**3**	

Course Objectives

1. To understand the Android application development environment.
2. To know the user interfaces for interacting with apps and triggering actions.
3. To realize the tasks used in handling multiple activities.

Course Outcomes (CO)		
K1 to K5	CO1	Apply the skills for designing and implementing basic mobile apps
	CO2	Examine the basic programming skills needed for developing mobile apps for a specific platform.
	CO3	Analyze the options to save persistent application data
	CO4	Illustrate the role of security and performance in Android applications
	CO5	Evaluate the functionality of mobile application using androids dk

LIST OF PRACTICAL PROBLEMS

1. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application using UI Widgets.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that uses Multiple Font and Colors using UI Widgets.
6. Develop a native application that uses GPS location information.
7. Implement an application that writes data to the SD card using UI Widgets.
8. Implement an application that creates an alert upon receiving a message.
9. Write a mobile application that creates alarm clock using UI Widgets.
10. Develop a mobile application to send an email.

Teaching Methods:

Program Demonstration and Hands-on training using LCD Projector.

Guide lines to the distribution of marks for Practical Examinations:

CIA: Total marks–40 [Practical – 25, Observation-10, Attendance–5].

ESE: Two Questions will be given for each student. (3 Hours / 60 marks)

Record: 10 Marks

Particulars	Program1 (Marks)	Program2 (Marks)
Algorithm	5	5
Program Coding	15	15
Result	5	5

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	H	S	M
CO2	H	S	S	S	S
CO3	S	H	H	S	S
CO4	S	S	S	H	S
CO5	S	S	H	S	S

S–Strong **H** –High **M**–Medium **L**–Low

24UBI6S3

Programme Code: 09		**B.Sc. Computer Science**		
Title of the Paper: **Skill Based Subject 3 - Basics of Intellectual Property Rights**				
Batch **2024-2025**	**Semester** **VI**	**Hours / Week** **2**	**Total Hours** **30**	**Credits** **3**

COURSE OBJECTIVES

1. To create awareness about recent trends in IPR and Innovation.
2. To explore the basic concepts IPR.
3. To focus upon trademarks, copyrights, patents, industrial designs andtraditional knowledge.
4. To learn more about managing IP rights and legal aspects.

COURSE OUTCOMES

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

K1 to K5	CO1	Know about basic concepts of IPR and patent.
	CO2	Understand copyrights, industrial designs and geographical indication of goods.
	CO3	Differentiate between trademarks and trade secrets.
	CO4	Acquire knowledge on protection of traditional knowledge and plant varieties.
	CO5	Manage and protect IP Rights.

UNIT – I **6 hours**

Introduction - origin and development of Intellectual Property Rights (IPR), need for protecting IP, **Patents:** Foundation of patent law, patent searching process, basic criteria of patentability. Patentable and non - patentable subject matters in India. Patent prior art search, drafting the patent specification and filing procedure.

UNIT – II **6 hours**

Copyrights: Fundamentals of copyright law, originality of material, right of reproduction, right to perform the work publicly, copyright ownership issues, notice of copyright. **Industrial Designs:** Kind of protection provided in Industrial design. **Geographical Indication of Goods:** Basic aspects and need for the registration.

UNIT – III **6 hours**

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, transfer of rights, selecting and evaluating trademark, registration of trademarks, claims. **Trade Secrets:** Trade secret law, determination of trade secret status, liability form is appropriation of trade secrets, trade secret litigation.

UNIT – IV **6 hours**

Protection of traditional knowledge - Objectives, concept of traditional knowledge, issues concerning, bioprospecting and biopiracy. **Protection of Plant Varieties -** Objectives, international position, plant varieties protection in India. Rights of farmers,breeders and researchers.

UNIT- V **6 hours**

Managing IP Rights: Acquiring IP Rights: letters of instruction, joint collaboration agreement, protecting IP Rights: non-disclosure agreement, cease and desist letter, settlement memorandum. **Transferring IP Rights:** Assignment contract, license agreement, deed of assignment. Infringement and enforcement.

Teaching Methods:
Program Demonstration and Hands-on training using LCD Projector.

TEXT BOOKS:

1. Ramakrishna Chintakunta and M. Geethavani (2022). A Textbook of IntellectualProperty Rights. Blue Hills publications.
2. N.K Acharya (2021).Intellectual property rights(8thEdn). Asia Law House.
3. Craig Allen Nard, Michael J. Madison, and Mark P. McKenna. (2017). Law ofIntellectual Property (5thEdn). New York Aspen publishers.
4. Barrett and Margreth (2009). Intellectual Property. New York Aspen publishers.
5. Deborah E. Bouchoux(2013). Intellectual property: The Law of Trademarks,Copyrights, Patents, and Trade Secrets. Publisher: Cengage India

REFERENCES:

1. B. Ramakrishna and H.S.Anil Kumar (2017). Fundamentals of Intellectual PropertyRights: For Students, Industrialist and Patent Lawyers. Notion Press.
2. V. K. Ahuja (2013). Law relating to Intellectual Property rights (2nd Edn).LexisNexis.
3. R. Radhakrishnan and S. Balasubramanian (2008). Intellectual property rights: Textand Cases. Excel Books India.
4. D. Goeland S. Parashar (2013). IPR Biosafety and Bioethics. Pearson EducationIndia.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	H	S	M
CO2	H	S	S	S	S
CO3	S	H	H	S	S
CO4	S	S	S	H	S
CO5	S	S	H	S	S

S–Strong **H** –High **M**–Medium **L**–Low

Extra Departmental Course

Programme Code:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**EDC - Web Development Laboratory**			
Batch **2024-2025**	Hours/Week **2**	Total Hours **30**	Credits **3**	Employability/ Skill Development

Course Objectives

1. To design and develop websites using fundamental web languages, technologies, and tools.
2. To implement the concepts in visual design and content structuring
3. To develop an ability to design and implement static and dynamic website
4. To develop skills in analyzing the usability of a web site.
5. To demonstrate the role of languages like HTML, CSS, JavaScript, PHP and protocols in the workings of the web and web applications.

Course Outcomes (CO)		
K1 to K5	CO1	Understanding the use of HTML tags.
	CO2	Create web pages using HTML and Cascading Stylesheets and Develop Dynamic web pages using JavaScript.
	CO3	Use cascading style sheets to design web pages
	CO4	Use JavaScript and HTML to create web pages with advanced interactivity.
	CO5	Understand, analyze and build web applications using PHP and Integrate HTML forms to PHP scripts.

List of Practical Problems

1. Design a page having suitable background color and text color with title "My First Web Page" using all the attributes of the Font tag and Create a HTML document giving details of your [Name, Age], [Address, Phone] and [Register Number, Class] aligned in proper order using alignment attributes of Paragraph tag.

2. Write HTML code to design a page containing some text in a paragraph by giving suitable heading style.

3. Write HTML code to create a Web Page that contains an Image at its center and description of the image.

4. Use table tag to format web page and also create the Time Table of your class using table.

5. Create your profile page i.e. educational details, Hobbies, Achievement, My Ideals etc.

6. Develop and demonstrate the usage of inline, internal and external style sheet using CSS.

7. Write an HTML page that contains a selection box with a list of 5 countries.

When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).

8. A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello, you are not authorized to visit the site" message, where should be replaced with the entered name. Otherwise, it should send "Welcome to this site" message.

9. Design a web page for your Department.

10. Design the following static web pages required for an online bookstore web site.

    1) HOME PAGE: The static home page must contain three frames.
    2) LOGIN PAGE
    3) CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table.
    4) REGISTRATION PAGE

11. Write JavaScript to validate the following fields of the Registration page.
    1. First Name (Name should contain alphabets and the length should not be less than 6 characters).
    2. Password (Password should not be less than 6 characters length).
    3. E-mail id (should not contain any invalid and must follow the standard patternname@domain.com)
    4. Mobile Number (Phone number should contain 10 digits only).
    5. Last Name and Address (should not be Empty).

12. Write PHP program to upload registration form into database and Display the Registration form from the database.

Teaching Methods:

Program Demonstration and Hands on training using LCD Projector.

Guide lines to the distribution of marks for Practical Examinations:

CIA: Total marks– 40 [Practical – 25, Observation-10, Attendance – 5].

ESE: Two Questions will be given for each student. (3Hours/60marks) Record:10 Marks

Particulars	Program1 (Marks)	Program2 (Marks)
Algorithm	5	5
Program Coding	15	15
Result	5	5

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	H	S	H
CO2	M	S	H	S	S
CO3	H	S	H	H	H
CO4	H	S	H	S	H
CO5	L	H	S	S	S

S– Strong **H** –High **M**–Medium **L**–Low

Sub. Code: 24EVS101

Programme Code:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Environmental Studies**			
Batch **2024 - 2025**	Hours/Week **2**	Total Hours **30**	Credits **2**	Employability/ Skill Development

Course Objectives

1. The course will provide students with an understanding and appreciation of the complex interactions of man, health and the environment. It will expose students to the multi-disciplinary nature of environmental health sciences.
2. To inculcate knowledge and create awareness about ecological and environmental concepts, issues and solutions to environmental problems.
3. To shape students into good "Eco citizens" there by catering to global environmental needs.
4. This course is designed to study about the types of pollutants including gases, chemicals petroleum, noise, light, global warming and radiation as well as pollutant flow and recycling and principles of environmental pollution such as air, water and soil.
5. The course will address environmental stress and pollution, their sources in natural and workplace environments, their modes of transport and transformation, their ecological and public health effects, and existing methods for environmental disease prevention and remediation.

Course Outcomes (CO)		
K1 to K5	CO1	Understand how interactions between organisms and their environments drive the dynamics of individuals, populations, communities and ecosystems.
	CO2	Develop an in-depth knowledge on the interdisciplinary relationship of cultural, ethical and social aspects of global environmental issues.
	CO3	Acquiring values and attitudes towards complex environmental socio-economic challenges and providing participatory role in solving current environmental problems and preventing the future ones.
	CO4	To gain inherent knowledge on basic concepts of bio diversity in an ecological context and about the current threats of biodiversity.
	CO5	To appraise the major concepts and terminology in the field of environmental pollutants, its interconnections and direct damage to the wildlife, in addition to human communities and ecosystems.

Syllabus	
UNIT I	**(6 Hours)**
Multidisciplinary Nature of Environment: Definition: scope and importance–Need for public Awareness - Natural resources–Types of resources–Forest Resources–Water Resources–Mineral Resources –Food Resources– Energy Resources – Land Resources.	
UNIT II	**(6 Hours)**
Ecosystems: Concept of an ecosystem – Structure and functions of an ecosystem–Procedures, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food web and ecological pyramids–Structure and function of the following ecosystem – Forest Ecosystem–Grassland Ecosystem –Desert Ecosystem –Aquatic Ecosystem.	
UNIT III	**(6 Hours)**

Biodiversity and its Conservation: Introduction – Definition – Genetic –Species and ecosystem diversity - Biogeographical classification of India–Value of biodiversity– Biodiversity at global, national and local levels – India as a mega - diversity Nation - Hot spot of biodiversity–Threats to biodiversity-Endangered and endemic species of India– Conservation of Biodiversity–Insitu-Conservation of Biodiversity–Exsitu-Conservation of Biodiversity.

UNIT IV	**(6 Hours)**

Environmental Pollution: Definition- Causes, effects and control measures of: Air Pollution – Water Pollution – Soil Pollution – Marine Pollution – Noise Pollution – Thermal Pollution – Nuclear Pollution – Solid Waste Management: Causes, effects, control measures of urban and industrial wastes – Role of individual in prevention of pollution – Pollution case studies – domestic waste water, effluent from paper mill and dyeing, cement pollution–Disaster Management–Food, Drought, Earthquake, Tsunami, Cyclone and Landslide.

UNIT V	**(6 Hours)**

Social Issues and the Environment: Sustainable Development–Smart City, Urban planning, Town Planning, Urban problems related to energy–Water Conservation: Rain Water Harvesting and Watershed Management–Resettlement and rehabilitation of people, its problems and concerns, case studies Narmatha Valley Project – Environmental ethics, issues and possible solutions – Climate change, global warming, ozone layer depletion, acid rain, nuclear accidents and holocaust, case studies–Hiroshima and Nagasaki, Chernobyl– Consumerism and waste products– Environmental Protection Act–Air Pollution Act(Prevention and Control)–Water Pollution Act(Prevention and control)–Wild Life Protection Act– Forest Conservation Act– Issues involved in enforcement environmental legislation–Public awareness–Human Population and the environment–Population Growth and Distribution – Population Explosion – Family Welfare Programme – Environment and Human Health–Human Rights–Value Education– HIV/AIDS–Women and Child-Welfare–Role of Information Technology in Environment and Human Health.

*Self-study and questions for examinations maybe taken from the self-study portions also.

Teaching Methods:

Chalk and Talk/Powerpoint presentation/Seminar/Brainstorming/Assignment/Google Classroom.

Text Book:

1.P. Arul, "A Text Book of Environmental Studies", Environmental Agency, No27, Nattar street, Velacherrymain road, Velacherry, Chennai–42, 1st Edition, Nov. 2004.

Reference Books:

1) Purohit Shammi Agarwal, "A Text Book of Environmental Sciences", Publisher Mrs. Saraswati Prohit, 1st Edition, Behind Naswan Cinema Chopansi Road, Jodhpur.

2) Dr.Suresh and K.Dhameja, "Environmental Sciences and Engineering", Publisher S.K.Kataria& Sons, 424/6, Guru Nanak Street, Vaisarak, Delhi –110 006.

3) J.Glynn Henryand Gary W Heinke, "Environmental Science and Engineering", Prentice Hall of India Private Ltd., New Delhi–110001.

Sub. Code: 24VED201

Programme Code:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Value Education – Moral and Ethics****			
Batch **2024-2025**	Hours/Week **2**	Total Hours **30**	Credits **2**	Employability/ Skill Development

Course Objectives

1. To impart Value Education in every walk of life.
2. To help the students to reach excellence and reap success.
3. To impart the right attitude by practicing self-introspection.
4. To portray the life and messages of Great Leaders.
5. To insist the need for universal brother hood, patience and tolerance.
6. To help the students to keep them fit.
7. To educate the importance of Yoga and Meditation.

Course Outcomes (CO)		
K1 to K5	CO1	Will be able to recognize Moral values, Ethics, contribution of leaders, Yoga and its practice.
	CO2	Will be able to differentiate and relate the day to day applications of Yoga and Ethics in real life situations.
	CO3	Can emulate the principled life of great warriors and take it forward as a message to self and the society.
	CO4	Will be able to analyze the Practical outcome of practicing Moral values in real-life situation.
	CO5	Could evaluate and Rank the outcome of the pragmatic approach to further develop the skills.

Syllabus	
UNIT I	**(6 Hours)**
Moral and Ethics: Introduction–Meaning of Moral and Ethics–Social Ethics–Ethics and Culture– Aim of Education.	
UNIT II	**(6 Hours)**
Life and Teachings of Swami Vivekananda: Birth and Childhood days of Swami Vivekananda –At the Parliament of Religions–Teachings of Swami Vivekananda.	
UNIT III	**(6 Hours)**
Warriors of our Nation: Subhas Chandra Bose–Sardhar Vallabhbhai Patel–Udham Singh–V. O. Chidambaram Pillai – Bhagat Singh – Tiruppur Kumaran – Dheeran Chinnamalai – Thillaiaadi Valliammai – Velu Nachiyar – Vanchinathan.	
UNIT IV	**(6 Hours)**
Physical Fitness and Mental Harmony: Simplified Physical Exercise–Hand Exercises–Leg Exercises–Neuro Muscular Breathing Exercises–Eye Exercises–Kabalabathi–Maharasana A & B – Massage-Acupressure–Relaxation–Kayakalpa Yogam-Life Force–Aim & Objectives– Principle–Methods. Introspection–Analysis of Thoughts–Moralization of Desires–Neutralization of Anger–Eradication of Worries.	
UNIT V	**(6 Hours)**

Yoga and Meditation–The Asset of India: Yogasanam–Rules & Regulations–Surya Namaskar–Asanas–Sitting–Stanging–Prone -Supine-Pranayama–Naadi Sudhi–Ujjayi –Seethali–Sithkari-Benefits. Meditation–Thanduvasudhi - Agna–Shanthi–Thuriyam– Benefits.

*Self-study and questions for examinations maybe taken from the self-study portions also.

Teaching Methods:

Chalk and Talk/Powerpointpresentation/Seminar/Brainstorming/Assignment/Google Classroom.

Text Book:

1. Value Based Education –Moral and Ethics–Published by Kongunadu Arts and Science College (Autonomous), 2nd Edition, (2021).

Reference Books:

1. Swami Vivekananda – A Biography, Swami Nikhilananda, Advaita Ashrama,India, 24th Reprint Edition, (2010).
2. Gandhi, Nehru, Tagore and other eminent personalities of ModernIndia Kalpana Rajaram, Spectrum Books Pvt. Ltd., revised and enlarged 1st Edition, (2004).
3. Freedom Fighters of India, Lion M.G. Agrawal, Isha Books Publisher,1st Edition (2008).
4. Easy steps to Yoga by Swami Vivekananda, A Divine Life Society Publication, (2000).
5. Yoga Practices -1–The World Community Service Centre –Vethathiri Publications, 6th Edition (2017), Erode.
6. Yoga Practices -2–The World Community Service Centre –Vethathiri Publications, 8th Edition (2017), Erode.

NON-MAJOR ELECTIVE PAPERS

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Non-Major Elective - Human Rights**			
Batch **2024-2025**	Hours/Week **2**	Total Hours **30**	Credits **2**	Employability/ Skill Development

Course Objectives

1. To prepare for responsible citizenship with awareness of the relationshipbetween Human Rights, democracy and development.
2. To impart education on national and international regime on Human Rights.
3. To sensitive students to human suffering and promotion of human life with dignity.
4. To develop skills on human rights advocacy.
5. To appreciate the relationship between rights and duties.
6. To foster respect for tolerance and compassion for all living creature.

Course Outcomes (CO)		
K1 to K5	CO1	To understand the hidden truth of Human Rights by studying various theories.
	CO2	To acquire over all knowledge regarding Human Rights given by United Nation Commission. (UNO)
	CO3	To gain knowledge about various organs responsible for Human Rights such as National Human Rights Commission and state Human Right commission. (UNHCR)
	CO4	To get habits of how to treat aged person, others and positive social responsibilities.
	CO5	To treat and confirm, child, refugees and minorities with positive social justice.

Syllabus

UNIT I **(6 Hours)**

Definition, Meaning, Concept, Theories and Kinds of Human Rights-Evaluation and Protection of Human Rights in India-Development of Human Rights under the United Nations.

UNIT II **(6 Hours)**

United Nations Charter and Human Rights-U.N. Commission on Human Rights-Universal Declaration of Human Rights-International Covenant on

- Civil & Political Rights
- Economic, Social and Cultural Rights.

UNIT III **(6 Hours)**

Human Rights and Fundamental Rights (Constitution)-Enactments regarding Human Rights Laws in India- National Human Rights Commission and State Human Rights Commission.

UNIT IV **(6 Hours)**

Aged persons and their Human Rights- Human Rights of Persons with Disabilities-Tribal Human Rights in India- Three Generation Human Rights-Social Awareness and responsibilities of Individuals

UNIT V **(6 Hours)**

Rights of Women, Child, Refugees and Minorities–Social media and Human Rights-NGO's in protection of Human Rights-Right to Election.

*Self-study and questions for examinations may be taken from the self-study portions also.

Teaching Methods:

ChalkandTalk/Powerpointpresentation/Seminar/Brainstorming/Assignment/GoogleClassroom.

Text Book:

1. Human Rights (2019) Compiled by Kongunadu Arts and Science College, Coimbatore–29.

Reference Books:

1. Human Rights, (2018) Jaganathan, MA.,MBA., MMM., ML., ML., Humanitarian Lawand Refugee Law, J.P. Arjun Proprietor, Usha Jaganathan law series,1stfloor,Narmatha Nanthi Street, Magathma Gandhi Nagar, Madurai – 625014.

24USG4N2

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Non-Major Elective – SOGIESC Studies**			
Batch	Hours/Week	Total Hours	Credits	Employability/ Skill Development
2024-2025	**2**	**30**	**2**	

(SEXUAL ORIENTATION, GENDER IDENTITY, GENDER EXPRESSION AND SEXUALCHARACTERISTICS)

Unit 1

- Introduction
- Importance of this course
- History of SOGIESC
- Definitions
- Sex/Gender identity
- Sexual orientation
- Indigenous minority (Jammath..)
- National Crime statistics
- Case study

Unit II

- Understanding Intersex Human Rights in India
- Genetic perspectives on Intersex
- Basic Understanding of genotypes and phenotypes
- Chromosomal abnormalities
- Case study

Unit III

- Salient Points from *Breaking India* –Rajiv Malhotra and AravindanNeelakandan
- Knowledge War
- Queer Theory
- Woke Theory
- SOGIESC
- Constructive Activism –Positive literature-Entrepreneurs and employeesall over India
- Case study

Unit IV

- Contemporary Politics
- Non-inclusion of SOGIESC-Economic issues
- Case study

Unit V

- Policies, Governance and Future perspectives
- Achievers
- Case study

References

[1] Godhawat, Jyoti. "Read Why Gopi Shankar Calls Attention of Arundhati Roy To Intersex Community." Indian Women Blog, 24 Nov 2017,www.indianwomenblog.org/read-why-gopi-shankar-calls-attention-of- arundhati-roy-to-intersex -community/

[2] Madurai, Gopi Shankar. "Arundhati Roy"s New Book Can Undo Decades ofWork Done ByIntersex Activists" Youth Ki Awaaz

[3] 4th Asian Intersex Forum Statement 2018 -https://intersexday.org/en/intersex-asia-2018/

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intersex-people)

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[14] Press Release. “IAAF introduces new eligibility regulations for female classification.” IAAF, 26 Apr 2018 www.iaaf.org/news/press-release/eligibility-regulations-for-female-classifica

[15] “Nepal Prohibits Discrimination on Grounds of Sexual Orientation and Gender Identity.” Equal Rights Trust, 16 Jan 2008, www.equalrightstrust.org/news/nepal-prohibits-discrimination-grounds-sexual- orientation-andgender-identity

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Times of india.india times.com/articles how/29879738.cms?utm_source=content of interest & utm_medi um=text&utm_campaign = cppst

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[20] United Nations Passes Groundbreaking Intersex Rights Resolution:https://www.hrw.org/news/2024/04/04/united-nations-passes- groundbreaking-intersex-rights-resolution

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[23] SOGIESC Rights in India- An unfinished Agenda, India Country Report, Ilgaasia.org

[24] SOGIESC UPR- Advocacy Toolkit, ilga.org

[25] Intersex Legal Mapping Report- Global Survey on Legal protection for people born with variations in Sex Characteristics ,2023, Ilga.org

ProgrammeCode:**09**	**B.Sc. Computer Science**			
Title of the Paper:	**Non-Major Elective - Consumer Affairs**			
Batch **2024-2025**	Hours/Week **2**	Total Hours **30**	Credits **2**	Employability/ Skill Development

Course Objectives

1. To familiarize the students with their rights and responsibilities as a consumer.
2. To understand the procedure of redress of consumer complaints.
3. To know more about decisions on Leading Cases by Consumer Protection Act.
4. To get more knowledge about Organizational set-up under the Consumer Protection Act.
5. To impart awareness about the Role of Industry Regulators in Consumer Protection.
6. To understand Contemporary Issues in Consumer Affairs.

Course Outcomes (CO)		
K1 to K5	CO1	Able to know the rights and responsibility of consumers.
	CO2	Understand the importance and benefits of Consumer Protection Act.
	CO3	Applying the role of different agencies in establishing product and service standards.
	CO4	Analyze to handle the business firms' interface with consumers.
	CO5	Assess Quality and Standardization of consumer affairs.

Syllabus

UNIT I **(6 Hours)**

Conceptual Framework-Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E- Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology. Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction /dissatisfaction-Grievances-complaint, Consumer Complaining Behavior: Alternatives Available to Dissatisfied Consumers; Complaint Handling Process: ISO10000suite.

UNIT II **(6 Hours)**

The Consumer Protection Law in India-Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, restrictive trade practice. Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important caselaw.

UNIT III **(6 Hours)**

Grievance Redressal Mechanism under the Indian Consumer Protection Law-Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/ Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties. Leading Cases decided under Consumer Protection law by Supreme Court /National Commission: Medical Negligence; Banking; Insurance; Housing& Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

UNIT IV **(6 Hours)**

Role of Industry Regulators in Consumer Protection

i. Banking: RBI and Banking Ombudsman
ii. Insurance: IRDA and Insurance Ombudsman
iii. Telecommunication: TRAI
iv. Food Products: FSSAI
v. Electricity Supply: Electricity Regulatory Commission
vi. Real Estate Regulatory Authority.

UNIT V **(6 Hours)**

Contemporary Issues in Consumer Affairs - Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings. Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag- mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview. Note: Unit 2 and 3 refers to the Consumer Protection Act, 1986. Any change in Law would be added appropriately afterthe new law is notified.

*Self-study and questions for examinations may be taken from the self-study portions also.

Teaching Methods:

Chalk and Talk / Powerpoint presentation /Seminar/ Brainstorming /Assignment/ Google Classroom.

Suggested Readings:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi, (2007), "Consumer Affairs", universities Press.
2. Choudhary, Ram Naresh Prasad (2005), "Consumer Protection Law Provisions and Procedure", Deep and Deep Publications pvt Ltd.
3. G. Ganesan and M. Sumathy. (2012), "Globalization and Consumerism: Issues and Challenges", Regal Publications.
4. Suresh Misra and Sapna Chadah (2012), "Consumer Protection in India: Issues andConcerns", II PA, New Delhi.
5. Rajyalaxmi Rao (2012), "Consumer is King", Universal Law Publishing Company.
6. Girimaji, Pushpa (2002), "Consumer Right for Every one Penguin Books".
7. E-books:
   - www.consumereducation.in, "Empowering Consumers", e- book.
   - www.consumeraffairs.nic.in
   - www.bis.org, "The Consumer Protection Act", 1986 and its later versions.

NON-MAJOR ELECTIVES

Question paper pattern (External Only)

Human Rights / SOGIESC Studies / Consumer Affairs

Duration:3 Hours Max:75 Marks

Answer All Questions

Section A (5 x 5 = 25)

Short note answers

Either or type, one question from each unit.

Section B (5 x 10 = 50)

Essay type questions

Either or type, one question from each unit.

Environmental Studies / Value Education–Moral and Ethics**

Question paper pattern (External Only)

Duration: 3 Hours Max: 50 Marks

Section A (5 X 10=50)

Essay type questions

Either or type, one question from each unit.

KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

COIMBATORE – 641029

DEPARTMENT OF COMPUTER SCIENCE (UA)

Certificate Course

in

Ethical Hacking

CURRICULUM ANDSCHEMEOFEXAMINATIONS

(2024-2025 onwards)

DEPARTMENT OF COMPUTER SCIENCE (UA)

Vision:

- To inculcate Human, Moral and ethical values in the young minds of the students and thereby improving the total personality of the students.

Mission:

- To produce employable graduates to cater the needs of various industries.

PROGRAMME OUTCOME (PO)

PO1	To understand the purpose of ethical hacking in identifying vulnerabilities and enhancing cybersecurity.
PO2	To explore the scope of ethical hacking in various domains such as network security, web application security, and mobile security.
PO3	To Learn about the tools and techniques used in each stage, such as port scanning, vulnerability scanning, and exploitation.
PO4	To explore real-world applications of ethical hacking in industries such as finance, healthcare, and government.
PO5	To analyze the potential effects of ethical hacking on improving cybersecurity posture and mitigating cyber threats.

PROGRAMME SPECIFIC OUTCOME (PSO)

On successful completion of this course you will have knowledge and understanding of:

PSO1 Ability to understand the scientific and technological principles in Ethical Hacking.

PSO2 Ability to know the concepts of Ethical Hacking Techniques and Tools.

PSO3 Ability to apply the design and development principles in Ethical Hacking.

PSO4 Ability to identify problem and solution provision in Ethical Hacking.

PSO5 Utilization of machine learning in Ethical Hacking.

KONGUNADU ARTS AND SCIENCE COLLEGE [Autonomous]

COIMBATORE -641029.

CERTIFICATE COURSE IN ETHICAL HACKING

(Six Months)

CURRICULUM & SCHEME OF EXAMINATION

[APPLICABLE TO THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2024-2025 & ONWARDS]

Semester	Subject code	Title of the Paper	Instruction Hours/Cycle	Exam. Marks			Duration of Exam (hrs)	Credits
				CIA	ESE	Total		
	24CEH101	**Core Paper 1** – Fundamentals of Ethical Hacking	3	25	75	100	3	2
	24CEH102	**Core Paper 2** - Social Engineering	3	25	75	100	3	2
	24CEH103	**Core Paper 3** – System Hacking & Security	3	25	75	100	3	2
	24CEH1CL	**Core Practical 1–** Ethical Hacking Essentials - Lab	3	40	60	100	3	2
	Total		12	-	-	400	-	8

Part-wise Total Marks:

SUBJECT	MARKS	TOTALCREDITS
Core Theory	300	6
Core Practical	100	2

CIA–Continuous Internal Assessment ESE–

End –of-Semester Examination

50% CIA is applicable to all subjects for both Theory and Practical.

CEH-2

Components of Continuous Internal Assessment (50 Marks)

Components		Marks	Total
Theory			
CIA I	75	(75+75) Converted to 15	25
CIA II	75		
Assignment/Seminar		5	
Attendance		5	
Practical			
CIA Practical		25	40
Observation Notebook		10	
Attendance		5	

* Class Participation, Case Studies Presentation, Field Work, Field Survey, Group Discussion, Term Paper, Workshop / Conference Participation. Presentation of Papers in Conferences, Quiz, Report / Content writing. Etc.

**Two Assignments to be given. (Each 5 marks).

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1-Remembering; **K2**-Understanding; **K3**-Applying; **K4**-Analyzing; **K5**-Evaluating

1. Theory Examination:

(i) CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 10	A (Answer all)	10 x 1 = 10	MCQ	75
K1 – K5 Q11 to 15	B (Either or pattern)	5 x 5 = 25	Short Answers	
K2 – K5 Q16 to 20	C (Either or pattern)	5 x 8 = 40	Descriptive / Detailed	

**For ESE 50 marks converted to 25 marks.

2. ESE Practical Examination:

Knowledge Level	Section	Marks
K3	Experiments	50
	Record Work	10
Total		60

CEH-3

Sub. Code: 24CEH101

Programme Code: 09	**CERTIFICATE COURSE IN ETHICAL HACKING**		
Title of the Paper: Core Paper 1– Fundamentals of Ethical Hacking			
Batch **2024-2025**	Hours/Week **3**	Total Hours **45**	Credits **2**

Course Objectives

1. To understand the fundamentals of ethical hacking.
2. To learn about different types of hackers and their motivations.
3. To explore the legal and ethical considerations associated with ethical hacking.
4. To gain knowledge of various hacking tools and techniques used for penetration testing.
5. To develop skills to identify and exploit vulnerabilities in computer systems and networks.

Course Outcomes (CO)

K1 to K5	CO1	Understand the fundamental concepts of ethical hacking.
	CO2	Demonstrate proficiency in using various hacking tools and techniques ethically.
	CO3	Analyze and assess network vulnerabilities and security threats effectively.
	CO4	Implement strategies for securing networks and systems against cyber attacks.
	CO5	Demonstrate knowledge of legal and ethical issues related to ethical hacking.

Syllabus

Unit I **(9 Hours)**

Overview of Ethical Hacking: Definition, scope, and importance of ethical hacking. Ethics and Legal Aspects: Understanding ethical considerations and legal frameworks in ethical hacking. Types of Hackers: Exploring different categories of hackers and their motivations.

Unit II **(9 Hours)**

Information Gathering Techniques - Methods for collecting data and foot printing. Foot printing Tools- Overview of tools used for foot printing and reconnaissance. Foot printing Process - Step-by-step approach to gathering information about target systems.

Unit III **(9 Hours)**

Network Scanning Overview - Introduction to network scanning and its objectives. Scanning Techniques - Understanding different scanning techniques and their applications. Scanning Tools - Overview of tools used for scanning networks and identifying vulnerabilities.

Sub. Code: 24CEH101

Unit IV **(9 Hours)**

Enumeration Concepts - Understanding the enumeration process and its significance. Enumeration Techniques - Exploring different techniques for extracting information from target systems. Enumeration Tools - Overview of tools used for enumeration and gathering system details.

Unit V **(9 Hours)**

System Hacking Fundamentals - Introduction to system hacking and its objectives. Exploitation Techniques - Understanding common vulnerabilities and exploitation methods. Hacking Tools - Overview of tools used for system hacking and gaining unauthorized access.

Teaching Methods:

Chalk and Talk, Smart Class Room, Powerpoint Presentation, Seminar, Quiz &Discussion

Text Books:

1. Patrick Engebretson (2013), **"The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy".**
2. Michael Bazzell (2018), **"Open Source Intelligence Techniques: Resources for Searching and Analyzing Online Information"**.
3. TJ O'Connor (2012), **"Violent Python: A Cookbook for Hackers, Forensic Analysts, Penetration Testers and Security Engineers"**.

Reference Books:

1. Jon Erickson (2008)."Hacking: The Art of Exploitation"

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	H
CO2	S	S	H	M	S
CO3	H	S	H	S	H
CO4	S	S	H	S	H
CO5	S	H	H	S	M

S– Strong **H** –High **M**–Medium **L** –Low

CEH-5

Sub. Code: 24CEH102

Programme Code: 09	**CERTIFICATE COURSE IN ETHICAL HACKING**		
Title of the Paper: Core Paper 2– Social Engineering			
Batch	Hours/Week	Total Hour	Credits
2024-2025	**3**	**45**	**2**

Course Objectives

1. To provide an overview and classification of various social engineering techniques.
2. To understand the fundamental principles and concepts of social engineering focusing on psychological manipulation, deception tactics, and human behavior analysis.
3. To acquire proficiency in the execution and application of social engineering techniques.
4. To understand the ethical and legal aspects associated with social engineering practices, emphasizing responsible conduct, privacy protection, and adherence to ethical standards

Course Outcomes (CO)

K1toK5	CO1	Understand the concept of social engineering and its role in cybersecurity.
	CO2	Identify various social engineering techniques used to manipulate individuals and organizations.
	CO3	Analyze case studies and real-world examples to comprehend the impact of social engineering attacks.
	CO4	Develop strategies to mitigate the risks associated with social engineering attacks
	CO5	Gain practical skills to recognize and respond to social engineering attempts effectively.

Syllabus

Unit I **(9 Hours)**

Understanding of the foundational concepts of social engineering - The importance of social engineering in cybersecurity - psychological principles underlying social engineering tactics - The ethical and legal aspects associated with social engineering techniques.

Unit II **(9 Hours)**

Various types of social engineering attacks – phishing – pretexting – baiting - tailgating, understanding their tactics and methods of exploitation.

Sub. Code: 24CEH102

Unit III **(9 Hours)**

Analyze notable social engineering incidents - extract lessons learned - conduct impact analysis to comprehend the consequences of these attacks.

Unit IV **(9 Hours)**

Mitigation strategies aimed at preventing social engineering attacks - including risk mitigation - security awareness training - incident response planning.

Unit V **(9 Hours)**

Importance of security awareness in combating social engineering attacks - Role of security policies- Training programs - Incident response protocols in fostering a culture of security within organizations.

Teaching Methods:

Chalk and Talk, Smart Class Room, Powerpoint Presentation, Seminar, Quiz &Discussion

Text Books:

1. Jeremiah Talamantes, 2018, "The Social Engineer's Playbook: A Practical Guide to Pretexting".
2. Christopher Hadnagy, 2018, "Social Engineering: The Science of Human Hacking".
3. Jeremiah Talamantes, 2018, "The Social Engineer's Playbook: A Practical Guide to Pretexting"

Reference Books:

1. Kevin D. Mitnick, 2002, The Art of Deception: Controlling the Human Element of Security".
2. Christopher Hadnagy, Michele Fincher, 2015, Phishing Dark Waters: The Offensive and Defensive Sides of Malicious Emails".
3. Gavin Watson, 2014, "Social Engineering Penetration Testing: Executing Social Engineering Pen Tests, Assessments and Defense".

CEH-7

Sub. Code: 24CEH102

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	H
CO2	S	S	H	S	S
CO3	S	H	H	S	H
CO4	S	S	S	S	M
CO5	S	S	S	H	M

S– Strong **H** –High **M**–Medium **L** –Low

CEH-8

Sub. Code: 24CEH103

Programme Code :09	**CERTIFICATE COURSE IN ETHICAL HACKING**		
Title of the Paper:	**Core Paper 3 – System Hacking & Security**		
Batch **2024-2025**	Hours/Week **3**	Total Hours **45**	Credits **2**

Course Objectives

1. To Understand concepts and principles of system hacking and security.
2. To Understand different hacking techniques such as password cracking, privilege escalation, and backdoor entry.
3. To understand the importance of reconnaissance, scanning, and enumeration phases in system hacking.
4. To develop proficiency in using hacking tools and software for ethical penetration testing.
5. To apply best practices and security measures to safeguard computer systems from cyber threats and attacks.

Course Outcomes (CO)

K1 to K5	CO1	Understand the fundamentals of system hacking and security measures.
	CO2	Learn various techniques and tools used in system hacking for penetration testing and vulnerability assessment.
	CO3	Gain insights into the methodologies employed by attackers to exploit system vulnerabilities.
	CO4	Develop the skills to identify, analyze, and mitigate security threats within computer systems.
	CO5	Apply ethical hacking principles to enhance the security posture of organizations and prevent unauthorized access to sensitive information.

Syllabus

Unit I **(9 Hours)**

Introduction to System Hacking - A foundational understanding of system hacking - focusing on various techniques and methodologies employed to compromise computer systems. Importance of system security - common vulnerabilities - ethical considerations and legal frameworks in system hacking.

Unit II **(9 Hours)**

Password cracking techniques - privilege escalation methods used by attackers to gain unauthorized access to systems. Different password cracking algorithms - brute-force attacks, dictionary attacks and the significance of strong password policies.

Sub. Code: 24CEH103

Unit III **(9 Hours)**

Malware and Rootkits - The concepts of malware and rootkits - Including types of malware such as viruses, worms, trojans, ransomware, and spyware.

Unit IV **(9 Hours)**

Backdoors and Remote Access - backdoors and remote access tools used by hackers to establish unauthorized access to systems - Different types of backdoors - including hardware and software-based backdoors - as well as remote access Trojans (RATs) - remote administration tools (RATs).

Unit V **(9 Hours)**

System Hardening and Security Measures - System hardening techniques and security measures aimed at protecting computer systems from various cyber threats. Intrusion detection / Prevention systems (IDS/IPS) – firewalls - antivirus software.

Teaching Methods:

Chalk and Talk, Smart Class Room, Powerpoint Presentation, Seminar, Quiz & Discussion

Text Books:

1. "Hacking: The Art of Exploitation" by Jon Erickson (2003).
2. "Violent Python: A Cookbook for Hackers, Forensic Analysts, Penetration Testers and Security Engineers" by TJ O'Connor (2012).
3. "Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software" by Michael Sikorski and Andrew Honig (2012).
4. "Network Security Essentials: Applications and Standards" by William Stallings (2017)

Reference Books:

1. "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws" by Dafydd Stuttard and Marcus Pinto (2011).
2. "Rootkits and Bootkits: Reversing Modern Malware and Next Generation Threats" by Alex Matrosov, Eugene Rodionov, and Sergey Bratus (2012).

Sub. Code: 24CEH103

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	H
CO2	S	S	H	S	S
CO3	S	H	H	S	H
CO4	S	S	S	S	M
CO5	S	S	H	S	S

S– Strong **H** –High **M**–Medium **L** –Low

Sub. Code: 24CEH1CL

Programme Code :**09**	**CERTIFICATE COURSE IN ETHICAL HACKING**		
Core Practical 1– Ethical Hacking Essentials - Lab			
Batch	Hours/Week	Total Hours	Credits
2024-2025	**3**	**45**	**2**

Course Objectives

1. To provide students with practical exposure to fundamental ethical hacking concepts and techniques.
2. To familiarize students with the operation and usage of common ethical hacking tools and software.
3. To enable students to perform ethical hacking exercises independently and analyze the results.
4. To enhance students' problem-solving skills through real-world ethical hacking scenarios and simulations.
5. To empower students with the skills and knowledge necessary to contribute to cybersecurity efforts and protect against malicious attacks.

Course Outcomes (CO)

K3 to K5	CO1	Gain practical experience in essential ethical hacking techniques and tools.
	CO2	Develop proficiency in using various hacking tools for penetration testing and vulnerability assessment.
	CO3	Understand the practical applications of ethical hacking principles to identify and mitigate security vulnerabilities.
	CO4	Acquire hands-on experience in conducting ethical hacking exercises and simulations.
	CO5	Apply ethical hacking methodologies to enhance the security posture of computer systems and networks.

List of Practical Programs

1. Write a Python script to perform a brute-force attack on a password-protected ZIP file.
2. Write a python script to implement a simple network scanner using the scapy library to discover devices on the local network.

CEH-12

Sub. Code: 24CEH1CL

3. Write a Python script to perform a TCP port scan on a target host.
4. Write a packet sniffer using the scapy library to capture and display network traffic.
5. Write a Python script to scrape a website and extract useful information, such as email addresses or links.

Guidelines to the distribution of marks for Practical

Examinations: Two Questions will be given for each student. (3 Hours / 60marks) Record: 10 marks

Particulars	Program1 (Marks)	Program2 (Marks)
Algorithm	5	5
Program Coding	15	15
Execution & Modifications	5	5

Teaching Methods:

Presentation and Program Demonstration using Projector

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	M	S	H
CO4	S	S	S	S	S
CO5	S	S	S	S	H

S– Strong **H** –High **M**–Medium **L** –Low