B.Sc. COMPUTER SCIENCE
(Honours)

CURRICULUM FRAMEWORK AND SYLLABI

(Under Choice Based Credit System - Outcome Based Education)

(For the students joining in the
Academic year 2024 – 2025 and afterwards)

DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS
THE GANDHIGRAM RURAL INSTITUTE
(Deemed to be University)
Gandhigram - 624 302
Dindigul District
Tamil Nadu

THE GANDHIGRAM RURAL INSTITUTE
(Deemed to be University)
DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

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Vision

To provide quality-assured academic, research and extension services in the domain of Computer Science and Applications, to promote dissemination of knowledge in Information and Communication Technologies for Rural Development.

Mission

Empower the rural youth by transforming them into proficient and socially responsible computer professionals and cater them to the envisaged demand in the operational and functional domains of the industries and service sectors.

Graduate Attribute

The graduates of our institute are expected to possess the following attributes.

1. *Informed*
   The graduates of GRI are well-informed and are able to retrieve, analyse and assimilate complex information. They understand the local and global issues and are able to apply their knowledge. They are able to work in tandem with the rural community.
2. *Problem solver*
   The graduates of GRI have the ability to work on development issues. They are capable of being creative, logical and critical thinking which in turn help them to respond to challenges and opportunities effectively. They are also capable of making and implementing decisions.
3. *Active learners and critical thinkers*
   Graduates of this university are active learners and are capable of critically analyzing issues. They are capable of undertaking critical enquiry and reflection, find and evaluate information using a variety of sources and technologies. They do possess the attitude of acknowledging the works and ideas of others.
4. *Effective communication*
   The graduates have good communication skills and are capable of articulating their ideas effectively. They can negotiate and engage with people in varied settings.
5. *Rural minded*
   The graduates of GRI are well-informed and are able to retrieve, analyse and assimilate complex information. They understand the local and global issues and are able to apply their knowledge. They are able to work in tandem with the rural community.

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PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 1: To prepare the graduates with expected domain knowledge to be employed in public and Information Technology (IT) enabled services.

PEO 2: To demonstrate needed skill in Computer Science and other inter-disciplinary areas.

PEO 3: To train the students to apply current tools and technologies to develop software solutions for social needs.

PEO 4: To prepare the students to continue the process of lifelong learning through professional activities that contributes to personal and social development.

PEO 5: To motivate the students to become entrepreneurs in IT enabled ventures.

PROGRAMME OUTCOME (PO)

PO 1: To become knowledgeable in the subject of Computer Science and Allied Subjects that are relevant and appropriate to the domain.

PO 2: To design and develop software solutions to cater to the industrial requirements.

PO 3: To develop communication skill to present ideas effectively and efficiently.

PO 4: To equip the students to the changing needs and motivate them to take-up masters and research programmes.

PO 5: To inculcate human, professional and ethical values to become a socially responsible citizen.

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO 1: Demonstrate the working principles of various hardware and software of a computer system.

PSO 2: Acquire knowledge in programming and understand the basic concepts and techniques in computer domain.

PSO 3: Analyse and identify the customer requirements to develop software solutions.

PSO 4: Develop software solutions for real life problems by applying latest technologies.

PSO 5: Empower the students with technical and other soft skills for successful career, entrepreneur and higher studies.

Mapping of PEOs with PSOs & POs:

PEO Vs. PO&PSO	PO					PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
PEO1	3	3	3	2	2	3	3	3	3	3
PEO2	3	3	2	2	3	3	3	3	3	3
PEO3	3	3	2	2	2	3	3	3	3	3
PEO4	3	3	3	3	3	3	3	3	3	3
PEO5	3	3	2	2	2	3	3	3	3	3

Strongly Correlating (S) - 3 marks

Moderately Correlating (M) - 2 marks

Weakly Correlating (W) - 1 mark

No Correlation (N) - 0 mark

CO & PO ATTAINMENT RUBRICS

Direct Assessment:

i) CFA & ESE - 30 %

ii) Assignment/Reports/Case Study - 40%

Indirect Assessment:

i) Exit Survey - 30 %

THE GANDHIGRAM RURAL INSTITUTE (DEEMED TO BE UNIVERSITY)
Ministry of Education (Shiksha Mantralaya), Govt. of India
Accredited by NAAC with A Grade (3rd Cycle)
DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

B. Sc. COMPUTER SCIENCE

(Honours)

(Under Choice Based Credit System - Outcome Based Education)

CURRICULUM FRAMEWORK AND SYLLABI
(For the students joining in 2024 – 2025 and afterwards)

Course code	Title of the Course	Credits	Hours		Max. Marks		
			Theory	Practical	CFA	ESE	Total
SEMESTER I							
24CSUC1101	**Core Major - 1:** Programming in C	3	3	-	40	60	100
24CSUC1102	**Core Major - Lab 1:** C Programming	1	-	3	60	40	100
24MAUB1104	**Core Minor - 1:** Mathematics - I: Foundations of Mathematical Analysis and Computation	4	4	-	40	60	100
---	**Multidisciplinary - I**	3	3	-	40	60	100
24ENUA1101	**Ability Enhancement Course (AEC):** Essential English: Basic	3	3	-	40	60	100
24TAUS1101/ 24MLUS1101/ 24HIUS1101	**Skill Enhancement Course:** Indian Language (Tamil/Malayalam/Hindi) - I	3	3	-	40	60	100
24FSUV1001	**Value Added Course - 1**: Environmental Science	2	2	-	50	-	50
24FAUV1001/ 24GTUV1002	**Value Added Course - 2:** Heritage & Culture History of India / Shanthi Sena	2	2	-	50	-	50
	Total	**21**	**20**	**3**			
SEMESTER II							
24CSUC1203	**Core Major - 2:** Data Structures	3	3	-	40	60	100
24CSUC1204	**Core Major - Lab 2:** Data Structures	1	-	3	60	40	100
24MAUB1209	**Core Minor - 2:** Mathematics - II: Statistical Analysis and Mathematical Calculus	4	4	-	40	60	100
---	**Multidisciplinary - II**	3	3	-	40	60	100
24ENUA1202	**Ability Enhancement Course (AEC):** Essential English: Intermediate	3	3	-	40	60	100
24TAUS1202/ 24MLUS1202/ 24HIUS1202	**Skill Enhancement Course:** Indian Language (Tamil/Malayalam/Hindi) - II	3	3	-	40	60	100
24PEUV1001	**Value Added Course - 3:** Yoga & Fitness	2	-	2	50	-	50
24GTUV1001	**Value Added Course - 4:** Let us Know Gandhi	2	2	-	50	-	50
24TAUS0004/ 24MLUS0004/ 24HIUS0004/	**Skill Enhancement Course:** Functional Tamil/Malayalam/Hindi	2	2	-	50	-	50
	Total	**23**	**20**	**5**			

Course code	Title of the Course	Credits	Hours		Max. Marks		
			Theory	Practical	CFA	ESE	Total
SEMESTER III							
24CSUC2105	**Core Major - 3:** Python Programming	3	3	-	40	60	100
24CSUC2106	**Core Major - Lab 3:** Python Programming	1	-	3	60	40	100
24CSUC2107	**Core Major - 4:** Operating System	3	3	-	40	60	100
24CSUC2108	**Core Major - Lab 4:** Operating System	1	-	3	60	40	100
24PHUB2103	**Core Minor - 3**: Physics - I for Computer Science: Digital Principles	4	4	-	40	60	100
--	**Multidisciplinary - III** (Online Course)	3	3	-	40	60	100
24ENUA2103	**Ability Enhancement Course (AEC):** Essential English: Advanced	3	3	-	40	60	100
24TAUS2103/ 24MLUS2103/ 24HIUS2103	**Skill Enhancement Course:** Indian Language (Tamil/Malayalam/Hindi) - III	3	3	-	40	60	100
24EXUE2101	**Extension:** Village Placement Programme	2	-	-	50	-	50
	Total	**23**	**19**	**6**			
SEMESTER IV							
24CSUC2209	**Core Major - 5**: Java Programming	3	3	-	40	60	100
24CSUC2210	**Core Major - Lab 5**: Java Programming	1	-	3	60	40	100
24CSUC2211	**Core Major - 6:** Computer Networks	3	3	-	40	60	100
24CSUC2212	**Core Major - Lab 6:** Computer Networks	1	-	3	60	40	100
24CSUC2213	**Core Major - 7:** Software Engineering	4	4	-	40	60	100
24PHUB2204	**Core Minor - 4:** Physics – II for Computer Science: Microprocessor and Assembly Language Programming	3+1	3	3	40	60	100
24ENUA2204	**Ability Enhancement Course (AEC):** Science Communication	3	3	-	40	60	100
24EXUE2201	**Extension:** Community Engagement	2	2	-	50	-	50
	Total	**21**	**18**	**9**			
SEMESTER V							
24CSUC3114	**Core Major - 8:** Database Management System	3	3	-	40	60	100
24CSUC3115	**Core Major - Lab 7:** DBMS	1	-	3	60	40	100
24CSUC3116	**Core Major - 9:** Cloud Computing	4	4	-	40	60	100
24CSUC3117	**Core Major - 10:** Mobile Computing	4	4	-	40	60	100
24GIUB3105	**Core Minor - 5:** Geographical Information System	3+1	3	3	40	60	100
24CSUC3118	**Internship**	2	-	-	50	-	50
24CSUE3101	**Field Study** : Field Visit for ITRD	2	1	1	50	-	50
	Total	**20**	**15**	**7**			

Course code	Title of the Course	Credits	Hours		Max. Marks		
			Theory	Practical	CFA	ESE	Total
SEMESTER VI							
24CSUC3219	**Core Major - 11:** Web Programming	3	3	-	40	60	100
24CSUC3220	**Core Major - Lab 8 :** Web Programming	1	-	3	60	40	100
24CSUC3221	**Core Major - 12:** Introduction to Artificial Intelligence	4	4	-	40	60	100
24CSUC3222	**Core Major - 13:** Information Security	4	4	-	40	60	100
24CSUC3223	**Core Major - 14:** Data Mining	4	4	-	40	60	100
24GIUB3206	**Core Minor - 6:** Remote Sensing	3+1	3	3	40	60	100
24CSUC3224	**Project /** **Core Major - 15:** Mobile Application Development	4 4	- 4	4 -	40 40	40+20 60	*100 100
	Total	**24**	**18/22**	**10/6**			
SEMESTER VII							
24CSUC4125	**Core Major - 16:** Advanced Algorithms	4	4	-	40	60	100
24CSUC4126	**Core Major - 17:** Advanced Java Programming	3	3	-	40	60	100
24CSUC4127	**Core Major - Lab 9:** Advanced Java & Algorithms	1	-	3	60	40	100
24CSUC4128	**Core Major - 18:** Machine Learning using Python	3	3	-	40	60	100
24CSUC4129	**Core Major - Lab 10:** Machine Learning using Python	1	-	3	60	40	100
24COUB4107	**Core Minor - 7:** Accounting for Decision Making	4	4	-	40	60	100
24MAUB4108	**Core Minor - 8:** Maths I: Mathematical Foundation for Computer Science	4	4	-	40	60	100
	Total	**20**	**18**	**6**			
SEMESTER VIII							
24CSUC4230	**Core Major - 19:** Advanced Database Management Systems	3	3	-	40	60	100
24CSUC4231	**Core Major - Lab 11:** Advanced DBMS	1	-	3	60	40	100
24CSUC4232	**Core Major - 20:** Deep Learning for Computer Vision	3	3	-	40	60	100
24CSUC4233	**Core Major - Lab 12:** DLCV	1	-	3	60	40	100
24CSUC4234	**Project**	12	-	16	100	100+100	#300
	Total	**20**	**6**	**22**			
	Total Credits I to VIII semester	**172**					

Project Evaluation:

	*	#
Internal	40	120
External	40	120
Joint Viva	20	60

Multidisciplinary – III:

Courses for B.Sc. Computer Science (Honours) in MOOC / Spoken Tutorials based on the availability

S. No.	Name of the Course	Semester
1.	Advanced C	I
2.	Ethical Hacking	I
3.	CSS	II
4.	Computer Graphics	II
5.	HTML	III
6.	The Joy of Computing using Python	III
7.	Introduction to Computers	IV
8.	Software Engineering	IV
9.	Javascript	V
10.	Cloud Computing	V
11.	Java	VI
12.	AI: Search Methods for Problem Solving	VI

SEMESTER I

Course Code & Title	**24CSUC1101** **Core Major 1: Programming in C** **Credits: 3**		
Class	**B.Sc. (Computer Science)**	**Semester**	**I**
Course Objectives	**The Course aims to** • Impart the Principles of C Language • Lay the foundation to learn other advanced programming languages • Motivate the students to develop projects using C		
Cognitive Level	**K1:** Remembering the C language Programming constructs **K2:** Understand the logic behind in writing any programs. **K3:** Apply the learnt syntax to write programs. **K4:** Analyze the output of the programme **K5:** Create a program for real world problems.		

UNIT	CONTENTS	Lecture Schedule
I	**Program Structure and Fundamentals**	12
	Program Structure: Identifiers – Data Types – Integer – Float – Character – Constants – Variables. Operators and Expressions, Managing Input and Output Operations.	
II	**Control Structures**	13
	Decision Making and Branching: *if* Statement – *if … else* Statement – Nested *if … else* Statements – *?:* operator – *switch* Statement – *go to* Statement. **Loop Statement:** *for* Statement – *do… while* Statement – *while … do* Statement.	
III	**Arrays and String**	12
	Arrays: Definition – Declaration – Entering Values in Arrays – Manipulating Arrays. **String:** Declaring, Initializing, Printing and Reading strings, String manipulation functions.	
IV	**Functions and Structures& Union**	13
	Functions: Defining User defined function – Accessing a function Passing arguments to a function – Recursion. **Structure& Union:** Defining – Declaring – Initialization – Structures and Functions – Array of structures – Union.	
V	**Pointers and File Management**	14
	Pointers: Understanding Pointers – Pointers and Functions **- File:** Defining – Opening and Closing –Input and output operations – File Random Access.	
Total Conduct Hours		**64**

Text Book:

1. E. Balagurusamy, Programming in ANSI C, 8/e Tata McGraw Hill, 2019.

References:

1. Stephen G. Kochan, Programming in C, 4th Ed., Pearson Education, 2015.
2. Byron Gottfried, Programming with C, 2ndEd., TMH publications, 2006.
3. Kalavathi. P, C – A Text for Beginners, Bonfring Publications, Tamil Nadu, 2014

E- Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.w3schools.in/c-tutorial/
3. http://www.learn-c.org/en/Welcome

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: Develop logic for problem solving through programming **CO2:** Decide on the appropriate C data types for problem solving **CO3:** Exhibit ability to contextually and optimally use the C programming constructs - decision making, iteration and looping **CO4:** Develop C programs with the concept of modularity using functions **CO5:** Provide computational solutions for real-time problems using C Programming

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	2	3
CO2	2	2	3	2	3
CO3	3	2	1	3	3
CO4	3	3	3	3	3
CO5	1	3	3	3	3

Course Code & Title	24CSUC1102 Core Major - Lab 1: C Programming Credit: 1		
Class	**B.Sc. (Computer Science)**	**Semester**	**I**
Course Objective	**The Course aims to** • Give a strong foundation on the structured programming using C language. • Provide hands–on training in C Programming • Train the students to implement various programming concepts and write C Program for the given problem		
Cognitive Level	**K1 – K5**		

Sl. No.	CONTENTS	No. of Hours
	C Programming with	
1.	Control structures if, nested if, for, while and do … while	48
2.	Array handling – Two and Three dimensional array	
3.	Pointers	
4.	Functions – Various function operations and recursive function	
5.	Structure and Union	
6.	File handling – read and write operations	
Total Conduct Hours		**48**
Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Analyse and understand the various programming constructs through simple C programs **CO2:** Write the C programs using control structures **CO3:** Trace the execution of programs and debug the programs **CO4:** Implement programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor statements **CO5:** Exhibit ability to handle files	

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	2	3
CO2	2	2	3	2	3
CO3	3	2	2	3	3
CO4	3	3	3	3	3
CO5	1	3	3	3	3

Course Code & Title	24MAUB1104 Core Minor 1: Mathematics - I Foundations of Mathematical Analysis and Computation Credits: 4		
Class	**B.Sc. (Computer Science)**	**Semester**	**I**
The syllabus will be provided by the respective department			

Course Code & Title	Multidisciplinary - I Credits: 3		
Class	**B.Sc. (Computer Science)**	**Semester**	**I**
The syllabus will be provided by the respective department			

Course Code & Title	24ENUA1101 Ability Enhancement Course(AEC) - Essential English: Basic Credits: 3		
Class	**B.Sc. (Computer Science)**	**Semester**	**I**
The syllabus will be provided by the respective department			

Course Code & Title	24TAUS1101 / 24MLUS1101 / 24HIUS1101 Skill Enhancement Course (AEC): **Indian language** (Tamil/Malayalam/Hindi) - I Credits: 3		
Class	**B.Sc. (Computer Science)**	**Semester**	**I**
The syllabus will be provided by the respective department			

Course Code & Title	24FSUV1001 Value Added Course - 1: Environmental Science Credits: 2		
Class	**B.Sc. (Computer Science)**	**Semester**	**I**
The syllabus will be provided by the respective department			

Course Code & Title	24FAUV1001 / 24GTUV1002 **Value Added Course - 2:** Heritage and Culture History of India / Shanthi Sena Credits: 2		
Class	**B.Sc. (Computer Science)**	**Semester**	**I**
The syllabus will be provided by the respective department			

SEMESTER II

Course Code & Title	24CSUC1203 Core Major - 2: Data Structures Credits: 3		
Class	**B.Sc. (Computer Science)**	**Semester**	**II**
Course Objectives	**The Course aims to** • Explain the design and implementation of various basic and advanced data structures. • Describe various technique for representation of the data in the real world • Prepare the students to choose the appropriate representation of data structures and their applications		
Cognitive Level	**K1:** Define the types of data structure **K2:** Describe the implementation of data structures **K3:** Identify the appropriate data structure for solving real-world problems		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction, Arrays** **Introduction**: Definitions-Concept of Data Structures-Overview of Data Structures-Implementation of Data Structures. **Arrays:** Definition-Terminology-One Dimensional Array-Multi Dimensional Array.	12
II	**Searching, Sorting** **Searching:** Linear Search-Binary Search. **Sorting**: Bubble Sort-Quick Sort-Merge Sort-Heap Sort.	13
III	**Linked List** **Linked List:** Definition- Single Linked List-Circular Linked List-Double Linked List-Circular Double Linked List.	13
IV	**Stacks, Queues** **Stacks:** Introduction-Definition-Representation of a Stack-Operation on Stacks. **Queues:** Introduction-Definition-Representation of Queues-Various Queue Structure.	13
V	**Tables, Trees** **Tables:** Rectangular Table - Jagged Table - Inverted Table - Hash Table. **Trees:** Basic Terminology - Definition and Concepts - Representation of Binary Tree - Operation on a Binary Tree - Binary Search Tree.	13
Total Conduct Hours		**64**

Text Book:

1. Debasis Samanta, "Classic Data Structures", Second Edition, PHI Learning Pvt, Ltd, Second Edition, 2018, Chapters 1, 2, 3, 4, 5, 6 & 7

References:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education Asia, 2nd Edition, 2016.
2. Reema Thareja, "Data structures with C", Tata Mc Graw Hill, 2nd Edition, 2014.

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: Describe the representation of single dimensional and multidimensional arrays.
	CO2: Discuss the Computational efficiency of the Searching and Sorting.
	CO3: Formulate the data representation using linked list and its variants.
	CO4: Demonstrate primitive operations of Stacks and Queues.
	CO5: Implementation of Trees and Tables and perform various operations on these data structure.

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	1	3	3
CO2	3	3	1	2	3
CO3	3	3	1	1	3
CO4	3	3	1	1	3
CO5	3	3	1	2	3

Course Code & Title	24CSUC1204 Core Major - Lab 2: Data Structures Credit: 1		
Class	B.Sc. (Computer Science)	Semester	II
Course Objectives	The Course aims to • Explain the design and implementation of various basic and advanced data structures. • Describe various techniques for representation of the data in the real world. • Prepare the students to choose the appropriate representation of data structures and their applications.		
Cognitive Level	K1 – K5		

Sl. No.	CONTENTS	Hours of Work
1. 2. 3. 4. 5. 6. 7. 8.	Array String Operations Sorting and Searching Stack – Creation, Push and Pop, Conversion and evaluation of Prefix and Postfix expression Queues – Creation, Insertion, Deletion Linked list – Creation, Insertion and Deletion using Singly Linked List, Circular List and Doubly - Linked list. Binary Trees – Creation, Tree traversal Binary Search Tree – Creation, Searching and Deleting an element	48
	Total Conduct Hours	**48**
Course Outcomes	**On completion of the course, students will be able to** **CO1:** Implementation of array functions **CO2:** Write string operations and sorting & searching algorithm **CO3:** Implement by using stack and queues **CO4:** Learn to understand linked list **CO5:** Develop a simple tree traversal	

Mapping COs with PSOs:

CO VsPSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	2
CO2	3	3	3	2	2
CO3	3	3	3	2	2
CO4	3	3	3	1	2
CO5	3	3	3	3	2

Course Code & Title	24MAUB1209 Core Minor - 2: Mathematics - II Statistical Analysis and Mathematical Calculus Credits: 4		
Class	B.Sc. (Computer Science)	Semester	II
The syllabus will be provided by the respective department			

Course Code & Title	Multidisciplinary - II Credits: 3		
Class	B.Sc. (Computer Science)	Semester	II
The syllabus will be provided by the respective department			

Course Code & Title	24ENUA1202 Ability Enhancement Course(AEC): Essential English - Intermediate Credits: 3		
Class	B.Sc. (Computer Science)	Semester	II
The syllabus will be provided by the respective department			

Course Code & Title	24TAUS1202 / 24MLUS1202 / 24HIUS1202 Skill Enhancement Course (AEC): Indian language (Tamil/Malayalam/Hindi) - II		Credits: 3
Class	B.Sc. (Computer Science)	Semester	II
The syllabus will be provided by the respective department			

Course Code & Title	24PEUV1001 Value Added Course - 3: Yoga & Fitness Credits: 2		
Class	B.Sc. (Computer Science)	Semester	II
The syllabus will be provided by the respective department			

Course Code & Title	24GTUV1001 Value Added Course - 4: Let us Know Gandhi Credits: 2		
Class	B.Sc. (Computer Science)	Semester	II
The syllabus will be provided by the respective department			

Course Code & Title	24TAUS0004 / 24MLUS0004 / 24HIUS0004 Skill Enhancement Course: Functional Tamil/Malayalam/Hindi Credits: 2		
Class	B.Sc. (Computer Science)	Semester	II
The syllabus will be provided by the respective department			

SEMESTER III

Course Code & Title	24CSUC2105 Core Major - 3: Python Programming Credits: 3		
Class	**B.Sc. (Computer Science)**	**Semester**	**III**
Course Objectives	**The Course aims to** • To develop logical thinking, problem solving and implementation skills using Python. • To understand the data structures of Python namely lists, dictionaries and tuples. • To familiarize the usage of Python Libraries for data analysis.		
Cognitive Level	**K1:** Recall the basic definitions of Programming Languages **K2:** Summarize the knowledge in programming **K3:** Prepare programs related to their field using Python language		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction**	12
	Introduction to Python: Introduction – Python overview – Getting started – Comments – Python identifiers – Reserved keywords – Variables – Standard data types – Operators – Statements and Expressions – String operations – Boolean expressions. **Control Statements:** The for loop – while statement – if-elif-else statement – Input from keyboard.	
II	**Strings - Tuples - Lists - Dictionaries**	13
	Strings: Strings –Compound data type – len function – String slices – String traversal – Escape characters – String formatting operator – String formatting functions. **Tuples:** Tuples – Creating tuples – Accessing values in tuples Basic tuple operations – Built-in tuple functions. **Lists:** Values and accessing elements – Traversing a list – Deleting elements from list – Built-in list operators & methods. **Dictionaries:** Creating dictionary – Accessing values in dictionary – Updating dictionary – Deleting elements from dictionary – Operations in dictionary - Built-in dictionary methods.	
III	**Functions - Files and Exceptions**	12
	Functions: Introduction – Built-in functions – User defined functions – Function Definition – Function Call - Type conversion – Type coercion – Python recursive function. **Files and Exceptions:** Introduction to File Input and Output - Writing Structures to a File - Using loops to process files Processing Records - Exception.	

IV	**Data Manipulation Tools & Softwares** **Numpy:** Installation - Ndarray - Basic Operations -Indexing, Slicing, and Iterating - Shape Manipulation - Array Manipulation - Structured Arrays -Reading and Writing Array Data on Files. **Pandas:** The pandas Library: An Introduction - Installation - Introduction to pandas Data Structures - Operations between Data Structures - Function Application and Mapping - Sorting and Ranking - Correlation and Covariance - ―Not a Number‖ Data - Hierarchical Indexing and Leveling – Reading and Writing Data: CSV or Text File - HTML Files - Microsoft Excel Files.	14
V	**Data Analysis with Python** **Data Analysis with Python:** Importing Datasets: Cleaning and Preparing the Data: Identify and Handle Missing Values - Data Formatting. **Data Visualization:** Matplotlib Architecture - pyplot - Plotting with pandas and seaborn: Line, Bar, Histogram, Density, Scatter charts - Python visualization tools.	13
Total Conduct Hours		**64**

Text Books:

1. Python: The Complete Reference, Matrin C Brown, McGrraw-Hill, 2018.
2. Python Programming a Modular Approach with Graphics, Database, Mobile, and Web Applications – SheetalTaneja, Naveen Kumar – Pearson Publication, 2018.
3. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, William McKinney, 2nd Edition, O'Reilly Media, 2017.
4. Data Analytics Using Python, Bharti Motwani, Wiley, 2020

References:

1. Charles R. Severance, Python for Everybody: Exploring Data Using Python 3, 2016.
2. E.Balagurusamy, Introduction to computing and problem solving using Python McGraw Hill Publication, 2016.
3. Mark Summerfield, Programming in Python 3: A Complete Introduction to the Python Language, 2nd Ed., Addison Wesley Professional, 2010.
4. Mark Lutz, Learning Python, 5th Ed., 2013.
5. Welsey J. Chun, Core Python Programming, Prentice Hall, 2001.

E-References.

1. https://freepdf-books.com/impractical-python-projects-playful-programming-activitiesto-make-yousmarter-book-of-2019/.
2. https://freepdf-books.com/fundamentals-of-python-first-programs-second-editionbook-of-2019.
3. https://docs.python.org 4. http://www.diveintopython.org.
4. https://www.learnpython.org/.
5. https://www.javatpoint.com/python-tutorial.
6. http://nptel.ac.in/.

Course Outcomes	On completion of the course, students will be able to **CO1:** Understand the core elements of the Python Programming **CO2:** Resolve on the ideal usage of complex data structures **CO3:** Describe the functions and files concepts in python **CO4:** Apply the Python libraries NumPy and Pandas for problem solving **CO5:** Explain the Data Analysis and Visualization with Python

Mapping of Cos with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	3
CO2	3	3	1	2	3
CO3	3	3	1	1	3
CO4	3	3	1	1	3
CO5	3	3	1	2	3

Course Code & Title	24CSUC2106 Core Major - Lab – 3: Python Programming Credit: 1		
Class	**B.Sc. (Computer Science)**	**Semester**	**III**
Course Objectives	**The Course aims to** • To develop higher-order programming skills in core Python. • To apply the theoretical elements of Python for problem solving • To provide hands-on training to solve data-intense real-world problems		
Cognitive Level	**K1-K3**		

Sl. No.	CONTENTS	No. of Hours
	PYTHON PROGRAMMING	
1.	Decision Making and Looping statements.	
2.	Arithmetic and Relational Operators on Strings.	
3.	Built-In String Functions.	
4.	Create and Access Strings and Substrings (using Indexing and Slicing).	
5.	Built-In List Functions.	
6.	Create and Access Lists.	
7.	Create and Access Tuples.	48
8.	Create and Access Dictionaries.	
9.	Built-In Dictionary Functions.	
10.	Function Definition & Function call.	
11.	Files and Exceptions.	
12.	Numpy Arrays	
13.	Pandas Libraries	
14.	Working on real-time Datasets	
15.	Data visualization	
Total Conduct Hours		**48**

Course Outcomes	On completion of the course, students will be able to **CO1:** Analyse and understand the various programming constructs through simple python programs **CO2:** Write the python programs using control structures **CO3:** Trace the execution of programs and debug the programs **CO4:** Illustrate file concept through python programs **CO5:** Implement python programs with NumPy and Pandas

Mapping of Cos with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	3
CO2	3	3	1	2	3
CO3	3	3	1	1	3
CO4	3	3	1	1	3
CO5	3	3	1	2	3

Course Code & Title	24CSUC2107 Core Major - 4: Operating System Credits: 3		
Class	B.Sc. (Computer Science)	Semester	III
Course Objectives	The Course aims to • Study the fundamental concepts of operating system. • Provide knowledge on process and CPU scheduling. • Know about memory, file system and device management.		
Cognitive Level	**K1:** Remembering the fundamental concepts in Operating Systems **K2:** Understand the process and the inter-process communications **K3:** Apply the various CPU scheduling algorithms **K4:** Analyze the performance of the scheduling algorithms **K5:** Evaluate the memory allocation based on page replacement algorithms		

UNIT	CONTENTS	Lecture Schedule
I.	**Introduction and Process Management** Operating System Structure - Process Scheduling - Process State - Scheduling Criteria -Scheduling Algorithms - Scheduling Algorithm Performance - Process Attributes - Process Supervisor Call	12
II.	**Inter-process Communication and Synchronization** Inter-process Communication - Process synchronization - Dead lock - deadlock detection and recovery - deadlocks avoidance - deadlock prevention.	12
III.	**Memory Management** Single absolute partition - Single relocatable partition - Multi programming - Multiple partition - Simple paging - Simple segmentation - Segmentation with paging - Page and segment tables – Swapping	13
IV.	**Virtual Memory & File System Management** Demand paging – Segmentation - Directories and names - Types of file system objects - File system functions - Information types - File system architecture	14
V.	**Device Management & Security** Hardware I/O Organization – Software Organization – Devices – Authentication – Prevention – Detection – Correction – Identification – Threat Categories – Program Threats	13
Total Conduct Hours		**64**

Text Book:

1. J.Archer Harris, John Cordani, Operating System, Mc-Graw Hills Publication, 2020.

References:

1. Silberschatz P.B.Galvin, Gange, "Operating System Concepts", 6th Ed, John Wiley & Sons., 2002.
2. H.M. Deitel, An Introduction to Operating System, Second Edition, Addison Wesley, 1990.

Course Outcomes	On completion of the course, students will be able to **CO1:** Analyze the structure and basic components of operating system. **CO2:** Describe the process, inter-process communication and synchronization. **CO3:** Understand the memory types and segmentation process. **CO4:** Learn the concept of memory allocation and relocation during process execution. **CO5:** Understand the file and device management of an operating system.

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	1	3	3
CO2	3	3	1	2	3
CO3	3	3	1	1	3
CO4	3	3	1	1	3
CO5	3	3	1	2	3

Course Code & Title	24CSUC2108 Core Major - Lab 4: Operating System Credits: 1		
Class	**B.Sc. (Computer Science)**	**Semester**	**III**
Course Objectives	**The Course aims to** • Teach the Shell commands of Linux operating system • Offer hands–on training on Linux Shell Programming		
Cognitive Level	**K1-K3**		

Sl. No.	CONTENTS	No. of Hours
	Shell Programming	
1.	Shell Programming Vi Editor Command	
2.	Operations on Directories and Files	20
3.	Working with Editors	
4.	GUI Operations	
5.	Shell Programming	
Total Conduct Hours		**20**

Course Outcomes	**On completion of the course, students will be able to** **CO1:** Use shell commands, Vi editor commands and command-line arguments appropriately. **CO2:** Design and develop shell scripts with conditional, control statements and Shell functions for problem solving. **CO3:** Exhibit ability to perform the file management and multiple tasks using **S**hell scripts in Linux environment.

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	2
CO2	3	3	3	2	3
CO3	3	3	3	2	2

Course Code & Title	**24PHUB2103** **Core Minor – 3:** Physics -I for Computer Science: Digital Principles **Credits: 4**		
Class	**B.Sc. (Computer Science)**	**Semester**	**III**
The syllabus will be provided by the respective department			

Course Code & Title	**Multidisciplinary – III** **Credits: 3**		
Class	**B.Sc. (Computer Science)**	**Semester**	**III**
The syllabus will be provided by the respective department			

Course Code & Title	**24ENUA2103** **Ability Enhancement Course(AEC) -** Essential English :Advanced **Credits: 3**		
Class	**B.Sc. (Computer Science)**	**Semester**	**III**
The syllabus will be provided by the respective department			

Course Code & Title	**24TAUS2103 / 24MLUS2103 / 24HIUS2103** **Skill Enhancement Course (AEC):** Indian Language (Tamil/Malayalam/Hindi)- III **Credits: 3**		
Class	**B.Sc. (Computer Science)**	**Semester**	**III**
The syllabus will be provided by the respective department			

Course Code & Title	**24EXUE2101** **Extension:** Village Placement Programme **Credits: 2**		
Class	**B.Sc. (Computer Science)**	**Semester**	**III**

SEMESTER IV

Course Code & Title	24CSUC2209 Core Major - 5: Java Programming Credits: 3		
Class	B.Sc. (Computer Science)	Semester	IV
Course Objectives	**The Course aims to** • Provide the foundation to the object oriented programming concepts. • Discuss the implementation of OOP's concepts in Java language. • Make learners as good Java programmers. • Import skills and knowledge to create and run Java programs for solving real time problems.		
Cognitive Level	**K1:** Remembering the object oriented approaches in programming. **K2:** Understand the concepts of classes and objects. **K3:** Apply the various exception handling in Java programs. **K4:** Analyze the use of strings and role of threads. **K5:** Create client-side programming using AWT.		

UNIT	CONTENTS	Lecture Schedule
I	**Basics** **Introduction:** Object Oriented Programming Concepts -Features of Java Language, Types of Java Programs, Java Architecture. **Literals, Data Types and Variables:** Literals - Integer, Floating Point, Character, String and Boolean Literals, Data Types - Integer, Floating Point, Character and Boolean. Variables. **The Structure of A Java Program** – Comments, Expressions and Statements, Type Conversion, Block Statements and Scope. **Operators** –Arithmetic, Bitwise, Relational, Boolean Logical and Ternary. Operator Precedence. **Control Statements** – If...Else, Switch, While, Do...While, For..., Break, Continue and Comma Statement. **Arrays** - One-Dimensional and Multi-Dimensional Arrays.	13
II	**Classes and Packages** **Classes:** Defining A Class, The New Operator and Objects, The Dot Operator, Method Declaration and Calling, Constructors, Instance Variable Hiding, This in A Constructor, Method Overloading, Passing Objects as Parameters to Methods. **Inheritance:** Creating Subclasses, Method Overriding, Final Class, Final Method, Final Variables, Object Destruction and Garbage Collection, Recursion, Static Method, Static Variables and Static Block, Abstract Classes. **Packages and Interfaces:** Package, The Import Statement, Access Modifier, Interfaces - Defining Interfaces, Implementing an Interface **Mathematical Methods:** Math class methods and programs.	13

III	**Exceptions, Input and Output Classes**	12
	Exceptions: Types of Exceptions, Catching Exceptions - Nested Try Blocks, Hierarchy of Multiple Catch Blocks, Throw Statement, Creating your Own Exceptions, Throws Statement, The Finally Block, Checked and Unchecked Exceptions. **Input and Output Classes** - I/O Streams, The File Class, Byte Stream – Input Stream, Output Stream, Disk File Handling - File Input Stream, File Output Stream, Filtered Byte Stream – Data Output Stream, Data Input Stream, Object Output Steam, Object Input Stream	
IV	**Strings and Threads**	13
	Strings: String Class - Equality Operator (==) and Equals Method, String Concatenation with +, String buffer Class. **Threads** - Multitasking, Creating a Thread, States of a Thread, Multithreaded Programming, Thread Priorities, Join Method, Controlling the Threads	
V	**Applets and Graphics**	13
	Applets: Applet Basics, Methods of Building an Applet, Some General Methods of Applet, Displaying Text in Status Bar, Embedding Applet Information, The HTML Applet Tag, Reading Parameters into Applets, Colors in Applet. **Graphics** - Drawing Lines, Rectangles, Ovals and Circles, Arcs, Polygons and Poly line, Colors in Graphics, Fonts in Graphics.	
Total Conduct Hours		**64**

Text Book:

1. K. Somasundaram, Introduction to JAVA Programming, Jaico Publishing House, New Delhi, 2013.

References:

1. K. Somasundaram, Programming in Java2, Jaico Publishing House, New Delhi, 2009.
2. H .Schildt, Java2: The Complete Reference, 4/e, TMH Publishing Company, New Delhi, 2001.
3. K. Somasundaram, Do and Learn JAVA–A Practical Approach, Anuradha Publications, Chennai, 2013.

Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Outline the concepts of OOP and basics of Java language features, types, control statements and array. **CO2:** Grasped the idea of inheritance, package and identify classes, objects, member of a class and the relationship among them. **CO3:** Discuss the implementation of exception handling and Input & Output stream classes. **CO4:** Describe the methods in String. Identify the use of threads to perform subtask and their control. **CO5:** Develop client side programming with AWT.

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	2
CO2	3	3	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	3	3	3	3	2

Course Code & Title	24CSUC2210 Core Major Lab - 5: Java Programming Credit: 1		
Class	**B.Sc. (Computer Science)**	**Semester**	**IV**
Course Objectives	**The Course aims to** • Develop the programs using all the fundamental concepts of Java programming • Utilize the existing packages for efficient programming • Help them create their own packages and databases • Demonstrate the advanced programming using threads and applets • Explain them the data storage with different file formats		
Cognitive Level	**K1-K5**		

Sl. No.	CONTENTS	No. of Hours
	Java Programming with	
1.	Control Statements and Arrays	48
2.	Classes and Objects	
3.	Inheritance Packages, Interfaces	
4.	Exception Handling	
5.	Input / Output classes	
6.	Strings and Mathematical methods	
7.	Threads	
8.	Applets	
9.	Graphics	
10.	Applications using the above concepts	
Total Conduct Hours		**48**
Course Outcomes	**On completion of the course, students will be able to** **CO1:** Develop programs using the fundamental concepts in Java. **CO2:** Demonstrate classes, objects, principles of inheritance and polymorphism, encapsulation, method overloading and to show thread priority, exception handling. **CO3:** Develop application using packages and store the data in the database. **CO4:** Design GUI using applets. **CO5:** Apply object oriented design for all real world problems.	

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	2
CO2	3	3	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	3	3	3	3	2

Course Code & Title	24CSUC2211 Core Major - 6: Computer Networks Credits: 3		
Class	**B.Sc. (Computer Science)**	**Semester**	**IV**
Course Objectives	**The Course aims to** • Understand the basics of computer networks, Network types. • Learn the models of protocol stack. • Learn the working of the transmission media and link and network layers. • Understand the functionalities of Transport, Session and Application layers.		
Cognitive Level	**K1:** Outline the basic concepts of computer networks **K2: U**nderstand the various types of communication media **K3:** Compare the functionalities of various layers **K4:** Analyze the protocol formats in each layer **K5:** Investigate the design issues of various layers		

UNIT	CONTENTS	Lecture Schedule
I	**Uses** **Uses of computer networks** - Network hardware - Network software - Reference models - Example networks - Network standardization	12
II	**Communication Media** **Communication Media:** Guided transmission media - Wireless transmission - Communication satellites - The public switched telephone network- The mobile telephone system	13
III	**Data link layer** **Data link layer:** Data link layer design issues - Error detection and correction - Elementary data link protocols - Sliding window protocols - Multiple access protocols – Wireless LANs – Bluetooth	13
IV	**Network Layer** **Network Layer:** Network layer design issues - Routing algorithms - Congestion control algorithms - Quality of service – Internetworking	14
V	**Transport Layer** **Transport Layer:** Transport service –Elements of transport protocols – Session Services - DNS- Electronic mail – The World Wide Web.	12
Total Conduct Hours		**64**

Text Book:

1. Andrew S. Tanenbaum, Nick Feamster and David Wetherall, "Computer Networks," 6/e, Pearson Education 2021.

References:

1. Douglas E. Comer, "Computer Networks and Internet", Sixth Edition, Pearson, 2018.
2. William Stallings, "Network Security Essentials: Applications and Standards", Sixth Edition, Pearson, 2018.

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: To remember the basic terminologies and concepts in computer networks. **CO2:** To understand the various types of communication media. **CO3:** Recognize the different functionalities of various layers. **CO4:** Appraise the working of the DNS and WWW**.** **CO5:** Understand the protocol formats in each layer.

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	1	2
CO2	3	3	-	1	2
CO3	3	3	-	1	3
CO4	3	3	-	1	2
CO5	3	3	-	1	2

Course Code & Title	24CSUC2212 Core Major - Lab 6: Computer Networks Credits: 1		
Class	**B.Sc. (Computer Science)**	**Semester**	**IV**
Course Objectives	**The Course aims to** • List the packages, interfaces and classes required • Encode working principles of the existing algorithms • Analyse the concepts and implement the algorithms • Apply the syntaxes in the appropriate functionalities • Write new programs based on the requirements		
Cognitive Level	**K1-K5**		

Sl. No.	CONTENTS	Hours of Work
1. 2. 3. 4. 5. 6. 7. 8. 9. 10.	Host Identification and Details Ping and Echo Commands Client/ Server Implementation File Transfer Framing Techniques Encoding Multi– Client and Server Error Control Routing Algorithms Encryption Techniques	48
Total Conduct Hours		**48**
Course Outcomes	**On completion of the course, students will be able to** **CO1:**List the packages, interfaces and methods **CO2:** Encode the working principles of algorithms **CO3:** Apply the concepts and implement the algorithms **CO4:** Write new programs according to the requirements **CO5:** Solve complex computational problems	

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	1	2
CO2	3	3	-	1	2
CO3	3	3	-	1	3
CO4	3	3	-	1	2
CO5	3	3	-	1	2

Course Code & Title	24CSUC2213 Core Major - 7: Software Engineering Credits: 4		
Class	**B.Sc. (Computer Science)**	**Semester**	**IV**
Course Objectives	**The Course aims to** • Understand the various processes requirements and concepts • Discuses the quality concepts and software quality assurance • Demonstrate the software testing strategies • Analyze the project scheduling and risk management		
Cognitive Level	**K1:** Remembering the terminologies in Software Engineering **K2:** Understand the concept of quality in Software Engineering **K3:** Apply the software testing strategies for any simple application software **K4:** Analyze the need for project scheduling and risk management		

UNIT	CONTENTS	Lecture Schedule
I	**Process Models** A Generic Process Model – Defining a Framework Activity - Identifying a Task Set - Process Patterns - Process Assessment and Improvement - Prescriptive Process Models – The Waterfall Model- Incremental Process Models - Evolutionary Process Models - Concurrent Models - Specialized Process Models - Component-Based Development - The Formal Methods Model- Aspect-Oriented Software Development.	12
II	**Design Concepts** The Design Process – Software Quality Guidelines and Attributes - The Evolution of Software Design - Design Concepts – Abstraction- Architecture- Patterns- Separation of Concerns - Modularity- Information Hiding- Functional Independence - The Design Model- Data Design Elements- Architectural Design Elements- Interface Design Elements- Component-Level Design Elements- Deployment-Level Design Elements.	13
III	**Quality Assurance** Elements of Software Quality Assurance– SQA Tasks, Goals and Metrics – Formal Approaches to SQA – Statistical Software Quality Assurance – A Generic Example - Software Reliability- Measures of Reliability and Availability - Software Safety.	13
IV	**Software Testing Strategies** A Strategic approach to software testing – Verification and Validation - Organizing for Software Testing - Strategic Issues - test strategies for conventional software – Unit Testing - Integration Testing - Validation Testing – System Testing - Recovery Testing - Security Testing - Stress Testing - Performance Testing - Deployment Testing.	13

V	**Risk Management** Software Risks - Risk Identification – Assessing Overall Project Risk - Risk Components and Drivers - Risk Projection – Developing a Risk Table - Assessing Risk Impact - Risk Refinement – Risk Mitigation, Monitoring and Management – The RMMM Plan	13
	Total Conduct Hours	**64**

Text Book:

1. Roger S. Pressman, Software Engineering – A Practitioner's Approach, 7/e, McGraw Hill Inc., 2014.

References:

1. Alistair Cockburn, Agile Software Development, 2/e ,Pearson Education, 2007
2. Richard E.Fairley, Software Engineering concepts, Mc-Graw Hill, 1984.
3. Ian Sommervillie, Software Engineering, 9/e, Addison Wesley, 2011.

Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Differentiate the various processes and understanding requirements and concepts **CO2:** Understand the quality concepts **CO3:** Gain knowledge in software quality assurance **CO4:** Formulate the software testing strategies **CO5:** Analyze the project scheduling and risk management

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	2	3	3	2
CO3	2	3	2	3	2
CO4	3	2	2	3	2
CO5	3	3	3	3	3

Course Code & Title	**24PHUB2204** **Core Minor- 4:** PHYSICS – II for Computer Science: Microprocessor and Assembly Language Programming C**redits: 3+1**		
Class	**B.Sc. (Computer Science)**	**Semester**	**IV**
The syllabus will be provided by the respective department			

Course Code & Title	**24ENUA2204** **Ability Enhancement Course (AEC):** Science Communication C**redits: 3**		
Class	**B.Sc. (Computer Science)**	**Semester**	**IV**
The syllabus will be provided by the respective department			

Course Code & Title	**24EXUE2201** **Extension:** Community Engagement C**redits: 2**		
Class	**B.Sc. (Computer Science)**	**Semester**	**IV**
The syllabus will be provided by the respective department			

SEMESTER V

Course Code & Title	24CSUC3114 Core Major - 8: Database Management System Credits: 3		
Class	**B.Sc. (Computer Science)**	**Semester**	**V**
Course Objectives	**The Course aims to** • Explain the concepts of database management systems • Demonstrate the various data models and database systems • Create and manipulate to implement database concepts • Design database schema considering the normalization rule		
Cognitive Level	**K1:** Remembering the components and functions of database systems **K2:** Understand the various data models in DBMS. **K3:** Apply the SQL queries to access the data in the database. **K4:** Analyze the design of a database based on normalization rules		

UNIT	CONTENTS	Lecture Schedule
I	**Databases and Database Users & Database System Concepts and Architecture** Introduction - An Example - Characteristics of the Database Approach - Actors on the Scene - Workers behind the Scene - Advantages of Using the DBMS Approach. Database System Concepts and Architecture - Data Models, Schemas, and Instances – Three - Schema Architecture and Data Independence - Database Languages and Interfaces - The Database System Environment - Centralized and Client/Server Architectures for DBMSs - Classification of Database Management Systems.	12
II	**Data Modeling Using the Entity – Relationship (ER) Model** Using High-Level Conceptual Data Models for Database Design - A Sample Database Application - Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints - Weak Entity Types - Refining the ER Design for the Company Database - ER Diagrams, Naming Conventions, and Design Issues.	13
III	**The Relational Data Model and Relational Database Constraints** The Relational Data Model and Relational Database Constraints: Relational Model Concepts - Domains, Attributes, Tuples, and Relations - Characteristics of Relations - Relational Model Constraints and Relational Database Schemas - Update Operations, Transactions, and Dealing with Constraint Violations.	13

IV	**Basic SQL** Basic SQL: SQL Data Definition and Data Types - Schema and Catalog Concepts in SQL - The CREATE TABLE Command in SQL - Attribute Data Types and Domains in SQL - Specifying Constraints in SQL - Basic Retrieval Queries in SQL - INSERT, DELETE, and UPDATE Statements in SQL	13
V	**Complex Queries, Triggers, Views and Schema Modification** More Complex SQL Retrieval Queries - Comparisons Involving NULL and Three-Valued Logic - Nested Queries, Tuples, and Set/Multiset Comparisons - Correlated Nested Queries - Specifying Constraints as Assertions and Actions as Triggers - Views (Virtual Tables) in SQL - Concept of a View in SQL - Specification of Views in SQL - Schema Change Statements in SQL.	13
	Total Conduct Hours	**64**

Text Book:

1. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition, Pearson, New Delhi, 2016.

References:

1. Ramez Elmasri and Shamkant B. Navathe, Database Systems: Models, Languages, Design and Application Programming, Pearson, New Delhi, 2014.
2. Avi Silberchartz, Henry F. Korth and S.Sudarshan, Database System Concepts, 6/e, McGraw - Hill Higher Education, International Edition, 2010.
3. Peter Rob, Carlos Coronol, Steven A. Morris, Keeley Crokett, Database Principles, 2/e, Cengage Learning, 2013

Course Outcomes	**On completion of the course, students will be able to** **CO1:** Discuss the components, functions and various database design techniques used for modeling the databases management system. **CO2:** Analyze the various data models and database architecture **CO3:** Examine the clauses and functions of SQL and write optimal queries in the above language. **CO4:** Design entity-relationship diagrams to represent simple database application scenarios. **CO5:** Apply the database schema normalization rules and techniques tocriticize and improve the database design

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	2
CO2	3	3	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	3	3	3	3	2

Course Code & Title	24CSUC3115 Core Major - Lab 7: DBMS Credit: 1		
Class	**B.Sc. (Computer Science)**	**Semester**	**V**
Course Objectives	**The Course aims to** • Prepare the students to create and manipulate relations using SQL • Write basic queries, views and triggers using SQL • Use oracle database from front-end applications		
Cognitive Level	**K1-K5**		

Sl. No.	CONTENTS	Hours of Work
	RDBMS (Oracle)	
1.	Tables: Creations, Assigning various types of keys, Sorting, Setting relation between tables Queries using single and multiple tables	48
2.	Cursor and Triggers	
3.	Importing Tables from Electronic Spreadsheet and Text File	
4.	Report creation from usage	
Total Conduct Hours		**48**
Course Outcomes	**On completion of the course, students will be able to** **CO1:** Model the databases using SQL **CO2:** Write SQL queries, sub queries and aggregate functions using single and multiple tables **CO3:** Implement views and triggers using SQL **CO4:** Use reporting tools to generate reports using databases **CO5:** Develop a simple project using SQL as back-end from front - end applications.	

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	3	3
CO2	3	2	3	3	3
CO3	3	2	3	3	3
CO4	3	2	3	3	3
CO5	3	2	3	3	3

Course Code & Title	24CSUC3116 Core Major - 9: Cloud Computing Credits: 4		
Class	**B.Sc. (Computer Science)**	**Semester**	**V**
Course Objectives	**The Course aims to** • Classify the various Cloud computing services and applications • Understand the architecture of Cloud computing • Know the Cloud computing standards • Realize the issue in cloud security.		
Cognitive Level	**K1:** Remembering the basic concepts of cloud computing **K2:** Understand the architecture of cloud computing **K3:** Apply the different frameworks for cloud computing **K4:** Analyze the practical applications of cloud computing **K5:** Evaluate the security levels in cloud computing		

UNIT	CONTENTS	Lecture Schedule
I	**Understanding Cloud Computing** History of Cloud computing - Cloud Computing Architectural Framework - Types of Clouds - pros and cons of cloud computing - difference between web 2.0 and cloud - key challenges in cloud computing - Major Cloud players - Cloud Deployment Models - Virtualization in Cloud Computing - types of virtualization - Parallelization in Cloud Computing - cloud resource management - dynamic resource allocation - Optimal allocation of cloud models.	14
II	**Cloud Service Models** Software as a Service (SaaS) - Infrastructure as a Service (IaaS) - Platform as a Service (PaaS) - Service Oriented Architecture (SoA) - Elastic Computing - On Demand Computing.	12
III	**Applications** Deployment of applications on the cloud - Hypervisor - Case studies - Xen, VMware, Eucalyptus - Amazon EC2, KVM, Virtual Box, Hyper-V.	12
IV	**Cloud Computing For Everyone** Cloud data centres - Energy efficiency in data centre - Mobile cloud computing service models - Collaboration with services and applications: CRM management - Project management - Email - on line database - calendar - schedules - Word Processing - Presentation - Spreadsheet - Databases - Desktop - Social Networks and Groupware.	14
V	**Cloud Security** Cloud security - Security threats and solutions in clouds - Auditing protocols - dynamic auditing - storage security - Privacy preserving - Fully Homo-morphic Encryption - big data security - Cloud availability - DoS attacks - Fault tolerance management in cloud computing - Cloud computing in India.	12
Total Conduct Hours		**64**

Text Book:

1. Anthony T.Velte, Toby J. Velte Robert Elsenpeter, Cloud Computing a Practical Approach, TATA Mc-Graw - Hill, New Delhi, 2017

References:

1. Judith Hurwitz, Bloor.R, Kanfman.M, Halper.F, (2010), "Cloud Computing for Dummies", Wiley India Edition.
2. Gautam Shroff, (2010), "Enterprise Cloud Computing", Cambridge University press.
3. Ronald Krutz and Russell Dean Vines, (2010), "Cloud Security", Wiley-India Pvt. Ltd.
4. Michael Miller – Que, Cloud Computing: Web-Based Applications, That Change the way You Work and Collaborate Online - 2008
5. Ronald L. Krutz, Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley-India, 2010

Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Gain knowledge in Basics of Cloud computing. **CO2:** Understand Cloud Computing architecture. **CO3:** Learn the different types of frameworks. **CO4:** Discuss practical applications of cloud computing. **CO5:** Should be able to define the security of cloud.

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	2	3	3	2
CO2	3	3	3	1	2
CO3	3	2	2	3	3
CO4	3	3	3	2	3
CO5	2	2	1	1	2

Course Code & Title	24CSUC3117 Core Major - 10: Mobile Computing Credits: 4		
Class	**B.Sc. (Computer Science)**	**Semester**	**V**
Course Objectives	**The Course aims to** • Learn about the importance of mobile devices and use • Understand the merits of its communication strategies in present scenario. • Analyze and apply various tools and techniques used in mobile • Computing		
Cognitive Level	**K1:** Remembering the types of wireless devices and their features **K2:** Understand the concepts of data transmission through wireless and MAC **K3:** Analyze the tools and techniques in mobile computing		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction**	12
	Introduction: Need for Mobile Computing, Mobile and Wireless Devices, Applications, History of wireless communication, A Simplified reference model. **Wireless transmission basics:** Frequencies for radio transmission, Regulations, Signals, Antennas, Signal Propagation, Multiplexing, Modulation.	
II	**Wireless Transmission & MAC**	13
	Spread Spectrum: Direct sequence spread spectrum, Frequency hopping spread spectrum, Cellular systems. **Medium access control:** Hidden and exposed terminals, Near and far terminals, SDMA, FDMA, TDMA, CDMA, and comparisons.	
III	**GSM and Satellite Systems**	13
	GSM: Mobile services, System architecture, Localization and calling, Handover, Security. **Satellite Systems:** Applications, Basics, Routing, Localization, Handover.	
IV	**Wireless LAN**	13
	Wireless LAN: Infrared vs. Radio transmission, Infrastructure and ad-hoc network, IEEE 802.11 – Architecture, Physical Layer, MAC Layer. **Bluetooth:** Architecture, Link Management and Security.	
V	**Mobile Network Layer**	13
	Mobile Network Layer: Mobile IP – Goals, Entities and terminology, Packet Delivery Strategies, Registration, Tunneling and Reverse Tunneling, **MANET:** Characteristics, Routing Strategies and Protocols.	
Total Conduct Hours		**64**

Text Book: 1. Jochen Schiller, Mobile Communication, 2/e, Pearson Education, Delhi 2009. **Reference:** 1. Kum Kum Garg, "Mobile Computing Theory and Practice", Pearson Education, 2014.	
Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Learn the types of mobile and wireless devices available and their features. **CO2:** Understand the basics of wireless transmission and MAC. **CO3:** Understand different types of telecommunication systems. **CO4:** Identify the types of wireless LAN architecture and protocols. **CO5:** Learn the structure, features and transmission techniques of mobile IP.

Course Code & Title	**24GIUB3105** **Core Minor- 5:** Geographical Information System **Credits: 3+1**		
Class	**B.Sc. (Computer Science)**	**Semester**	**V**
The syllabus will provided by the respective department			

Course Code & Title	**24CSUC3118** **Internship** **Credits: 2**		
Class	**B.Sc. (Computer Science)**	**Semester**	**V**

Course Code & Title	24CSUE3101 Field Study: Information Technology for Rural Development Credits: 2		
Programme	**B.Sc.(Computer Science)**	**Semester**	**V**
Course Objectives	**The Course aims to** • Provide the basics of ICT technology • Impart the basics skills in ICT Applications • Understand the importance of ICT in Rural development • Inculcate the impact of ITRD through filed study		
Cognitive Level	**K1:** Recall the various ICT tools and techniques. **K2:** Understand the need for ICT in Rural Development. **K3:** Conduct the field based study to evaluate the use of ICT for rural development.		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to ICTs for sustainable Development** Introduction to Information and Communication Technology (ICT): Role of ICTs in Sustainable Development - Current Status of ICT sin Sustainable Development - Global and India, Scenario - Potential of ICT sin various fields - Impact of Information Technologies on GDP growth.	8
II	**Information** Internet and WWW - Community radio - Technology - User interface - Design of relevant ICT products and services.	8
III	**ICT Applications** Applications of ICT in Education - Health - Gender Equality - agriculture - Rural Industry – E - Governance, Telecentres - Climate change and disaster management - ICT Networks for water management.	8
IV	**ICT Applications** Field based case study on Information and Communication Technology for Rural Development.	8
Total Conduct Hours		**32**

Text Book:

1. Dr. M. Vanaja, Dr. S. Rajasekar, Information & Communication Technology (ICT) in Education Paperback, 2016.

Reference:

1. Prof. T. Mrunalini, Prof. A. Ramakrishna, Information & Communication Technology (ICT) in Education, Paperback, 2016

Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Understand various ICT tools and techniques **CO2:** Realize the importance of ICT in rural development **CO3:** Select the right tools for right applications **CO4:** Analyse various existing ICT products for Sustainable development **CO5:** Realize the use of ICT in rural development through field based Study

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	3	3
CO2	2	2	3	3	3
CO3	1	1	3	3	3
CO4	1	2	3	3	3
CO5	2	2	3	3	3

SEMESTER VI

Course Code & Title	24CSUC3219 Core Major - 11: Web Programming Credits: 3		
Class	B.Sc. (Computer Science)	Semester	VI
Course Objectives	**The Course aims to** • Provide insight into the basics of Web Programming • Design and implement a dynamic web applications using HTML, JavaScript and PHP		
Cognitive Level	**K1:** Recall the basis of internet. **K2:** Understand the use of HTML and CSS for web designing. **K3:** Develop dynamic web pages using JavaScript and PHP. **K4:** Create a webpage for any real time applications.		

UNIT	CONTENTS	Lecture Schedule
I	**Web Essentials** Web Programming Fundamentals – Origin of the Internet – WWW – Web Browser. **Web Servers:** Introduction – Types of servers – Apache HTTP Server – IIS (XAMPP – LAMPP) and Tomcat servers **Web Application Framework:** Introduction – Advantages – Types of Frontend and Backend frameworks.	12
II	**Markup Language** **Introduction to HTML:** Headings - Linking- Internal linking - Images- Special Characters and horizontal Rules - Lists- Tables- Forms-Frames- Meta elements.**CSS:** Introduction to Cascading Style Sheets - Cascading Style Sheet Features - CSS Core Syntax - Style Sheets and HTML - Style Rule Cascading and Inheritance - Text Properties - CSS Box Model	13
III	**Client-Side Programming** **Java Script:** Introduction to Scripting -Control Statements – Functions. **Objects:** Math object –Array Object-String Object Document object - Boolean and Number objects -Window object. Events handling.	13
IV	**Server-Side Programming** **PHP:** Introduction – Syntax – Comments – Variables – Operators – Expression – Conditional and Branching Statement – Looping statements - Functions – Arrays - Form Elements – File Handling	14
V	**Database Connectivity** **Database Connectivity with MySQL:** MySQL Database Connect-Create Database-Create Table – Insert Data – queries – Integrating web form and databases – Displaying queries in Tables	12
Total Conduct Hours		**64**

Text Books:

1. Jeffrey C. Jackson, Web Technologies: A Computer Science Perspective, Pearson Education, New Delhi, India, Last Impression 2010.
2. Steven Holzner, PHP: The Complete Reference, Tata McGraw-Hill, 2017
3. Deitel, Internet and World Wide Web – How to Program, Fourth Edition, Pearson Prentice Hall, 2011

References:

1. Uttam K. Roy, "Web Technologies", Oxford University Press, 2011.
2. Julie C. Meloni, Sams Tech Yourself: HTML, CSS and JavaScript all in One, SAMS, 2014.
3. Achyut S Godole & Atul Kahate, Web Technologies, TCP/IP Architecture and Java Programming, Second Edition, Tata Mc-Graw Hill, 2010
4. Deitel H.M and Nieto T.R, Internet and World Wide Web How to Program, Fifth Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2012
5. JavaScript: Programming Basics for Absolute Beginners (Step-By-Step JavaScript Book 1), Nthan Clark, Kindle Edition, 2018.

E-Resource:

- www. w3schools.com
- https://www.seu1.org/files/level6/IT230/Book/(web.tech%201st%20book)%20Web%20Technologies%20-%20A%20Computer%20Science%20Perspective.pdf
- https://www.pearson.ch/HigherEducation/Pearson/EAN/9780273764021/Internet-and-World-Wide-Web-How-to-Program

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: Outline the basics of internet and IP address **CO2:** Design webpages using HTML and CSS **CO3:** Have practical experience in creating dynamic HTML **CO4:** Generate dynamic content to webpages using JavaScript and PHP **CO5:** Develop online web applications using MySQL database

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	3	3
CO2	3	2	3	3	3
CO3	3	2	3	3	3
CO4	3	2	3	3	3
CO5	3	2	3	3	3

Course Code & Title	24CSUC3220 Core Major - Lab 8: Web Programming Credit: 1		
Class	**B.Sc. (Computer Science)**	**Semester**	**VI**
Course Objectives	**The Course aims to** • Explore the designing of web applications • Design and implement a dynamic web applications using HTML, Java Script and PHP		
Cognitive Level	**K1 – K5**		

Sl. No.	CONTENTS	Hours of Work
1. 2. 3. 4. 5. 6. 7. 8.	Web page design using HTML Tags Creation – Ordered List, Unordered List, Tables, Frames, Links, Image Anchor, Image Maps Using Form Controls with Input Tag, Cascading Style Sheets Working with client-side scripting using JavaScript Working with server-side scripting using PHP Exploring the usage of MYSQL database Develop a Web applications	48
Total Conduct Hours		**48**
Course Outcomes	**On completion of the course, students will be able to** **CO1:** Design webpages using HTML and CSS **CO2:** Write scripts using JavaScript to develop dynamic webpages **CO3:** Develop online web applications using JavaScript and PHP **CO4:** Develop web application project using web designing tools and Techniques **CO5:** Hosts the web application in the internet	

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	3	3
CO2	3	2	3	3	3
CO3	3	2	3	3	3
CO4	3	2	3	3	3
CO5	3	2	3	3	3

Course Code & Title	24CSUC3221 Core Major - 12: Introduction to Artificial Intelligence Credits: 4		
Class	**B.Sc. (Computer Science)**	**Semester**	**VI**
Course Objectives	**The Course aims to** • Explain the basic concepts of Artificial Intelligence. • Demonstrate the methods of solving problems using Artificial Intelligence. • Outline the basic issues of knowledge representation and Inference that play an important role in AI programs. • Discuss the applications of AI such as Natural language processing, Robotics, Expert systems.		
Cognitive Levels	**K1:** Define the basic concepts of Artificial Intelligence **K2:** Demonstrate the Implementation of Heuristic Search Techniques **K3:** Develop the model for Knowledge Representation **K4:** Apply the Computable Functions and Predicates **K5:** Examine the applications of AI such as Natural Language processing, Robotics, Expert systems.		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to AI**	8
	Artificial Intelligence: The AI Problems – The Underlying Assumption- AI Technique- The level of the Model – Criteria for Success - Problems, Problem Spaces and Search: Defining the Problem as a State Space Search – Production System Characteristics - Issues in the Design of Search Programs	
II	**Heuristic Search Techniques**	8
	Generate - and - Test – Hill Climbing Best-FirstSearch – Problem Reduction Constraint Satisfaction – Means-Ends Analysis.	
III	**Knowledge Representation**	8
	Representing Knowledge using Rules: Procedural versus Declarative knowledge – Logic Programming Forward versus Backward Reasoning – Matching – ControlKnowledge.	
IV	**Predicate Logic**	8
	Using Predicate Logic: Representing Simple Facts in Logic - Representing instance and Relationships - Computable Functions and Predicates – Resolution – Natural Deduction.	
V	**Introduction To NLP, Neural Introduction To NLP, Neural Nets, Game Playing, Expert Systems**	
	Game Playing: Overview – The Minimax Search Procedure Natural Language Processing: Introduction. **Connectionist Models:** Introduction Hopfield Networks Learning in Neural Networks: Perceptron Expert Systems: Representing and Using Domain Knowledge	
Total Conduct Hours		**32**

Text Book:

1. Kevin Knight and Shivashankar B Nair, Artificial Intelligence, Elaine Rich, 3rd Edition, Tata Mc-Graw, Hill publications, 2014 Reprint.
   (Chapters : 1 - 6 , 12.1, 12.2, 15.1, 18.1, 18.2.1, 20)

References:

1. Nils J Nilson, Principles of Artificial Intelligence, Narosa Publishing House, 1982.
2. Elaine Rich, Artificial Intelligence, Tata McGraw-Hill publications, 2008.
3. V.S.Janakiraman, K. Sarukesi, P.Gopalakrishnan, Foundations of Artificial Intelligence and Expert System, Infinity Press, 1st Edition, 2016.

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: Differentiate AI method of problem solving from normal methods. **CO2:** Identify heuristics for a given problem. **CO3:** Explain the various search techniques. **CO4:** Explain predicate logic. **CO5:** Describe the fundamentals of Game Playing, NLP, NN and Expert Systems.

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	3	2	3	3
CO2	1	2	3	3	2
CO3	1	3	2	3	1
CO4	1	2	2	3	1
CO5	1	3	3	3	3

Course Code & Title	24CSUC3222 Core Major - 13: Information Security Credits: 4		
Class	**B.Sc. (Computer Science)**	**Semester**	**VI**
Course Objectives	**The Course aims to** • Understand the need for Security. • Define the basics of Information Security • Identify Risk and Management of Risks • Recognize various standards in Security		
Cognitive Level	**K1:** Learn fundamentals of cryptography and its application to network security. **K2:** Understand the need for security, threats, security services, and attacks. **K3:** Analyze the identification of Risk Management. **K4:** Apply the Information security planning and policies to real time applications. **K5:** Evaluate the Intrusion Detection and Prevention Systems.		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction** Introduction: History, What is Information Security? - Critical Characteristics of Information - NSTISSC Security Model - Components of an Information System - Balancing Security and Access - The SDLC, The Security SDLC	10
II	**Security Investigation** Security Investigation: Need for Security - Business Needs – Threats – Attacks - Secure Software Development - Laws and Ethics in Information security - Ethics in Information security	13
III	**Security Analysis** Risk Management: Identifying and Assessing Risk - Controlling Risk - Quantitative versus Qualitative Risk control practices - Risk management discussion points	13
IV	**Logical Design** Information security planning and Governance - Information Security Policy - Standards and Practices - The Information Security Blueprint - Security Education, Training and Awareness program - Continuity Strategies	14
V	**Physical Design** Intrusion Detection and Prevention Systems - Scanning and Analysis Tools - Cipher Methods -Cryptographic Algorithms - Cryptographic Tools - Attacks on Cryptosystems - Physical Access Controls	14
Total Conduct Hours		**64**

Text Book:

1. Michael E Whitman and Herbert J Mattord, Principles of Information Security, 4/e, Cengage Learning, New Delhi, 2012.

References:

1. Micki Krause, Harold F. Tipton, Handbook of Information Security Management, Vol. 1–3, CRC Press, LLC, 2004.
2. Stuart Mc Clure, Joel Scrambray, George Kurtz, Hacking Exposed, Tata McGraw– Hill, 2003.
3. Matt Bishop, Computer Security Art and Science, Pearson/Prentice Hall of India, 2002.

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: Explain the basics of Information Security **CO2:** Describe various Security Threats and Attacks **CO3:** Analyse Risk Management **CO4:** Define various standards in Security **CO5:** Explain technological aspects of Information Security

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	2	3	3	2
CO2	3	2	3	1	3
CO3	2	2	2	3	3
CO4	3	2	3	2	3
CO5	1	1	2	2	2

Course Code & Title	24CSUC3223 Core Major - 14: Data Mining Credits: 4		
Class	B.Sc. (Computer Science)	Semester	VI
Course Objectives	The Course aims to • Explore the evolution of data mining. • Teach the basic concepts of Data Warehousing and its Architecture. • Discuss the basic algorithms and techniques used in data mining.		
Cognitive Level	**K-1:** Define the concepts and architecture of data warehousing. **K-2:** Understand the working of recent classification and Cluster analysis. **K-3:** Comprehend and select data mining technique in a problem specific manner.		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction** Data Mining – Need for Data Mining – Kinds of Data can be Mined Kinds of Patterns can be Mined – Technologies used Applications Targeted – Major Issues in Data Mining Data Objects and Attribute Types – Basic Statistical Descriptions of Data, Data Visualization – Measuring Data Similarity and Dissimilarity	14
II	**Data Pre-processing** Data Pre-processing: An Overview - Data Cleaning Data Integration Data Reduction, Data Transformation and Data Discretization	12
III	**Data Warehousing** Data Warehousing: Introduction- Difference between Database Systems and Data Warehouses - A Multi-tiered Architecture Data Warehouse Models- Data Cube: A Multidimensional Data Model Data Warehouse Design and Usage	14
IV	**Classification** Classification – Basic Concepts – Attribute selection Measures- Decision Tree Induction - Bayes Classification Methods	12
V	**Cluster Analysis** Cluster Analysis - Partitioning methods – K MEANS, K-MEDOIDS Hierarchical methods- BIRCH, ROCK Density based methods – DBSCAN **Grid based methods :** STING	12
Total Conduct Hours		**64**

Text Book:

1. Jiawei Han, Micheline Kamber and Jian Pei, Data Mining: Concepts and Techniques, Morgan Kauffmann Publishers, 2012.
   (Chapters: 1,2,3,4.1,4.2.1,4.3,4.4.1,8.1-8.3,10.1-10.4)

References:

1. Hongbo DLL, Data Mining Techniques and Applications: An Introduction,
2. Cengage Lmg Business Press, 2010.
3. Jiawei Han, Micheline Kamber, Data Mining: Concepts and Techniques, 3rd Edition Morgan Kauffmann Publishers, 2011.

4. Udit Agarwal, Data Mining & Data Warehousing, 1 st Edition, S.K.Kataria & sons Publication, 2016. 5. https://www.tutorialspoint.com/data_mining/index.htm 6. https://www.tutorialspoint.com/data_mining/index.htm	
Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Comprehend the fundamental principles of data mining **CO2:** Explain the data extraction and transformation techniques. **CO3:** Describe Data Warehouse architecture and multidimensional data model **CO4:** Illustrate the use of decision tree induction for mining classification rules **CO5:** Explain the different types of clustering methods used in cluster analysis.

Mapping COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	2	3	3	2
CO3	2	3	2	3	2
CO4	3	2	2	3	2
CO5	3	3	3	3	3

Course Code & Title	**24GIUB3206** **Core Minor- 6: GIS – II:** Remote Sensing **Credits: 4**		
Class	**B.Sc. (Computer Science)**	**Semester**	**VI**
The syllabus will provided by the respective department			

Course Code& Title	**24CSUC3224** **Core Major: Project/ Major – 15:** Mobile Application Development		**Credits: 4**
Class	**B.Sc. (Computer Science)**	**Semester**	**VI**

B.Sc. Computer Science (Honours)
SEMESTER VII

Course Code & Title	**24CSUC4125** **Core Major - 16: Advanced Algorithms** **Credits: 4**		
Class	**B.Sc. (Computer Science)**	**Semester**	**VII**
Course Objectives	**The Course aims to** • Demonstrate the procedures for analyzing and comparing the performance of different algorithms. • Impart an overview of Algorithms and their applications • Describe the basic algorithm design strategies. • Prepare the students to write effective algorithms for solving a given problem.		
Cognitive Level	**K-1** Describe the fundamental strategies of algorithm design **K-2** Apply the appropriate algorithm strategy for finding efficient solution to a given problem **K-3** Analyse and compare the performance of different algorithms.		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction**	13
	Definition – Algorithm Specification –Recursive Algorithms – Performance Analysis – Space Complexity – Time Complexity – Asymptotic Notations. Graphs – Introduction – Definitions – Graph Representations.	
II	**Greedy Method**	13
	General Method-Binary Search – Merge Sort, Quick Sort. The Greedy Method: General Method -Knapsack Problem, Minimum Cost Spanning Trees: Prim's Algorithm -Kruskal's Algorithm - Single Source Shortest Paths.	
III	**Dynamic Programming**	13
	The General Method – Multistage Graphs – All Pairs Shortest Paths – Optimal Binary Search Trees –Travelling Salesman Problem.	
IV	**Backtracking**	12
	The General Method – The 8 Queens Problem – Sum of Subsets - Graph Coloring -Hamiltonian Cycles.	
V	**Randomized Algorithms**	13
	Randomized Algorithms: Introduction- Classification of Randomized Algorithms - Randomized Quick Sort – Karger's Miinium Cut Algorithm.	
Total Conduct Hours		**64**

Text Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni & Sanguthevar Rajasekaran, 2nd Edition, University Press, 2017.
2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, 2nd Edition, Prentice Hall of India Pvt Ltd,2006

References:

1. Data Structures and Algorithms in Python, The Complete Beginners Guide, DS Publishing, 2019.
2. Dr. Basant Agarwal, Hands-On Data Structures and Algorithms with Python, Second Edition, 2018.
3. Design and Analysis of Algorithms, Prabhakar Gupta, Vineet Agarwal, Manish Varshney, Phi learning Pvt. Ltd, New Delhi, 2012.
4. Algorithm and Data Structures, Levitin, Anany, 2nd Edition, Pearson Publication, Delhi, 2013.
5. Algorithms and Data Structures, M. M. Raghuwanshi, Narosha Publishing House, 2016.

E-Reference:

https://www.tutorialspoint.com/data_structures_algorithms/index.htmlhttps://onlinecourses.nptel.ac.in/noc20_cs70/preview

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: Analyze the time and space complexity of given Algorithms. **CO2:** Apply Divide & Conquer and Greedy strategies in solving problems. **CO3:** Illustrate and apply the Dynamic Programming technique to solve the problems **CO4:** Demonstrate the principle of Backtracking and its applications in solving typical problems like 8-Queens problem and Sum of Subsets problem **CO5:** Analyse the application of randomized algorithms for solving problems.

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	1	3	3
CO2	3	3	1	2	3
CO3	3	3	1	1	3
CO4	3	3	1	1	3
CO5	3	3	1	2	3

Course Code & Title	24CSUC4126 Core Major - 17: Advanced Java programming Credits: 3		
Class	**B.Sc. (Computer Science)**	**Semester**	**VII**
Course Objectives	**The Course aims to** • To make learners a good Java programmer for developing advanced applications • To import skills and knowledge to create and run Java programs for solving real time problems		
Cognitive Level	**K1:** Remember the basic concepts of Java Programming **K2:** Illustrate the Event-Handling Modules with Swing Component. **K3:** Apply the various Swing-2 GUI Components. **K4:** Analyze the JDBC Connectivity. **K5:** Evaluate the Working model using JSP and Servlet.		

UNIT	CONTENTS	Lecture Schedule
I	**Basics**	12
	Basics: Introduction, Literals, Data types, Variables, Operator, Control Statements, Arrays, Class and Objects, Inheritance, Exception Handling.	
II	**Event Handling**	13
	Event Handling: Model, Event, Event Listeners, Registering Listener with Source, Example programs, Adapter Classes. **Swing-1 (Graphics):** JComponent, JFrame	
III	**GUI Components**	13
	Swing-2 (GUI Components): Jbutton, JLabel, JToggle Button, JCheckBox, JRadioButton, JList, JScrollBar, JTextField, JPasswordField, JTextArea, JComboBox, JMenuItem, JMenu, JMenuBar, Jdialog, JProgressBar, LayoutManager.	
IV	**JDBC**	12
	JDBC: Introduction, Driver Manager, Connection Interface, Statement Interface, Prepared Statement Interface, Callable Statement Interface, Result Set Interface	
V	**Servlet**	14
	Servlet: Introduction, HTML, Interface Servlet, HttpServlet Class, Servlet Programs, Servelet with I/O Files, Servelet with JDBC, Session Handling, Session Tracking. **JSP:** Introduction, JSP Working Model, Syntax of a JSP Page with Sample Programs.	
Total Conduct Hours		**64**

Text Book:

1. Advanced Programming in Java2, K.Somasundaram, Jaico Publishing Company Limited, New Delhi, 2008.

References:

1. Herbert Schildt, Java 2-The complete reference, 7th Edition McGraw Hill, 2018.
2. Naughton and Herbert Schildt, Java The complete reference, 7th Edition McGrawHill, 2007.

3. Jim Keogh, The Complete Reference J2EE, Tata McGraw Hill Edition, NewDelhi, 2002.
4. Marty Hall, and Larry Brown, Core Servlets and Java Server Pages, 2nd Edition, Pearson Education, 2004

E-Resources:

1. Advanced Programming in Java2, https://www.researchgate.net/publication/315894230_Advanced_Programming_in_Java2
2. JDBC, Java Database Connectivity, K.Somasundaram, Jaico Publishing House, Mumbai, India, First Edition, 2013. JDBC Connectivity in Java JDK16, June 2021, DOI: 10.13140/RG.2.2.19415.60325 https://www.researchgate.net/publication/352172393_JDBC_Connectivity_in_Java_JDK16
3. Installing Eclipse 2019-12-R and Tomcat 9.0 and Develop a Servlet, June 2021, DOI:10.13140/RG.2.2.12123.08487 https://www.researchgate.net/publication/352785295_Installing_Eclipse_2019-12- R_and_Tomcat_90_and_Develop_a_Servlet
4. JSP, Java Server Pages, In book: Server Side Programming Chapter: Chapter 25,K.Somasundaram, 2012, DOI: 10.13140/2.1.1715.9365

Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Java Programming basic & OOPS Develop Concepts. **CO2:** Interactive applications by capturing events activities **CO3:** GUI oriented applications by using several graphical components **CO4:** Database connectivity and handling **CO5:** Server-side programming &Web applications in a client-server architecture

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	3
CO2	3	3	3	2	2
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Course Code & Title	24CSUC4127 Core Major - Lab 9: Advanced Java & Algorithms Credit:1		
Class	**B.Sc. (Computer Science)**	**Semester**	**VII**
Course Objectives	**The Course aims to** • This course aims to train the students for developing Java programs for advanced concepts such as GUI based applications, handling server-side programming, client-server applications and Algorithms.		
Cognitive Level	**K1-K5**		

Unit	Content	Lecture Schedule
1.	**Sample Programs** 1. Using Control Structure 2. Creating Class and Objects 3. Using Constructors 4. Using Inheritance 5. Using Exception Handling	10
2.	**Event Handling & Swing-1(+Graphics)** 6. Create applet with default Panel in Japplet 7. Create applet on JFrame 8. Applet with data 9. Draw, line, rectangle, filledrectangle 10. Draw oval, arc, polygon,polyline 11. Event handling- MouseEvent,KeyEvent, ActionEvent,WindowEvent 12. Swing with JFrame 13. JButton,JText,JTextfield (on JApplet and JFrame)	10
3.	**Swing-2** 14. JLabel, JCheckBox, JRadioButton and usingthem 15. JList and usingit 16. JScrollBar,JScrollPane, 17. TexField, JPassword,JTextArea 18. JComboBox, JMenuItem, JMenu,JMenuBar 19. JDialog, JOptionPane, JFileChooser,JProgressBar 20. BorderLayout, FlowLayout,GridLayout,CardLayout	10
4.	**JDBC** 21. Configuring ODBC in the system 22. Creating connection and identifying Drivers 23. Creating and using a database 24. Use of Statement interface and database 25. Use of Prepared Statement and database 26. Use of Callable Statement and database 27. Use of ResultSet interface and database	9

5.	**Servlet** 28. Simple Servlet 29. Servlet - HTML form with GET and Servlet with doGet() method 30. Servlet - HTML form with POST and Servlet with doPost() method 31. Servlet with doGet() and doPost()methods 32. Servlet receiving numbers and processing and sending the result (Factorial, Sum of numbers) 33. Servlet with JDBC 34. Creating cookies and reading them **JSP** 35. Creating HTML with variousformats, superscript, subscript 36. HTML with Tables, images, link to other page 37. HTML with different forms-input, button, select, textarea 38. Creating a simple JSP with welcome note 39. JSP with page directive 40. JSP with Scriptlet- finding factorial, JSP with expression 41. JSP with declaration 42. JSP with implicit object 43. JSP with action element- Java beans	9
6.	**ADVANCED ALGORITHMS** 1. Knapsack Problem. 2. Prim's Algorithms. 3. Multistage Graph. 4. All pairs shortest path. 5. 8 Queens problem 6. Sum of subsets 7. Hamiltonian cycle. 8. Randomized Algorithm (Quick select).	
Total Conduct Hours		**48**
Course Outcomes	**On completion of the course, students should be able to** **CO1:** Develop programs using delegation vent models **CO2:** Design GUI based applications **CO3:** Develop application using packages and store the data in the database. **CO4:** Demonstrate server-side programming **CO5:** Design client-server based applications for all real-time problems.	

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	2	2
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Course Code & Title	24CSUC4128 Core Major - 18: Machine Learning using Python Credits:3		
Class	**B.Sc. (Computer Science)**	**Semester**	**VII**
Course Objectives	**The Course aims to** • To impart knowledge on core concepts and techniques of machine learning. • To impart a skill on data representation, processing and inference. • To have a thorough understanding of the regression and classification. • To familiar with a set of well-known machine learning algorithms. • To develop the skills in using recent machine learning software for solving practical problems.		
Cognitive Level	**K1:** Remembering the mathematical concepts of machine learning approaches. **K2:** Understand the fundamentals of linear algebra and probability theory to the machine learning problems. **K3:** Apply the concepts of regression analysis and vector calculus to the machine learning models. **K4:** Analyze the role of dimensionality reduction and density estimation for machine learning problems **K5:** Evaluate and test the significance of machine learning results statistically.		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to Machine Learning using Python**	13
	Introduction to analytics and machine learning– Framework for developing ML models- Python stack for data science - Introduction to python. **Descriptive Analytics**: Working with Data Frames in python - Handling missing values - Exploration of data using visualization.	
II	**Linear Regression**	10
	Simple Linear Regression - steps in building a regression model- building simple linear regression model - model diagnostics - multiple linear regression.	
III	**Classification Problems**	13
	Classification overview- Binary logistic regression- credit classification - classification tree - decision tree learning - benefits of decision tree.	
IV	**Advanced Machine Learning**	16
	Introduction - Gradient Descent algorithm- Scikit-learn library for ML- applying regularization - advanced machine learning algorithms - dealing with Imbalanced datasets - Logistic regression model - Support Vector Machine (SVM) - K-nearest neighbours - Ensemble methods - Random Forest – Boosting –	
V	**Recommender Systems**	12
	Introduction - datasets -Association Rules - collaborative filtering - user-based similarity - item-based similarity - using Surprise library.	
Total Conduct Hours		**64**

Text Book:

1. "Machine Learning with Python", U Dinesh Kumar, Manaranjan Pradhan, Wiley, 2020.

References:

1. "Machine Learning", Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson Education, 2018.
2. "Advanced Machine Learning with Python: Solve data science problems with state-of-the-art machine learning models", John Hearty, 2nd Edition, Packt Publishing, 2023.
3. "Pattern Recognition and Machine Learning", C. M. Bishop, 2nd ed, springer, 2011.
4. "Hands-On Machine Learning with Scikit-Learn, Keras, and Tensorflow", Aurélien Géron, O'reilly Media, 2019.
5. "Machine Learning Engineering", Andriy Burkov, 2020.

E-resources:

1. http://nptel.ac.in/
2. https://www.pdfdrive.net/machine-learning-d31767902.html
3. https://ggnindia.dronacharya.info/Downloads/Sub-info/Related Book/4thSem/Fundamentals-of-AIML-text-book-4.pdf

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: Understand the distribution and diversity of Data. **CO2:** Extract features useful for building predictive models. **CO3:** Understand the important learning algorithms pertaining to classification and regression. **CO4:** Design efficient algorithms with trained models, conduct experiments, and deliver ML-based applications. **CO5:** Understand the performance evaluation of learning algorithms and model selection.

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	1	3
CO2	3	2	2	1	2
CO3	3	3	2	1	2
CO4	2	3	2	2	3
CO5	3	2	3	1	3

Course Code & Title	24CSUC4129 Core Major - Lab 10: Machine Learning using Python Credit: 1		
Class	**B.Sc. (Computer Science)**	**Semester**	**VII**
Course Objectives	**The Course aims to** • Understand the usage of .csv/ .xlsx files for organising data in the form of datasets. • Introduce basic machine learning techniques. • Design and analyze the performance of various machine learning algorithms. • Identify suitable machine learning algorithms for solving real world problems.		
Cognitive Level	**K1 – K5**		

Sl. No.	CONTENTS	Hours of Work
1.	1. Familiarizing with Anaconda Jupyter / Google Colab for importing modules and dependencies for ML. 2. Basic exercises on Python Machine Learning Packages such as Numpy and Pandas. 3. Demonstrate various data preprocessing techniques like Handling missing values, Anomaly Detection. 4. Demonstrate various Data Visualization Techniques using matplotlib. 5. Implement covariance and correlation of attributes for a given dataset. 6. Implement Simple and Multiple Linear Regression Models 7. Develop Logistic Regression Model for a given dataset. 8. Develop Decision Tree Classification model for give dataset to solve real-world problems. 9. Build KNN and Naïve Bayes classification using python for a given dataset and identify correct and wrong predictions. 10. Implement Random Forest ensemble method on a given dataset. 11. Build Recommendation System for real-world datasets.	48
Total Conduct Hours		**48**

Course Outcomes	**On completion of the course, students will be able to** **CO1:** Generate .csv files for organizing data in the form of datasets. **CO1:** Implement and compare the performance metrics of various machine learning algorithms. **CO1:** Apply suitable data sets to the Machine Learning algorithms. **CO1:** Outline predictions using machine learning algorithms. **CO1:** Select appropriate algorithms for solving a of real-world problems

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	1	3
CO2	3	2	2	1	2
CO3	3	3	2	1	2
CO4	2	3	2	2	3
CO5	3	2	3	1	3

Course Code & Title	**24COUB4107** **Core Minor - 7:** Accounting for Decision Making **Credits:4**		
Class	**B.Sc. (Computer Science)**	**Semester**	**VII**
The syllabus will be provided by the respective department			

Course Code & Title	**24MAUB4108** **Core Minor - 8: Maths I:** Mathematical Foundation for Computer Science **Credits:4**		
Class	**B.Sc. (Computer Science)**	**Semester**	**VII**
The syllabus will be provided by the respective department			

B.Sc. Computer Science (Honours)
SEMESTER VIII

Course Code & Title	24CSUC4230 Core Major - 19: Advanced Database Management Systems Credits:3		
Class	**B.Sc. (Computer Science)**	**Semester**	**VIII**
Course Objectives	**The Course aims to** • Explore the emerging database management systems and their architecture and applications • Provide an overview of NoSQL, its features, characteristics, paradigms and challenges • Illustrate the usage of Mongo DB for a real time applications.		
Cognitive Level	**K1:** Describe the architectures of the emerging database systems **K2:** Understand the characteristics and applications of different data models **K3:** Choose the data models for real time applications. **K4:** Analyze the NoSQL storage types and MangoDB **K5:** Review the techniques used to criticize and improve the database design		

UNIT	CONTENTS	Lecture Schedule
I	**Advanced Database Techniques and System Architecture** Concept of Advanced Database Techniques, Impact of Emerging Database Standards. Database System Architecture: Overview –Centralized Database Systems Architectures –Server System Architectures - Parallel Systems –Distributed Systems –Transaction Processing in Parallel and Distributed Systems –Cloud-Based Services.	11
II	**Emerging Database Models, Technologies and Applications** Emerging database Models, technologies and Applications– Object-Based Databases – NoSQL databases – Distributed databases – Parallel databases – Cloud databases – Multimedia databases – Personal databases – Operational databases – Enterprise databases – End User databases – Commercial databases – Graph databases – Open source databases – OLTP databases – Document databases – Blockchain Databases.	13
III	**Overview of NoSQL** An Overview of NoSQL database –Defining NoSQL –What NoSQL is and what it is not –List of NoSQL Databases – Characteristics of NoSQL –RDBMS approach – Challenges –NoSQL approach.	12

IV	**NoSQL Storage Types and Comparative Study** NoSQL Storage Types – Storage types – Column-oriented databases – Document store – Key value store –Multi storage type databases – Advantages and Drawbacks – Transactional application – Computational application – Web-scale application. Comparative Study of NoSQL Products – Technical comparison – Nontechnical comparison.	14
V	**Working with Mongo DB** Working with MongoDB: Create Database – Create Collection – Insert Document – Find Data – Update Document – Query Operators – Update Operators – Aggregations – Indexing/Search – Validation – Data API – Drivers – Charts	14
Total Conduct Hours		**64**

Text Books:

1. Avi Silberschatz, Henry F.Korth, S.Sudarshan, Database System Concepts, 7th Edition, 2019
2. Ramez Elmasri and Shamkant B.Navathe, Fundamentals of Database Systems, Seventh Edition, Pearson Publication, 2018.
3. Gaurav Vaish, "Getting Started with NoSQL", Packt Publishing Ltd., 2013.

References:

1. Dan Sullivan, NoSQL for Mear Mortals, Pearson Publishing India Ltd., 2016.
2. Lee Chao, Database Development and Management, Auerbach Publications, 2010.
3. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Education, 2013.
4. Luc Perkins, Eric Redmond, Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement, 1st Edition, et al. O'Reilley Publishers, 2018.
5. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 6th Edition, McGraw Hill International Edition, 2011.
6. Wilfried Lemahieu, Seppe vanden Broucke, Bart Baesens, :Principles of Database Management: Practical Guide to Storing, Managing and Analyzing Big and Small Data,Cambridge University press (1st Ed), 2018.
7. Martin Kleppmann : Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems (1st Ed), O'Reilly 2017.
8. Paul Done, Practical MongoDB Aggregations: The official guide to developing optimal aggregation pipelines with MongoDB 7.0, Packt Publishers, 2023.

E-Resource:

- www. w3schools.com
- https://www.geeksforgeeks.org/introduction-to-nosql/
- https://www.javatpoint.com/nosql-databases

https://www.mongodb.com/docs/manual/tutorial/

Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Revise the architectures of the emerging database systems **CO2:** Examine the types of database models, their technologies and its applications. **CO3:** Understand the concept of NoSQL databases, its features and characteristics. **CO4:** Analyze the NoSQL storage types and techniques to criticize and improve the database design. **CO5:** Have a practical experience to master the MongoDB**.**

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	2	3
CO2	3	3	3	2	3
CO3	3	3	2	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Course Code & Title	24CSUC4231 Core Major - Lab 11: Advanced DBMS Credit: 1		
Class	**B.Sc. (Computer Science)**	**Semester**	**VIII**
Course Objectives	**The Course aims to** • Explore the creation and usage of NoSQL databases. • Performing simple and complex database operations using Mongo DB.		
Cognitive Level	**K1 – K5**		

Sl. No.	CONTENTS	Hours of Work
1. 2. 3. 4. 5. 6. 7. 8. 9. 10	Create Database Creation of Collection Insert/Find/Update/Delete Documents Using Query Operator and Aggregation Operations Implementing Indexing and Searching on Documents Performing Schema Validation Operations using Data API Working with Language Drivers Data Visualization using Charts Connecting Databases to Server-side Web Frameworks	48
Total Conduct Hours		**48**
Course Outcomes	**On completion of the course, students will be able to** **CO1:** Design and create different types of databases **CO2:** Perform basic and complex operations **CO3:** Implementing validation, indexing and searching on databases **CO4:** Usage of language drivers in databases **CO5:** Designing and using databases for server-side frameworks	

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	2	3
CO2	3	3	3	2	3
CO3	3	3	2	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Course Code & Title	24CSUC4232 Core Major - 20: Deeping Learning for Computer Vision Credits:3		
Class	**B.Sc. (Computer Science)**	**Semester**	**VIII**
Course Objectives	**The Course aims to** • To acquire knowledge on the basics of neural networks. • To impart skills on problem formulation over deep learning frameworks • To train on how to fine tune hyper parameters of Deep Learning algorithms. • To study the fundamental concepts of computer vision in deep learning perspective. • To explore various deep learning architectures and transfer learning. • To impart concepts that help identify suitable applications for Generative Adversarial Networks		
Cognitive Levels	**K1:** Remembering the basic mathematical concepts **K2:** Understand the mathematics behind functioning of artificial neural networks **K3:** Apply the mathematics to deep learning models. **K4:** Analyze the given dataset for designing a neural network based Solution **K5:** Evaluating the Design and Implementation of deep learning models for signal/image processing applications.		

UNIT	CONTENTS	Lecture Schedule
I	**Deep Learning** Understanding Deep Learning and its application: Introduction to Deep Learning (DL) - DL Applications in various domains - Supervised and unsupervised learning - Multi-layer Perceptrons – Back propagation- Artificial Neural Networks - Activation function - Gradient Descent - Model training – over fitting - model deployment.	16
II	**Convolutional Neural Networks** Convolutional Neural Networks(CNN): Introduction to Deep Supervised Learning - Convolution & Pooling – Kernels – Dropout – LeNet – AlexNet – ZFNet – VGGNet – GoogleNet – ResNet - DenseNet and other State-of-the-art CNNs.	12
III	**Transfer Learning** Transfer Learning: Transfer Learning Scenarios - Applications of Transfer Learning - Transfer Learning Methods - Fine Tuning and Data Augmentation.	11
IV	**CNN for Computer Vision** CNN for Computer Vision: Image Classification and Localization - Object Detection: R-CNN, F-RCN, YOLO - Semantic Segmentation - Instance Segmentation.	13

V	**Deep Generative Models** Introduction - Understanding Generative Adversarial Networks - Applications: Image Editing, Inpainting, Super Resolution, 3D Object Generation, Security - Variants: Cycle GANs, Progressive GANs, Stack GANs, Pix2Pix.	12
Total Conduct Hours		**64**

Text Book:

1. "Deep Learning", Ian Good fellow, Yoshua Bengio and Aaron Courville, MIT Press, 2016.
2. "Deep Learning for Computer Vision - Image Classification, Object Detection and Face Recognition in Python", Jason Brownlee, 2019.
3. "Deep Learning for Computer Vision with Python", Dr. Adrian Roseb rock, PyImage Search, 2017.

References:

1. "Fundamentals of deep learning", Nikhil Buduma, O'Reilly Media, 2017.
2. "Deep Learning for Computer Vision: Expert techniques to train advanced neural networks using Tensor Flow and Keras", Rajaling appaa Shanmugamani, Packt Publisher, 2018.

E-Resources:

1. http://nptel.ac.in/
2. https://github.com/tallamjr/iit-madras-DLCV
3. https://www.pdfdrive.com/search?q=deep+learning+for+computer+vision&pagecount=&pubyear=&searchin=&em=

Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Learn the fundamental principles of deep learning. **CO2:** Explore the essentials of Deep Learning and Deep Neural Network architectures. **CO3:** Evaluate the fundamentals of computer vision using deep learning. **CO4:** Choose appropriate Deep Learning algorithm with appropriate hyper parameter setting to solve the problem. **CO5:** Implement deep learning algorithms to solve real-world problems.

Mapping of Cos with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	3	2	3
CO2	3	3	3	3	2
CO3	2	2	3	3	3
CO4	3	3	3	1	2
CO5	2	3	3	3	3

Course Code & Title	24CSUC4233 Core Major - Lab 12: Deep Learning and Computer Vision Credit: 1		
Class	B.Sc. (Computer Science)	Semester	VIII
Course Objectives	The Course aims to • To learn deep neural networks and apply for simple problems • To Learn and apply Convolution Neural Network for image processing. • To Learn and apply Recurrent Neural Network and its variants for text analysis. • To augment data using generative models • To explore real world applications with deep neural networks		
Cognitive Level	K1 – K5		

Sl. No.	CONTENTS	Hours of Work
1.	1. XOR problem using Multilayer perceptron 2. Implement character and Digit Recognition using ANN. 3. Implement the analysis of X-ray image using auto encoders 4. Implement Speech Recognition using NLP 5. Develop a code to design object detection and classification for traffic analysis using CNN 6. Implement online fraud detection of share market data using any one of the data analytics tools. 7. Implement image augmentation using deep RBM 8. Implement Sentiment Analysis using LSTM. Mini Project	48
Total Conduct Hours		**48**

Course Outcomes	On completion of the course, students will be able to **CO1:** Apply deep neural network for simple problems **CO2:** Apply Convolution Neural Network for image processing **CO3:** Apply Recurrent Neural Network and its variants for text analysis **CO4:** Apply generative models for data augmentation **CO5:** Develop a real world application using suitable deep neural networks

Mapping of Cos with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	3	2	3
CO2	3	3	3	3	2
CO3	2	2	3	3	3
CO4	3	3	3	1	2
CO5	2	3	3	3	3

Course Code & Title	24CSUC4234 Project Credits: 12		
Class	B.Sc. (Computer Science)	Semester	VIII