CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

Nationally Accredited With "A" Grade By NAAC
TIRUCHIRAPPALLI

PG & RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M. Sc. COMPUTER SCIENCE

SYLLABUS

2023-2024 and Onwards

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

PG & RESEARCH DEPARTMENT OF COMPUTER SCIENCE

VISION

To create an ambience for a quality academic erudition which drives technologically adept, innovative and globally competent graduates with ethical values

MISSION

- To have a breath of knowledge across the subject areas of Computer Science
- To professionally enrich the students for successful career in Academic, Industry and Research
- To promote and inculcate ethics and code of professional practice among students

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	**LEARNING ENVIRONMENT** To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
PEO2	**ACADEMIC EXCELLENCE** To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	**EMPLOYABILITY** To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO4	**PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY** To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO5	**GREEN SUSTAINABILITY** To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

PROGRAMME OUTCOMES FOR M.Sc. COMPUTER SCIENCE PROGRAMME

PO NO.	Programme Outcome On completion of M.Sc. Computer Science The students will be able to
PO 1	**DOMAIN KNOWLEDGE** Acquire the in-depth computing knowledge both conceptual and applied pertaining to the core discipline
PO 2	**PROBLEM SOLVING** Procure knowledge-based skills to satisfy the needs of society and the industry by providing hands on experience of various technologies in Computer Science
PO 3	**INNOVATION AND CRITICAL THINKING** Critically evaluate global issues, recognize the need and identify sustainable solutions through research capabilities towards Nation building initiatives
PO 4	**LIFE LONG LEARNING** Capable of upgrading and advancing knowledge through innovation and technology as evidenced by current developments
PO 5	**LEADERSHIP AND TEAMWORK** Work in collaborative environment through applications of scientific reasoning and communicate effectively to the stakeholders

PROGRAMME SPECIFIC OUTCOMES FOR M.Sc COMPUTER SCIENCE PROGRAMME

PSO NO.	Programme Specific Outcomes Students of M.Sc. Computer Science will be able to	PO s Addressed
PSO 1	Identify, formulate and develop solutions for computational challenges	PO 1 PO 2
PSO 2	Inculcate broad knowledge in core areas of Computer Science and emerging technologies in related domains	PO 1 PO 2
PSO 3	Integrate computing knowledge on crafting innovative solutions and to provide a gateway for research.	PO 2 PO 3 PO 4
PSO 4	Develop analytical and technical skills to enhance employment potential and entrepreneurship	PO 3 PO 4 PO 5
PSO 5	Imbibe professional and ethical skills to become a competent citizen for the betterment of society	PO 3 PO 4 PO 5

Cauvery College for Women (Autonomous), Trichy

PG & Research Department of Computer Science

M.Sc. Computer Science

LEARNING OUTCOME BASED CURRICULUM FRAMEWORK (CBCS- LOCF)

(For the Candidates admitted from the Academic year 2023-2024 and onwards)

Semester	Course	Course Title	Course Code	Inst. Hrs. / week	Credits	Exam			Total
						Hrs.	Marks		
							Int.	Ext.	
I	Core Course– I (CC)	Analysis & Design of Algorithms	23PCS1CC1	6	5	3	25	75	100
	Core Course – II (CC)	Object Oriented Analysis and Design & C++	23PCS1CC2	6	5	3	25	75	100
	Core Course –III (CC)	Python Programming	23PCS1CC3	6	5	3	25	75	100
	Core Practical - I (CP)	Algorithm and OOPS (P)	23PCS1CC1P	6	5	3	40	60	100
	Discipline Specific Elective Course-I (DSE)	A. Advanced Software Engineering	23PCS1DSE1A	6	3	3	25	75	100
		B. Advanced Computer Architecture	23PCS1DSE1B						
		C. Advanced Database Systems	23PCS1DSE1C						
	Total			**30**	**23**	**-**	**-**	**-**	**500**
15 Days INTERNSHIP during Semester Holidays									
II	Core Course– IV(CC)	Data Mining and Warehousing	22PCS2CC4	6	5	3	25	75	100
	Core Course– V(CC)	Compiler Design	23PCS2CC5	6	5	3	25	75	100
	Core Choice Course–I (CCC)	A. Mobile Computing	22PCS2CCC1A	6	4	3	25	75	100
		B. Wireless Sensor Networks	22PCS2CCC1B						
		C. MANET	22PCS2CCC1C						
	Core Practical-II(CP)	Data Mining (P)	22PCS2CC2P	6	5	3	40	60	100
	Discipline Specific Elective Course-II (DSE)	A. Cryptography and Network Security	22PCS2DSE2A	6	3	3	25	75	100
		B. Block chain and Cryptocurrencies	22PCS2DSE2B						
		C. Ethical Hacking	22PCS2DSE2C						
	Internship	Internship	22PCS2INT	-	2	-	25	75	100
	Extra Credit Course	SWAYAM	As per UGC Recommendation						
	Total			**30**	**24**	**-**	**-**	**-**	**600**

Semester	Course	Course Title	Course Code	Inst. Hrs. / week	Credits	Exam			Total
						Hrs	Marks		
							Int.	Ext.	
III	Core Course– VI (CC)	Machine Learning Techniques	23PCS3CC6	6	5	3	25	75	100
	Core Course – VII (CC)	Cloud Computing	22PCS3CC7	6	5	3	25	75	100
	Core Choice Course– II (CCC)	A. Cyber Security	22PGCS3CCC2A	5	4	3	25	75	100
		B. IoT	22PCS3CCC2B						
		C. Natural Language Processing	22PCS3CCC2C						
	Core Practical - III (CP)	Cloud Computing (P)	23PCS3CC3P	5	4	3	40	60	100
	Discipline Specific Elective Course-III (DSE)	A. Computer Science for Competitive Examinations	22PCS3DSE3A	5	3	2	-	100	100
		B. IoT (P)	22PCS3DSE3BP			3	40	60	
		C. Natural Language Processing (P)	22PCS3DSE3CP						
	Generic Elective Course -I (GEC)	Data Analysis (P)	22PCS3GEC1P	3	2	3	40	60	100
	Extra Credit Course	SWAYAM	As per UGC Recommendation						
	Total			**30**	**23**	-	-	-	**600**
IV	Core Course–VIII (CC)	Big Data Analytics	22PCS4CC8	6	5	3	25	75	100
	Core Choice Course– III (CCC)	A. Robotic Process Automation	22PCS4CCC3A	6	4	3	25	75	100
		B. Virtual and Augmented Reality	22PCS4CCC3B						
		C. Digital Image Processing	22PCS4CCC3C						
	Core Practical - IV (CP)	FOSS (P)	22PCS4CC4P	6	5	3	40	60	100
	Generic Elective Course-II (GEC)	Animation (P)	22PCS4GEC2P	3	2	3	40	60	100
	Project	Project Work	23PCS4PW	9	4	-	-	100	100
	Total			**30**	**20**				**500**
	Grand Total			**120**	**90**				**2200**

Courses & Credits for M.Sc. Computer Science Programme

S. No.	Courses	No. of Courses	No. of Credits	Marks
1.	Core Course– (CC)	8	40	800
2.	Core Choice Course– (CCC)	3	12	300
3.	Core Practical - (CP)	4	19	400
4.	Discipline Specific Elective- (DSE)	3	9	300
5.	Generic Elective Course - (GEC)	2	4	200
6.	Project	1	4	100
7.	Internship	1	2	100
	Total	**22**	**90**	**2200**

The Internal and External marks for theory and practical courses are as follows:

Course	Internal Marks	External Marks
Theory	25	75
Practical	40	60
Project	-	100
Internship	25	75

For Theory courses:

a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)

b) The passing minimum for End Semester Examinations shall be 40% out of 75 marks (i.e. 30 marks)

c) The passing minimum not less than 50% in the aggregate

For Practical courses:

a) The passing minimum for CIA shall be 40% out of 40 marks (i.e. 16 marks)

b) The passing minimum for End Semester Examinations shall be 40% out of 60 marks (i.e. 24 marks)

c) The passing minimum not less than 50% in the aggregate

For Project Work:

a) The passing minimum not less than 50% out of 100 marks

For Internship:

a) The passing minimum not less than 50% in the aggregate

Semester: I	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
23PCS1CC1	ANALYSIS & DESIGN OF ALGORITHMS	CORE	6	5

Course Objective

- To learn the Elementary Data Structures and algorithms
- To understand the basics of an algorithm, their analysis and design
- To inculcate the knowledge of Basic Traversal and Search Techniques, Greedy method, Divide and Conquer method, Dynamic programming and Backtracking

Prerequisite

Basic concepts of data structures and algorithms

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	Get knowledge about algorithms and determine their time complexity	K1
CO2	Demonstrate specific search and sort algorithms using divide and conquer technique	K2
CO3	Apply different methods to analyze the algorithm performance	K3
CO4	Compare the concept of various algorithm technique	K4
CO5	Explore the algorithm technique on Real time applications	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2	3	3	1	3	2
CO2	3	3	3	2	3	3	3	2	3	3
CO3	3	2	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	1	2
CO5	3	3	3	3	3	3	3	2	3	3

"1"–Slight (Low) Correlation
"2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation
"-"–indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction:** - Algorithm Definition and Specification – Space complexity – Time Complexity –Asymptotic Notation. **Elementary Data Structures:** Stacks and Queues – Binary Trees - Binary Search Trees - Heaps – Heap sort - Graphs.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Basic Traversal And Search Techniques:** Techniques for Binary Trees – Techniques for Graphs. **Divide and Conquer:** General Method – Binary Search – Merge Sort– Quick Sort.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**The Greedy Method**: General Method – Knapsack Problem – Minimum Cost Spanning Trees: Prim's Algorithm – Kruskal Algorithm – Optimal storage on Tapes – Single Source Shortest Paths.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Dynamic Programming:** General Method – Multistage Graphs – All Pair Shortest Path – Optimal Binary Search Trees – 0/1 Knapsack – Traveling Sales person Problem – Flow Shop Scheduling.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Back tracking**: General Method – 8-Queens Problem – Sum of Subsets – Graph Coloring– Hamiltonian Cycles. **Branch And Bound:**-The Method–Traveling Sales person.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment:** **(Not included for End Semester Examination)** NP Hard and NP Complete Problems: Basic Concept – COOK's theorem – NP Hard Graph Problems – NP Hard Code Generation.		CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

TextBook

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekan.(2017). *Fundamentals of Computer Algorithms.* 2nd Edition, University Press.

Reference Books

1. Alfred V. Aho, John E Hopcraft, Jefffrey D. Ullman.(2004). *Data Structures and Algorithms*. Pearson Education.
2. Goodrich. *Data Structures & Algorithms in Java.* 3rd Edition, Wiley.
3. Skiena.(2008).*The Algorithm Design Manual*. 2nd Edition,Springer.
4. Anany Levith.(2003). *Introduction to the Design and Analysis of algorithm*. Pearson Education Asia.
5. Robert Sedgewick, Phillipe Flajolet.(1996).*An Introduction to the Analysis of Algorithms.* Addison-Wesley Publishing Company.

Web References

1. https://nptel.ac.in/courses/106/106/106106131/
2. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
3. https://www.javatpoint.com/daa-tutorial

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Quiz, Seminar.

Course Designer

Ms.P.Muthulakshmi

Semester: I	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
23PCS1CC2	OBJECT ORIENTED ANALYSIS AND DESIGN &C++	CORE	6	5

Course Objective

- To Present the object model, classes and objects, object orientation, machine view and model management view
- To learn the basic functions, principles and concepts of object oriented analysis and design
- To understand C++ language with respect to Object Oriented Analysis and Design

Prerequisites

Basics of Programming and Object Oriented Programming Concepts

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	Understand the concept of Object Oriented development and modeling techniques	K1, K2
CO2	Gain knowledge about the various steps performed during object design	K2, K3
CO3	Abstract object-based views for generic software systems	K3
CO4	Link OOAD with C++ language	K4,K5
CO5	Apply the basic concepts of OOPs and familiarize to write C++ program	K5, K6

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	2
CO2	3	2	3	3	2	3	3	2	3	2
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	2	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

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"3" – Substantial (High) Correlation "-" –indicates there is no Correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**The Object Model**: The Evolution of the Object Model – Elements of the Object Model – Applying the Object Model. **Classes and Objects**: The Nature of an Object – Relationships among Objects- The Nature of Class – Relationship among Classes – The Interplay of Classes and Objects.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	Introduction to C++-Input and Output in C++- C++ Declarations - Control Structures.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	Functions in C++ - Classes and Objects in C++– Constructors and Destructors–Operator Overloading and Type Conversion.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	Inheritance – Pointers and Arrays-C++ And Memory: the new and Delete operators – Polymorphism and Virtual Functions.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	Applications with Files–Exception Handling – Working with Strings - Overview of Standard Template Library (STL).	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	**Self Study for Enrichment:** **(Not included for End Semester Examinations)** **Classification:** The Importance of Proper Classification –Identifying Classes and Objects – Key Abstractions and Mechanisms. **Notation:** The Unified Modeling Language – Component Diagrams-Deployment Diagrams-Use Case Diagrams-Activity Diagrams-Class Diagrams-Object Diagrams.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Books

1. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, BobbiJ.Young, Jim Conallen, Kelli A.Houston.(2014).*Object Oriented Analysis and Design with Applications*.3rdEdition, Pearson Education.**(Unit: I)**
2. Ashok N.Kamthane.(2009),*Object-Oriented Programming with ANSI & TurboC++,7th Impression*, Pearson Education Limited. **(Unit: II - V)**

Reference Books

1. Balagurusamy (2003), *Object Oriented Programming with C++*, Second Edition, TMH.
2. Yashwant Kanetkar .(2019). *Let Us C++* , Third Edition, BPB.

Web References

1. https://onlinecourses.nptel.ac.in/noc19_cs48/preview
2. https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/
3. https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.htm

Pedagogy

Chalk and Talk, PPT ,Discussion, Assignment, Quiz, Seminar

Course Designer

Ms. K. Pradeepa

Semester: I	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
23PCS1CC3	PYTHON PROGRAMMING	CORE	6	5

Course Objective

- To learn the Syntax and Semantics of Python Programming Language
- To write Python functions to facilitate code reuse and manipulate Strings
- To Understand different Data Structures of Python
- To Illustrate the process of Structuring the data using Lists, Tuples and Dictionaries

Prerequisites

Basic Knowledge in Programming Language

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	Recall and understand the basic concepts of Python Programming	K1, K2
CO2	Understand the fundamental principles of Classes and Objects	K2
CO3	Solve real world problems by applying Object Oriented Skills	K3
CO4	Analyze the concepts of Python for developing Web applications	K4
CO5	Develop and evaluate programs for Client Server Networking applications	K5, K6

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	2	3	3	2	3
CO2	3	2	2	2	2	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation "-" –indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**A Taste of Py:** Installing Python – Running Python. **Py Ingredients:** Numbers, Strings, and Variables. **Py Filling:** Lists, Tuples, Dictionaries and Sets.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**Py Crust: Code Structures:** Compare with if, elif and else – Repeat with while – Iterate with for – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – Make your own Exceptions.	18	CO1, CO2, CO3, CO4, CO5,	K1, K2, K3, K4, K5, K6
III	**Py Boxes: Modules, Packages, and Programs:** Standalone Programs – Command-Line Arguments – Modules and the import Statement – Packages - The Python Standard Library. **Oh Oh: Objects and Classes:** Objects - Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Your Parent with super – In self Defense –Get and Set Attribute Values with Properties –Name Mangling for Privacy – Method Types – Duck Typing – Special Methods – Aggregation and Composition.	20	CO1, CO2, CO3, CO4, CO5,	K1, K2, K3, K4, K5, K6
IV	**Mangle Data Like a Pro:** Text Strings – Binary Data. **Data Has to Go Somewhere:** File Input/Output – Structured Text Files – Structured Binary Files - Relational Databases – NoSQL Data Stores. **The Web, Untangled:** Web Clients – Web Servers – Web Services and Automation.	17	CO1, CO2, CO3, CO4, CO5,	K1, K2, K3, K4, K5, K6
V	**Systems:** Files – Directories – Programs and Processes – Calendars and Clocks. **Concurrency and Networks:** Concurrency: Queues – Processes – Threads –Green Threads and gevent – twisted – Redis-Networks: Patterns – The Publish - Subscribe Model – TCP/IP – Sockets – ZeroMQ – Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and Map Reduce – Working in the Clouds.	17	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

VI	**Self-Study for Enrichment:** **(Not included for End Semester Examinations)** Full-Text Databases – PyCharm-Case Study: Data Analysis and Visualization using Python-Web Development Using Python-Scientific Computing Using Python.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Book

1. Bill Lubanovic.(2016). *Introducing Python.* 1st Edition, Third Release, O'Reilly

Reference Books

1. MarkLutz.(2013). *Learning Python.* 5th Edition, O'Reilly
2. David M. Beazley.(2009). *Python Essential Reference.* 4th Edition, Developer's Library.
3. Sheetal Taneja, Naveen Kumar.(2017). *Python Programming – A Modular Approach*, Pearson Publications

Web References

1. https://www.programiz.com/python-programming/
2. https://www.tutorialspoint.com/python/index.htm
3. https://onlinecourses.swayam2.ac.in/aic20_sp33/preview
4. https://www.w3schools.com/python/python_intro.asp
5. https://www.javatpoint.com/python-tutorial

Pedagogy

Chalk and Talk, PPT, Discussion, Assignment, Quiz, Seminar

Course Designer

Ms.R. Sangeetha

Semester: I	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
23PCS1CC1P	ALGORITHM AND OOPS (P)	CORE	6	5

Course Objective

- To learn the applications of the data structures using various techniques
- To understand C++ language with respect to Object Oriented Analysis and Design (OOAD) concepts
- T build application of OOPS concepts

Prerequisites

Basic understanding of C++ Programming

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	Identify and apply the suitable data structure for the given real world problem	K2, K3
CO2	Able to understand and implement OOPS concepts.	K2,K3
CO3	Apply the concepts of Stack, Queue, Tree, List using C++	K3
CO4	Analyze the concepts of sorting and searching algorithms using relevant data structures.	K4
CO5	Interpret and Solve problem involving graphs, trees and heaps	K6

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	2
CO2	3	2	3	3	2	3	3	2	3	2
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	2	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

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"2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation
"-" –indicates there is no Correlation.

Exercises

1. Write a program to solve the Tower of Hanoi using recursion.
2. Write a program to traverse through Binary Search Tree using traversals.
3. Write a program to perform various operations on Stack using Linked list.
4. Write a program to perform various operations in a circular queue.
5. Write a program to sort an array of elements using Quick sort.
6. Write a program to solve the number of elements in ascending order using Heap sort.
7. Write a program to solve the knapsack problem using Greedy method
8. Write a program to search an element in a tree using Divide & Conquer strategy.
9. Write a program to place the 8 queens on an 8 x 8 matrix so that no two queens Attack.
10. Write a C++ program to perform Virtual Function
11. Write a C++ program to perform Parameterized Constructor
12. Write a C++ program to perform Friend Function
13. Write a C++ program to perform Function Overloading
14. Write a C++ program to perform Single Inheritance
15. Write a C++ program to perform Employee Details using files.

Web References

1. https://onlinecourses.nptel.ac.in/noc19_cs48/preview
2. https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.htm
3. https://www.geeksforgeeks.org/c-plus-plus/?ref=shm
4. https://www.tutorialspoint.com/cplusplus-program-to-implement-stack-using-linked-list
5. https://webeduclick.com/cpp-program-tower-of-hanoi-using-recursion/

Pedagogy

Power Point Presentation, Live Demonstration

Course Designer

Ms. S.Saranya

Semester: I	Internal Marks:25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
23PCS1DSE1A	ADVANCED SOFTWARE ENGINEERING	DISCIPLINE SPECIFIC ELECTIVE	6	3

Course Objective

- To learn the concepts of Software Engineering
- To provide the idea of decomposing the given problem into Analysis, Design, Testing and Maintenance phases
- To inculcate knowledge on Software Project Management, Software Design &Testing

Prerequisites

Basics of Software Engineering &Software Project Management

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	Understand about Software Engineering process	K1, K2
CO2	Make use of Software Project Management Skills, Design and Quality Management	K3
CO3	Analyze on Software Requirements and Specification	K4
CO4	Analyze and Compare Software Testing, Maintenance and Software Re-Engineering	K4, K5
CO5	Design and conduct various types and levels of software quality or a software project	K5, K6

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	2	2	3	3	3	2	2	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no Correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction:** The Problem Domain – Software Engineering Challenges - Software Engineering Approach. **Software Processes:** Software Process – Characteristics of a Software Process – Software Development Process Models – Other software processes.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**Requirements Analysis and Specification**: Requirements Gathering and Analysis- Software Requirements Specification (SRS) - Formal System Specification – Axiomatic Specification – Algebraic Specification. **Software Quality Management:** Software Quality-Software Quality Management System-ISO 9000 - SEI Capability Maturity Model.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	**Software Project Management:** Responsibilities of a Software Project Manager – Project Planning – Metrics for Project Size Estimation – Project Estimation Techniques – Empirical Estimation Techniques – COCOMO – Halstead's Software Science – Staffing Level Estimation – Scheduling– Organization and Team Structures – Staffing – Risk Management – Software Configuration Management.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	**Software Design:** Outcome of the Design Process – Characteristics of a good software design – Cohesion and Coupling -Layered Arrangement of Modules- Function Oriented Design – Object Oriented Design. **Function Oriented Software Design**: Structured Analysis-Structured Design-Detailed Design-Design Review.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	**Software Testing:** Basic concepts and Terminologies – Design Test Cases: Functional testing– Structural testing – Levels of testing: Unit testing, Integration Testing and System Testing – Debugging–Program Analysis tools-Some General Issues Associated with Testing: Regression testing. **Software Maintenance:** Characteristics of Software Maintenance – Software Reverse Engineering – Software Maintenance Process Models: Software Re-engineering.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	**Self-Study for Enrichment:** (Not included for End Semester Examinations) Requirement engineering -Strategy of Design-IEEE Recommended Practice for Software Design Descriptions - Reliability Estimation. Case Study: Student Result Management System.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Books

1. Pankaj Jalote, (2005). *An Integrated Approach to Software Engineering*, 3rd Edition, Springer Science + Business Media. (**Unit: I**)
2. Rajib Mall,(2018).*Fundamentals of Software Engineering*,5thEdition, PHI Learning Private Limited. (**Unit: II - V**)

Reference Books

1. K.K.Aggarwal and Yogesh Singh,(2005). *Software Engineering*. Revised 2nd Edition, New Age International Publishers.
2. R.S.Pressman(2010).*A Practitioner's Approach-Software Engineering*. McGraw-Hill Higher Education.
3. Carlo Ghezzi.M, Jazayeri, D.Mandrioli (2010).*Fundamentals of Software Engineering*, PHI Publication

Web References

1. https://www.javatpoint.com/software-engineering-tutorial
2. https://onlinecourses.swayam2.ac.in/cec20_cs07/preview
3. https://onlinecourses.nptel.ac.in/noc19_cs69/preview
4. https://www.google.co.in/books/edition/FUNDAMENTALS_OF_SOFTWARE_ENGINEERING_FIF/-
5. https://www.google.co.in/books/edition/_/pJc3xKQfD-MC?hl=en&gbpv=1

Pedagogy

Chalk & Talk, PPT, Group Discussion, Seminar and Assignment

Course Designer

Dr.K.Reka

Semester: I	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
23PCS1DSE1B	ADVANCED COMPUTER ARCHITECTURE	DISCIPLINE SPECIFIC ELECTIVE	6	3

Course Objective

- To understand the micro-architectural design of processors
- To learn about the various techniques used to obtain performance improvement and power savings in current processors
- To gain knowledge in distributed and Parallel Computing Architecture

Prerequisites

Basic Knowledge about Microprocessor

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO 1	Remember and Understand the computer architecture	K1, K2
CO 2	Interpret and Experiment with different pipelined processor	K2, K3, K5
CO 3	Organize and Analyze the architectural features of advanced processors	K3, K4
CO 4	Examine and Evaluate the cache and memory related issues in multiprocessors	K4, K5
CO 5	Assess the historical and current developments in computer architecture and adopt to the needs	K5, K6

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	3	3	3	3	3	3
CO 2	3	2	3	2	3	2	3	2	2	3
CO 3	2	3	2	3	2	3	3	3	3	3
CO 4	3	3	3	2	3	3	3	3	2	2
CO 5	2	3	3	3	2	2	3	3	3	3

"1"–Slight (Low) Correlation
"2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation
"-"indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Fundamentals of Quantitative Design and Analysis:** Classes of Computers - Defining Computer Architecture- Trends in Technology, Power, Energy and Cost – Dependability- Measuring, Reporting, and summarizing Performance - Quantitative Principles of Computer Design	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**Instruction-Level Parallelism:** Concepts and Challenges – Basic Compiler Techniques for Exposing ILP – Reducing Branch Costs with Advanced Branch Prediction - Overcoming Data Hazards with Dynamic Scheduling-Hardware-Based Speculation - Exploiting ILP Using Dynamic Scheduling, Multiple Issue, and Speculation	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	**Data-Level Parallelism in Vector SIMD and GPU Architectures:** Vector Architecture - SIMD Instruction Set Extensions for Multimedia -Graphics Processing Units- Detecting and Enhancing Loop-Level Parallelism	19	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	**Thread-Level Parallelism:** Centralized Shared-Memory Architectures-Performance of Symmetric Shared-Memory multiprocessor-Distributed Shared-Memory and Directory-Based Coherence-Synchronization-Models of Memory Consistency	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	**Warehouse-scale Computers to Exploit Request Level and Data-Level Parallelism:** Programming Models and Workloads for Warehouse- Computer Architecture of Warehouse-Scale Computers – The Efficiency and cost of Warehouse-Scale Computers	17	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Historical Perspectives Quantitative Design and Analysis:** Limitations of Instruction-Level Parallelism and Its Exploitation-Fallacies and pitfalls of Data-Level Parallelism in Vector-Cross Cutting Issues in Thread - Level Parallelism-Using Energy Efficiency inside the server.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Book

1. John L Hennessey, David A Patterson (2019).*Computer Architecture A Quantitative Approach.* Sixth Edition, Morgan Kaufmann Elsevier.

Reference Books

1. KaiHwang, FayeBrigg(2000). *Computer Architecture And Parallel Processing*. International Edition, McGraw-Hill.
2. SimaD, FountainT, KacsukP(2000). *Advanced Computer Architectures: A Design Space Approach*.Addison Wesley.

Web References

1. www.cs.iiie.edu.in/
2. https://passlab.githlub.io/CSE565/note

Pedagogy

Chalk and talk & Seminar

Course Designer

Ms. A. Jabeen

Semester: I	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS / WEEK**	**CREDITS**
23PCS1DSE1C	**ADVANCED DATABASE SYSTEMS**	**DISCIPLINE SPECIFIC ELECTIVE**	**6**	**3**

Course Objective

- To inculcate knowledge in Transaction Management with ACID properties
- To learn about advanced concepts of Database Management System
- To gain Knowledge in Information retrieval using XML and Internet Databases

Prerequisites

Basic knowledge about Relational Database Management Systems.

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	Remember and Understand the concepts of databases	**K1, K2**
CO2	Demonstrate and make use of different kinds of databases	**K2, K3**
CO3	Identify and analyze databases for real life applications	**K3, K4**
CO4	Compare and evaluate the performance of databases based on its transaction and concurrency control feature	**K4, K5**
CO5	Interpret and develop parallel, distributed, object oriented And advanced databases for handling real time data	**K5, K6**

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	2	3	2	3	3	3	2	2	3
CO3	2	3	2	3	2	3	3	3	3	3
CO4	3	3	3	2	3	2	3	3	2	2
CO5	2	3	3	3	2	3	3	3	3	3

"1"–Slight (Low) Correlation
"2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation
"-"indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Transactions Management:** Transaction Concepts – A Simple Transaction Model - Transaction Atomicity and Durability – Transaction Isolation- Serializability Transaction Isolation and Atomicity. **Concurrency Control:** Lock based Protocols – Deadlock Handling – Multiple Granularity – Timestamp - Based Protocols – Validation - Based Protocols.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**Parallel Databases:** I/O Parallelism – Interquery Parallelism - Intraquery Parallelism - Intraoperation Parallelism-Interoperation Parallelism- Query Optimization - Design of Parallel Systems - Parallelism on Multicore Processors	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	**Distributed Databases:** Homogeneous and Heterogeneous Databases – Distributed Data Storage - Distributed Transactions - Commit Protocol – Concurrency Control in Distributed Databases- Availability - Distributed Query Processing- Heterogeneous Distributed Databases-Cloud Based Databases - Directory Systems	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	**Object Based Databases:** Complex Data Types – Structured types and Inheritance in SQL – Table Inheritance - Array and Multiset Types in SQL – Object Identity and Reference Types in SQL - Implementing O-R features–Object Relational Mapping - Object-Oriented versus Object-Relational.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	**XML: Extensible Markup Language:** Structured, Semi Structured and Unstructured Data – XML Hierarchical (Tree) Data Model – XML Documents, DTD, XML Schema - Storing and Extracting XML documents from Databases –XML Languages - Extracting XML documents from Relational Databases.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Case Studies:** SQL - MYSQL -Oracle - PostgreSQL- NOSQL -DynamoDB- MongoDB .	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Books

1. Abraham Silberschatz., Henry F. Korth. S. Sudarshan (2013). *Database System Concepts*.6thEdition, McGraw Hill. **(Unit I - IV)**
2. Ramez Elmasri, Shamkant. B.Navathe (2015). *Fundamentals of Database Systems.* 6th Edition, Pearson Education. **(Unit V)**

Reference Books

1. Thomas Connolly, Carolyn Begg. (2015). *Database Systems, A Practical Approach to Design, Implementation and Management*. 6thEdition, Pearson Education.
2. Raghu Ramakrishnan, Johannes Gehrke. (2007). *Database Management System*. 3rd Edition, McGraw Hill Higher Education.

Web References

1. https://www.exploredatabase.com/p/advanced-database-concepts
2. https://www.wideskills.com/introduction-to-database

Pedagogy

Chalk and talk, Lecture, Discussion, Quiz, Demonstration, and PPT

Course Designer

Ms.R. Sridevi

SEMESTER II

Semester II	Internal Marks: 25		External Marks:75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS / WEEK**	**CREDITS**
22PCS2CC4	**DATA MINING AND WAREHOUSING**	**CORE**	**6**	**5**

Course Objective

- Able to understand the data sets and data preprocessing
- Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification, clustering and regression
- Exercise the data mining techniques with varied input values for different parameters
- Ability to apply mining techniques for realistic data
- To prepare the students for building career in data warehousing and data mining areas

Prerequisites

Basic knowledge in Probability, Programming Languages and Database concepts

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO 1	Recognize the basic concepts and functionality of data mining and warehousing.	K1, K2
CO 2	Identify and Choose appropriate data mining techniques	K2, K3
CO 3	Apply and Analyse the suitable solution to the problem	K3, K4
CO 4	Build and Justify the results produced by data mining	K3, K5
CO 5	Categorize and evaluate skills in selecting the appropriate data mining algorithm for solving practical problems	K4, K5

Mapping of CO with PO and PSO

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

"1"-Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"-Substantial (High) Correlation "-"-indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction**: Data mining – Kinds of data to be mined– Kinds of patterns to be mined– Kinds of Applications to be targeted-Major Issues in Data mining –**Data mining Trends and Research Frontiers:** Other Methodologies – Data mining Applications –Datamining Trends.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**Data Pre-Processing**: Data Cleaning–Data Integration-Data Reduction: Overview of Data Reduction Strategies – Wavelet Transforms – Principle Component Analysis – Attribute Subset Selection –Data Transformation and Data Discretization: Data Transformation Strategies Overview – Data Transformation by Normalization. **Mining Frequent Patterns, Associations and Correlations**: Basic concepts – Frequent Itemset Mining Methods- Pattern Evaluation Methods.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	**Advanced Pattern Mining**: Pattern Mining: A Road Map – Pattern Mining in Multilevel, Multidimensional Space-Constraint-Based Frequent Pattern Mining. **Data Warehousing**: Basic Concepts – Data Warehouse Modeling: Data cube and OLAP – Data Warehouse Design and usage.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	**Classification:** Basic concepts- Decision Tree Induction - Bayes Classification Methods – Rule Based Classification – Model Evaluation and Selection-Techniques to improve Classification Accuracy - Classification using Frequent Patterns.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	**Cluster analysis**: **Basic concepts and methods –** Cluster analysis – Partitioning methods - Hierarchical Methods – Density Based Methods-Grid Based Methods-Evaluation of Clustering.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Classification**: **Advanced Methods**: Classification by Back Propagation – Support Vector Machines –K - Nearest-Neighbor Classifiers – Genetic algorithms. **Advanced Cluster Analysis**: Clustering High Dimensional data. **Outlier Detection**: Outlier and Outlier Analysis.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Book

1. Jiawei Han, Micheline Kamber, JianPei. (2019).*Data Mining: Concepts and Techniques*.Third Edition, Morgan Kaufman Publishers.

Reference Books

1. Margaret H. Dunham. (2006).*Data Mining Introductory and Advanced Topics*. Pearson Education.
2. C. S. R. Prabhu (2010). *Data Warehousing: Concepts, Techniques, Products and Applications*, Second Edition, PHI Learning Private Ltd.
3. K.P.Soman, Shyam Diwakar, V.Ajay. (2010).*Insight into Data Mining Theory andPractice*. First Edition, PHI Learning Private Ltd.

Web References

1. www.tutorialride.com/data-mining/data-mining-tutorial.htm
2. https://hanj.cs.illinois.edu/bk3/bk3_slidesindex.htm
3. www.guru99.com/datawarehouse-architecture.htm
4. www.tutorialpoint.com/dwh/dwh_data_warehousing.htm

Pedagogy

Chalk and Talk, Group discussion, Seminar& Assignment.

Course Designer

Ms**.** S.Udhaya Priya

Semester: II	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS / WEEK**	**CREDITS**
22PCS3CC6 / 23PCS2CC5	**COMPILER DESIGN**	**CORE**	**6**	**5**

Course Objective

- To enrich the knowledge in various development phases of compiler and its uses
- To learn Code optimization techniques, machine code generation and use of symbol table
- To identify the similarities and differences among various parsing techniques and grammar transformation techniques

Prerequisites

Basic Knowledge in Programming Languages, Data Structures and Discrete Mathematics

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	Understand the structure of compiler, applications of finite automata, regular expressions, Grammar and identify the significance of different phases of the compiler.	K1, K2
CO2	Demonstrate the construction of finite automaton, various parsing, intermediate, target code generation and code optimization techniques.	K2
CO3	Construct the finite automaton, various parsing tables and develop intermediate and target code by using storage Allocation strategies.	K3, K4
CO4	Analyze and explain the relationship among the phases of compiler, various parsing and code optimization techniques	K4, K5
CO5	Assess and Recommend tools, methods, and techniques to build compiler	K4, K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	2	3	3	3	3	2
CO4	3	3	3	3	2	3	3	3	3	2
CO5	3	3	3	3	2	3	3	3	3	2

"1"– Slight (Low) Correlation
"2" – Moderate (Medium) Correlation
"3"– Substantial (High) Correlation
"-"indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction** to Compiler– The Structure of a Compiler – **Lexical Analysis:** The Role of the Lexical Analyzer – Specification of Tokens–Finite Automata- Nondeterministic Finite Automata- Deterministic Finite Automata- From Regular Expressions to Automata-Conversion of an NFA to a DFA-Construction of an NFA from Regular Expression	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Syntax Analysis**: The Role of the Parser-Context Free Grammars-Verifying the language generated by a grammar-Context Free Grammars versus Regular Expressions-Writing a Grammar-Eliminating ambiguity -Elimination of Left Recursion-Left Factoring – Top-Down Parsing-Recursive Descent Parsing – Nonrecursive Predictive Parsing- Bottom-Up Parsing- Shift-Reduce Parsing	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	LR Parsers- The LR-Parsing algorithm-Constructing SLR Parsing tables-Canonical LR(1) Parsing tables-Constructing LALR Parsing tables. **Syntax-Directed Translation:** Inherited and Synthesized Attributes – Dependency Graphs – S-Attributed Definitions – L-Attributed Definitions – Construction of syntax trees- Syntax Directed Translations Schemes	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Intermediate-Code Generation:** Variants of Syntax trees – Three Address code – Types and Declarations - Translation of Expressions – Type Checking - Control Flow – Back patching - Switch Statements – Intermediate Code for Procedures.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Code Generation**: Issues in the design of a Code Generator - Basic Blocks and Flow graphs– Optimization of Basic Blocks- The DAG Representation of Basic Blocks - Peephole Optimization	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment:** **(Not included for End Semester Examinations)** Compiler Construction tools -Input buffering- Recognition of tokens- Symbol Tables - Lexical analyzer Generator Lex-Parser Generator YACC. Error recovery in Parsing – Run time Environments- Storage organization- The target machine - A simple code generator.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi and Jeffrey D. Ullman,(2013). "*Compilers - Principles, Techniques and Tools*", Second Edition, Pearson Education.

Reference Books

1. Kennath C. Louden,(2006). "*Compiler Construction: Principles and Practice"*, Vikas publishing House.
2. S. Godfrey Winster, S.Aruna Devi, R.Sujatha,(2020). "*Compiler Design*", Second Edition, Yesdee Publishers.
3. Raghavan V, (2017). "*Principles of Compiler Design*" Tata McGraw Hill Education Pvt. Ltd.

Web References

1. https://www.geeksforgeeks.org/introduction-of-finite-automata/
2. https://www.slideshare.net/appasami/cs6660-compiler-design-notes?next_slideshow=1
3. https://www.javatpoint.com/lr-parser
4. https://www.tutorialspoint.com/compiler_design/compiler_design_phases_of_compiler.htm
5. https://byjus.com/gate/intermediate-code-generation-in-compiler-design-notes/
6. https://www.youtube.com/watch?v=F9ZoFP7D474
7. https://www.codingninjas.com/codestudio/library/code-generation-4403

Pedagogy

Chalk & Talk, PPT, Group Discussion, Seminar and Assignment

Course Designer

Ms. K. Sangeetha

Semester II	Internal Marks: 25		External Marks:75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS / WEEK**	**CREDITS**
22PCS2CCC1A	**MOBILE COMPUTING**	**CORE CHOICE**	**6**	**4**

Course Objective

- To understand Wireless networks GSM, UMTS and WAP Architecture
- To gain basic knowledge about Android Application Development
- To create real time application using Content Providers

Prerequisites

Java, Computer Fundamentals and Networking

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO 1	Define and Outline the Mobile Computing frameworks	**K1, K2**
CO 2	Demonstrate the network concepts and Identify Routing protocols	**K2, K3**
CO 3	Identify and Analyze the basics of Android Programming	**K3, K4**
CO 4	Examine and Assess the Interfaces for the Android platform	**K4, K5**
CO 5	Explain and Build the key Android programming concepts	**K5, K6**

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	2	3	3	3	2	3
CO 2	3	3	3	3	3	3	3	2	3	3
CO 3	3	3	3	3	3	3	3	3	2	3
CO 4	3	3	3	2	3	3	2	3	3	3
CO 5	3	3	2	2	3	3	3	2	3	3

"1"–Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation "-" indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction:** Applications- Simplified Reference Model – **Wireless Transmission:** Signal Propagation-Path Loss of Radio Signals-Multipath Propagation-Multiplexing – Modulation- Cellular Systems-**Telecommunication Systems:** GSM – System Architecture- Handover – Security. **Satellite Systems:** Applications– Basics.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Wireless LAN:** Advantages- Disadvantages- Design Goals- IEEE 802.11 – System Architecture-MAC Frames – MAC Management –Synchronization -Power Management – Roaming -Bluetooth - Architecture. **Mobile Network Layer:** Mobile IP- Goals –Entities and Terminology–IP Packet Delivery –Agent Advertisement and Discovery-Registration – Adhoc Networks – Routing - Routing Strategies-Destination Sequence Distance Vector – Dynamic Source Routing- Hierarchical Algorithms - Alternative Metrics.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Getting started with Android Programming:** Introduction to Android – Obtaining the Required Tools-Creating an Android Application-Anatomy ofan Android Application. **Activities, Fragments, and Intents:** Understanding Activities-Applying styles and Themes to an activity-Hiding the activity title-Displaying a dialog window-Displaying a progress dialog-Linking Activities Using Intents –Resolving Intent Filter collision-Returning Intents from an Intent-Fragments.	21	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Getting to know the Android User Interface**: Understanding the Components of a Screen-Adapting to Display Orientation - Managing Changes to Screen Orientation -**Designing user interface with views**: Using Basic Views - Using Picker Views-Using List Views to Display Long Lists.	21	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Displaying Pictures and Menus with Views**: Using Image views to display Pictures-Some additionalviews. Content Providers: Sharing Data in Android-**Messaging**: SMS Messaging-Sending SMS messages programmatically- Getting feedback after sending a message-Receiving SMS message- Sending E-mail– **Location Based Services**: Displaying Maps	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Data Persistence:** Creating and using databases**. Content Providers:** Sharing data in Android-Using Content Provider. **Developing Android services:** Creating own services-Establishing communication between a service and an activity-Binding activity to services.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Jochen H.Schiller.(2014). *Mobile Communications.*2nd Edition, Addison Wesley Pearson Education.
2. Wei Meng Lee.(2012). *Beginning Android 4 Application Development.*1st Edition, Wiley India Pvt Ltd.

Reference Books

1. Raj Kamal.(2012),*Mobile Computing*,2nd Edition, Oxford University Press.
2. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal(2010).*Mobile Computing*. 2nd Edition, Tata McgrawHill Publishing Company Limited.

Web References

1. https://www.tutorialspoint.com/gsm/gsm_architecture.html
2. https://www.geeksforgeeks.org/advantages-and-disadvantages-of-wlan
3. http://developer.android.com/guide/
4. http://developer.android.com/reference/packages.html

Pedagogy

Chalk and Talk, Lecture, Group Discussion, e-Contents-Power point, Demonstration

Course Designer

Ms.K.Pradeepa

Semester II	Internal Marks: 25		External Marks:75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS / WEEK**	**CREDITS**
22PCS2CCC1B	**WIRELESS SENSOR NETWORKS**	**CORE CHOICE**	**6**	**4**

Course Objective

- To get a thorough knowledge about sensors and its architecture
- To learn the characteristics of wireless transmission
- To understand the working of MAC and Routing Protocols for sensor networks
- To gain knowledge in Transport layer, QoS and Security for sensor networks

Prerequisites

Basic knowledge in Data Communication Networks

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO 1	List and Summarize the applications, challenges of wireless sensor networks	**K1, K2**
CO 2	Interpret and Make use of the architecture for the wireless networks	**K2, K3**
CO 3	Apply and Correlate the concepts in sensor networking	**K3, K4**
CO 4	Categorize and compare the different routing protocols	**K4, K5**
CO 5	Evaluate and Conclude the QoS in wireless networks	**K5**

Mapping of CO with PO and PSO

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

"1"–Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation "-"indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction:** Application Examples-Types of Applications -Challenges for Wireless Sensor Networks-Why are sensor networks different-**Single-node architecture**: Hardware components	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Single-Node Architecture:** Energy Consumption of Sensor Nodes - Operating Systems and Execution Environments- **Network Architecture**: Sensor Network Scenarios-Design principles of WSNs.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**MAC Protocols:** Fundamentals of MAC Protocol - Low Duty Cycle Protocols and Wakeup Concepts-Contention-based protocols -The IEEE 802.15.4 MAC protocol	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Routing protocols:** Energy efficient unicast-Broadcast and multicast-Geographic routing. **Data-centric and content based Networking:** Data centric routing	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Transport Layer and Quality of Service:** QoS-Transport protocols-Sensing models-Coverage measures-Reliable data transport-Single packet delivery-Congestion situations in sensor networks. **Advanced application support**: Security Fundamentals-Security considerations in wireless sensor networks -DoS Attacks	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Link Layer Protocols:** Fundamentals-Tasks and requirements-Error control-Framing-Link Management	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book

1. Holger Karl, Andreas Willig (2015). *Protocols and Architectures for Wireless Sensor Networks.* Student Edition, John Wiley & Sons.

Reference Books

1. Waltenegus Dargie, Christian Poellabauer (2010). *Fundamentals of Wireless Sensor Networks Theory and Practice.*1st Edition, John Wiley and Sons.
2. Xiang-Yang Li (2008). *Wireless Ad Hoc and Sensor Networks: Theory and Applications*. Illustrated Edition, Cambridge University Press.
3. Feng Zhao, Leonidas J.Guibas (2007).*Wireless Sensor Networks-An Information Processing*. 1st Edition, Elsevier.
4. Kazem Sohraby, Daniel Minoli,TaiebZnati (2007). *Wireless Sensor Networks Technology, Protocols, and Applications*. Student Edition, John Wiley and sons.
5. Anna Hac (2003). *Wireless Sensor Network Designs.*1st Edition, John Wiley and sons.

Web References

1. https://www.intechopen.com/chapters/38793
2. https://www.geeksforgeeks.org/wireless-sensor-network-wsn/
3. https://nptel.ac.in/courses/106105160
4. http://www.tfb.edu.mk/amarkoski/WSN/Kniga-w02

Pedagogy

Chalk and Talk, PPT, Discussion, Assignment, Quiz and Seminar

Course Designer

Dr.D.Radhika

Semester II	Internal Marks: 25		External Marks:75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS / WEEK**	**CREDITS**
22PCS2CCC1C	**MANET**	**CORE CHOICE**	**6**	**4**

Course Objective:

- To understand the principles of adhoc networks
- To get a knowledge of routing protocols and their performance
- To gain knowledge about battery management schemes
- To identify the issues and solutions of transport layer

Prerequisites

Computer Networks

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO 1	Recall and Understand the fundamentals of Mobile ad-hoc Networks.	**K1, K2**
CO 2	Identify and analyze the current features of MANET and WSN	**K3, K4**
CO 3	Determine and Classify the functions of various routing protocols and their implications	**K3, K4**
CO 4	Identify the issues of architecture and its protocol, and Design solutions to overcome the issues	**K3, K5**
CO 5	Discriminate the current trends in MANETs and WSNs from industry and research point of views.	**K5**

Mapping of CO with PO and PSO

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

"1"–Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation "-"indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction:** Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio Propagation Mechanisms – Characteristics of the Wireless Channel – IEEE 802 Networking Standard – **Ad Hoc Networks:** Introduction – Issues in Ad Hoc Wireless Networks – Ad Hoc Wireless Internet	14	CO1, CO2, CO4, CO5	K1, K2, K3, K4 K5
II	**Routing Protocols for Ad Hoc Wireless Networks:** Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks – Classifications of Routing Protocols – Table–Driven Routing Protocols – On-Demand Routing Protocols - Hybrid Routing Protocols.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Multicast Routing in Ad Hoc Wireless Networks:** Issues in Designing a Multicast Routing Protocol – Classifications of Multicast Routing Protocols – Tree–Based Multicast Routing Protocols– Mesh–Based Multicast Routing Protocols– Energy–Efficient Multicasting.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Transport layer and Security Protocols for Ad Hoc Wireless Networks:** Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks - Classification of Transport Layer Solutions – Network Security Requirements - Security in Ad Hoc Wireless Networks - Network Security Attacks - Secure Routing in Ad Hoc Wireless Networks – **Quality of Service in Ad Hoc Wireless Networks:** Network Layer Solutions	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Energy Management in Ad Hoc Wireless Networks:** Battery Management Schemes-Transmission Power Management Schemes-**Recent advances in Wireless Networks:** Ultra-Wide-Band Radio Communication-Wireless Fidelity Systems.	20	CO1, CO2, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Wireless Sensor Networks:** Sensor Network Architecture – Data Dissemination – Data Gathering – MAC Protocols for Sensor Networks – Location Discovery – Quality of Sensor Networks – Evolving Standards – Other Issues.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book

1. C.Siva Ram Murthy, B.S.Manoj (2014).*Ad hoc Wireless Networks Architectures and protocols.* Pearson Education.

Reference Books

1. Stefano Basagni, Marco Conti, Silvia Giordano (2015). *Mobile Ad Hoc Networking: The Cutting Edge Directions.* 2nd Edition, Wiley India.
2. Mohamad Taha Sultan (2018). *Wireless Technologies in Mobile Ad-Hoc Networks.* Globe Edit.

Web References

1. https://www.tutorialspoint.com/what-is-ad-hoc-network
2. https://www.javatpoint.com/mobile-adhoc-network
3. https://www.geeksforgeeks.org/introduction-of-mobile-ad-hoc-network-manet/
4. http://et.engr.iupui.edu/~dskim/manet/

Pedagogy

Chalk and Talk, Group discussion, Seminar & Assignment

Course Designer

Ms.R.Sangeetha

Semester II	Internal Marks: 40		External Marks: 60	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS / WEEK**	**CREDITS**
22PCS2CC2P	**DATA MINING (P)**	**CORE**	**6**	**5**

Course Objective

- Exposure on Solving of data science problems
- Analyze real life data sets for analysis and prediction.
- Able to explore data using Python and R

Prerequisites

Data Mining, Python and R languages

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO 1	Interpret on data insights to evaluate preprocessing techniques	**K2**
CO 2	Identify various algorithms used in information analysis of data mining Techniques	**K3**
CO 3	Evaluate the performance of various data mining algorithms	**K5**
CO 4	Visualize the results produced by data mining techniques	**K6**
CO 5	Formulate library functions of Python and R	**K6**

Mapping of CO with PO and PSO

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

"1"–Slight (Low) Correlation
"2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation
"-"indicates there is no Correlation.

Exercises

R

1. Built in functions
2. Operators
3. Looping statements
4. Reading and Writing Different Types of Datasets
5. Correlation and Covariance
6. Classification
7. Clustering
8. Visualizations

PYTHON

1. To compute central tendency and dispersion measures.
2. Implement python libraries.
3. Data Preprocessing
4. Implement Simple Linear and Multiple Linear Regressions.
5. Implement decision tree
6. Implement KNN
7. Implement K-means clustering
8. Implement Association Rule Mining

Web References

1. https://www.springboard.com/blog/data-science/data-mining-python-tutorial/
2. https://dzone.com/refcardz/data-mining-discovering-and
3. https://www.rdatamining.com/
4. https://edisciplinas.usp.br/pluginfile.php/

Pedagogy

Demonstration

Course Designer

Ms.S.Udhaya Priya

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS / WEEK**	**CREDITS**
22PCS2DSE2A	**CRYPTOGRAPHY AND NETWORK SECURITY**	**DISCIPLINE SPECIFIC ELECTIVE**	**6**	**3**

Course Objective

- To overview the principles of Network Security
- To inculcate the encryption standards and techniques
- To gain knowledge in establishing IP security

Prerequisites

Computer Networks

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO 1	Understand and state the Network security concepts	**K1, K2**
CO 2	Classify and apply network security principles	**K2, K3**
CO 3	Interpret and analyze network security protocols	**K3, K4**
CO 4	Examine and Defend network security threat	**K4, K5**
CO 5	Interpret with various network security applications	**K5**

Mapping of CO with PO and PSO

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

"1"–Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation "-"indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Computer and Network Security concepts:** Computer security concepts-The OSI Security architecture-Security Attacks – Security Services – Security Mechanisms-A model for Network Security**. Classical Encryption Techniques**: Symmetric Cipher Model-Substitution Techniques -Transposition Techniques –Steganography.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Block Ciphers and the Data Encryption Standard:** Traditional Block Cipher Structure-The Data Encryption Standard-A DES Example -The Strength of DES-Block cipher design Principles- **Public key cryptography and RSA:** Principles of Public Key Cryptosystems – The RSA Algorithm.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Digital Signatures:** Digital signatures-**Mutual Trust**: X.509 Certificates-Public Key Infrastructure. **User Authentication:** Remote User-Authentication Principles-Remote User-Authentication Using Symmetric Encryption-Kerberos-Remote User-Authentication Using Asymmetric Encryption.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Network Access Control and Cloud Security:** Cloud Computing-Cloud Security Risks and Countermeasures. **Transport–Level Security:** Web Security Considerations-Transport layer Security**-Wireless Network Security:** Wireless Security – Mobile Device Security.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Electronic Mail Security**: Internet Mail Architecture-Email Formats- S/MIME-Pretty Good Privacy - **IP Security**: IP Security Overview –IP Security Policy-Encapsulating Security Payload- Combining Security Associations.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **System Security:** Malicious Software: Viruses and Related Threats-Distributed Denial of Service Attacks. **Intruders:** Intrusion Detection – Password Management-**Firewalls**: Need for Firewalls-Types of Firewalls.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book

1. William Stallings.(2017).*Cryptography and Network Security-Principles and Practices*. 7th edition, Pearson Education, New Delhi.

Reference Books

1.Behrouz.A.Forouzan(2020).Cryptography and Network Security.5th Edition. Tata McGraw Hill, New Delhi.
2. Atul Kahate (2017).*Cryptography and NetworkSecurity*.3rd Edition, Tata McGraw Hill, NewDelhi.
3.Charles P Fleeger, Shari Lawrence P Fleeger.(2011). *Security in Computing*. 4th Edition, Pearson Education, New Delhi.

Web References

1. https://www.open.edu/openlearn/science-maths-technology/computing-and ict/systems-computer/network-security/scs.carleton.ca/~paulv/5900wBooks.html
2. scs.carleton.ca/paulv/5900wBooks.html
3. https://en.wikipedia.org/wiki/Network_security
4. https://www.slideshare.net/HatemMahmoud/network-security-applications-4562405
5. https://www.intechopen.com/books/security-enhanced-applications-for-information-systems/cybersecurity-in-the-real-world

Pedagogy

Chalk and Talk ,PPT, Discussion, Assignment

Course Designer

Ms.G.Sujatha

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS/ WEEK**	**CREDITS**
22PCS2DSE2B	**BLOCKCHAIN AND CRYPTOCURRENCIES**	**DISCIPLINE SPECIFIC ELECTIVE**	**6**	**3**

- To assess blockchain applications in a structured manner
- To impart knowledge in block chain techniques and able to present the concepts clearly and structured
- To get familiarity with future currencies and to create own crypto token

Prerequisites

Basic knowledge in Cryptography, Data Structures, Distributed Systems and networking

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO 1	Understand the various technologies and its business use	**K1**
CO 2	Summarize the blockchain applications in a structured manner	**K2**
CO 3	Make use of the modern concepts of blockchain technology	**K3**
CO 4	Compare the modern currencies	**K4**
CO 5	Interpret the applications in real world scenario	**K5**

Mapping of CO with PO and PSO

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

"1"–Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation "-"indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Basic Concepts:** Decentralized society - Distributed Database, Byzantine General problem - Fault tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete - P2P network - Private key - Public key - Cryptography - Hash Function - Digital Signature - ECDSA - Memory Hard Algorithm - Zero Knowledge Proof	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3 K4, K5
II	**Blockchain:** Introduction-Advantage over conventional distributed database - Network and protocols - Block chain network - Mining - Mechanism - Life Cycle of Block chain - Distributed consensus - Merkle Patricia Tree - Gas Limit - Transactions and Fee - Anonymity - Reward - Chain policy- Life of Block chain applications -Soft and Hard Fork - Private and Public blockchain.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3 K4, K5
III	**Distributed Consensus:** Nakamoto consensus - Proof of work - Proof of Stake - Proof of Burn - Difficulty level - Sybil Attack - Energy Utilization and alternate - Fabric model - SDKs - Components of Fabric Model - Architecture of Hyperledger fabric.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3 K4, K5
IV	**Cryptocurrency:** History - Distributed ledger - Bitcoin protocols - Mining strategy and rewards - Ethereum - construction - Truffle - DAO - dApps - Smart Contract - Boot strapping - GHOST Vulnerability - Attacks - Sidechain - Namecoin	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3 K4, K5
V	**Applications:** Payment Channels and State Channels - State Channels—Basic Concepts and Terminology - Simple Payment Channel Example-Routed Payment Channels- Bitcoin Transactions- Transaction Outputs and Inputs-Wallet Technology details	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3 K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Cryptocurrency Regulations**: Stakeholders - Roots and Bitcoin - Legal Aspects - Crypto currency exchange - Black market and Global economy	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3 K4, K5

Text Books

1. Daniel Drescher(2017). *Blockchain Basics A Non-Technical Introduction in 25 steps*, 1st Edition, Apress.
2. Andreas M.Antonopoulos.(2019). *Mastering Bitcoin:Unlocking Digital Cryptocurrencies*. 2nd Edition, O'REILLY.

Reference Books

1. Paul Vigna and Michael J.Casey (2016). *The Age of Cryptocurrency*, 1st Edition, Picador St.Martin's Press.
2. Imran Bashir (2018). *Mastering Blockchain*. 1st Edition, Packt, Birmingham.
3. David Hooper, Kevin Solorio (2019). *Hands–On Smart Contract Development with Solidity andEthereum: From Fundamentals to Deployment,* 1st Edition, O'REILLY.
4. Chris Dannen (2017). *Introducing Ethereum and Solidity,* 1st Edition, Apress.

Web References

1. https://www.simplilearn.com/tutorials/blockchain-tutorial/blockchain-technology
2. https://sjce.ac.in/wp-content/uploads/2021/12/Block-Chain-notes.pdf
3. https://mrcet.com/downloads/digital notes.pdf
4. https://www.ibm.com/in-en/topics/what-is-blockchain

Pedagogy

Chalk and Talk, Group discussion, Seminar & Assignment.

Course Designer

Dr. D. Radhika

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS / WEEK**	**CREDITS**
22PCS2DSE2C	**ETHICAL HACKING**	**DISCIPLINE SPECIFIC ELECTIVE**	**6**	**3**

Course Objective

- To understand and analyze information security threats and countermeasures
- To gain knowledge about security audit and testing
- To study the issues related to hacking and types of attacks

Prerequisites

Basic knowledge in Operating Systems, Networking and Programming Language

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO 1	Recall and Understand the vulnerabilities in hacking	**K1, K2**
CO 2	Analyze and apply testing for security	**K3, K4**
CO 3	Plan and Execute vulnerability assessment test for a network	**K4, K5**
CO 4	Assess the various kinds of standard attacks	**K5**
CO 5	Determine the target system vulnerability and make use of penetration test using standard hacking methods in an ethical manner	**K5**

Mapping of CO with PO and PSO

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

"1"–Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation "-"indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction to Hacking:** Important terminologies-Categories of Penetration Test-Writing Reports-Structure of a Penetration Testing Report-Vulnerability Assessment Summary-Risk Assessment-Methodology-**Linux Basics:** Major Linux Operating systems-File structure inside of Linux-Linux Scheduler(Cron Jobs)-Users inside of Linux-Common Applications of Linux-What is BackTrack-Changing the Default Screen Resolution-Some Unforgettable basics-**Information Gathering Techniques**-Active Information Gathering-Passive Information Gathering-Sources of Information Gathering-Copying Websites Locally-Yougetsignal.com-Intercepting a Response-WhatWeb-Netcraft-Some basic Parameters-TIP regarding Filetype-Xcode Exploit Scanner-Interacting with DNS Servers-Nslookup-DIG-Forward DNS Lookup with Fierce-Reverse DNS Lookup with fierce-What is DNS Cache Snooping-Automating DNS CacheSnooping Attacks-Problem with SNMP-Sniffing SNMP Passwords-SMTP Enumeration	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Vulnerability Assessment:** What areVulnerability Scanners and how do they work?- Pros and Cons of a Vulnerability Scanner- Vulnerability Assessment with Nmap-Updating the database-Testing SCADA environments with Nmap-Nessus Vulnerability Scanner-Installing Nessus on BackTrack-Adding a User-creating anew policy-Safe Checks-Silent Dependencies-Port Range **Network Sniffing:** Introduction-Types of sniffing-Hubs versus Switches-Promiscuous versus Nonpromiscuous Mode-MITM Attacks-ARP Protocol Basics-How ARP works-ARP Attacks-Denial of Service attacks-Tools of the trade-Using ARP Spoof to perform MITM Attacks-Hijacking Session with MITM Attack-Hijacking the session-DNS Spoofing-DHCP Spoofing	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Capturing Traffic:** Using Wireshark-ARP Cache Poisoning-DNS Cache Poisoning-SSL Attacks-SSL Stripping-**Password Attacks:** Password management-Online password attacks-offline password attacks-**Client Side Exploitation**-Bypassing filters with Metasploit payloads-Client side attacks-**Social Engineering:** Social Engineering toolkit-Spear Phishing attacks-Web Attacks-Mass E-mail attacks-Multipronged Attacks.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

IV	**Bypassing Antivirus Applications:** Trojans-How Antivirus application works-Microsoft Security essentials-Virustotal-Getting past an antivirus program-**Post Exploitation**: Meterpreter-Meterpreter scripts-Local privilege escalation-Lateral Movement-Pivoting Persistence-**Web Application Testing:** Using Burp proxy-SQL Injection-XPath Injection-Local file inclusion-Remote file inclusion-Command Execution-Cross Site Scripting-Cross site Request forgery-Web application Scanning with w3af.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Wireless Hacking:** Introduction-Requirements-Introducing Aircracks-ng-Uncovering Hidden SSIDs-Turning on the Monitor mode-Monitoring Beacon frames on Wireshark-Monitoring with Airodump-ng-Speeding up the process-Placing your wireless adapter in Monitor mode-Determining the target with Airodump-ng-Cracking a WPA/WPA2 Wireless Network using Aircrack-ng-Capturing packets-Capturing the Four way handshake-Cracking WPA/WPA2-Reducing the delay-**Web Hacking:** Attacking the authentication-Brute Force and Dictionary Attacks-Types of Authentication-Brute Force attack-SSRF Attack-impact-Server hacking-Finding the local root exploit-basic syntax-Updating the password-Finding a WHMCS Server-Symlinking the Configuration file.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Using Kali Linux:** Linux Command Line-The Linux filesystem-User privileges-File permissions-Editing files-Data manipulation-Managing Installed Packages-Processes and Services-Managing Networking-Netcat: The Swiss Army knife of TCP/IP Connections	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Rafay Baloch(2014).*Ethical Hacking and Penetration Testing Guide*.1st Edition, CRC Press(for Unit I, II & V)
2. Georgia Weidman(2014).*Penetration testing: A hands-on introduction to hacking*.1st Edition, No Starch Press(for Unit III,IV & VI)

Reference Books

1. Stuttard,Dafydd and Marcus Pinto(2011). *The web application hacker's handbook:Finding and exploiting security flaws* . 2ndEdition, John Wiley & Sons.
2. Himanshu Sharma(2017).*Kali-linux Ethical Hacker's cook book: End-to-End penetration testing solution.*1st Edition, Packt Publishing.
3. Kimberly Graves(2010).*Certified Ethical Hacker Study Guide*.1st Edition, Wiley India Pvt Ltd.
4. Kevin Beaver.(2018). *Ethical Hacking for Dummies*. 6thEdition, Wiley

Web References

1. https://www.elsevier.com/books/
2. https://www.elsevier.com/books/cyber-security-awareness-forlawyers
3. https://books.google.co.in/books
4. https://www.coursera.org/specializations/ethical-hacking
5. https://nptel.ac.in/courses

Pedagogy

Chalk and Talk, Group discussion, Seminar & Assignment

Course Designer

Ms. S.Saranya

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS / WEEK**	**CREDITS**
22PCS2INT	**INTERNSHIP**	**INTERNSHIP**	**-**	**2**

- At the end of Semester I, the students should undergo an internship in a reputed IT company or IT division of reputed company
- Minimum number of days for the internship is 15 days
- A project report and a certificate of attendance are to be submitted after completing the internship

EVALUATION PATTERN FOR INTERNSHIP

Internal Components	Marks	External Components	Marks
Institution Profile	5	Regularity	10
Presentation Skill	10	Problem solving	10
Report Evaluation	10	Participation and Hands – on training	20
		Professional Attitude	15
		Report Writing	20
Total	25	Total	75

SEMESTER III

Semester: III	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
23PCS3CC6	**MACHINE LEARNING TECHNIQUES**	**CORE**	**6**	**5**

Course Objective

- To study basic concepts and techniques of Machine Learning
- To solve real world problems through implementation of machine learning algorithms
- To be able to formulate new approaches in machine learning

Prerequisites

Probability, Linear Algebra and Calculus

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO 1	Recognize and Understand the rudiments of MachineLearning	K1, K2
CO 2	Examine and Analyze the concepts of neural networks and Bayesian analysis from probability models and methods	K2, K4
CO 3	Identify, Analyze and Interpret various Learning algorithms	K3, K4, K5
CO 4	Apply and Evaluate the solutions of various Machine Learning techniques	K4, K5
CO 5	Assess, Distinguish and Determine the Machine Learning techniques for Real-world applications	K3, K4, K5

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	2	2	3	3	3	3	2
CO 2	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction:** Learning-Types of Machine Learning-Supervised Learning-The Machine Learning Process. **Preliminaries:** Some Terminology-Testing Machine Learning Algorithms - Turning Data into Probabilities-The Bias-Variance Tradeoff. **Learning with Trees:** Using Decision Trees-Constructing Decision Trees-Classification and Regression Trees (CART) –Issues in Decision Tree Learning.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Probabilistic Learning:** Gaussian Mixture Models-Nearest Neighbour Methods. **Support Vector Machines:** Optimal Separation-The Support Vector Machine Algorithm-Extension to the SVM .**Graphical Models:** Bayesian Networks-Markov Random Fields-Hidden Markov Models (HMMS).	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Neurons, Neural Networks, and Linear Discriminants:** Neuron Networks-The Perceptron-Linear Separability-Linear Regression. **The Multi-Layer Perceptron:** Going Forwards-Going Backwards: Back Propagation of Error-The Multi-Layer Perceptron in Practice-Deriving Back-Propagation.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Dimensionality Reduction:** Linear Discriminant Analysis (LDA)-Principal Component Analysis (PCA)-Factor Analysis- Independent Components Analysis (ICA)-ISOMAP. **Unsupervised Learning:** The K-Means Algorithm- Vector Quantisation-The Self-Organising Feature MAP.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Evolutionary Learning:** The Genetic Algorithm (GA)-Generating Offspring: Genetic Operators-Using Genetic Algorithms-Genetic Programming. **Ensemble Learning:** Boosting-Bagging-Random Forests-Different ways to combine Classifiers. **Reinforcement Learning:** Introduction- The Learning Task- Q Learning.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Combining Inductive and Analytical Learning:** The EBNN Algorithm – The FOCL Algorithm. **Evaluating** Hypotheses: Estimating Hypothesis Accuracy- Basics of Sampling Theory-A General Approach for Deriving Confidence Intervals-Difference in Error of Two Hypotheses.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Stephen Marsland (2015). *Machine Learning an Algorithmic Perspective*. 2nd Edition, CRCPress
   (Unit I - Chapter: 1,2 & 12
   Unit II - Chapter: 7, 8 & 16
   Unit III - Chapter: 3,4
   Unit IV - Chapter: 6, 14
   Unit V - Chapter: 10,13)

2. Tom M. Mitchell (2018). *Machine Learning*. 1st Edition, McGraw-Hill Education (India)Private Limited
   (Unit V- Chapter:13)

Reference Books

1. Patanjali Kashyap(2017). *Machine Learning for Decision Makers*. 1st Edition. Apress.
2. Ethem Alpaydin (2010). *Introduction to Machine Learning*. Second Edition. The MIT Press.

Web References

1. https://www.simplilearn.com/tutorials/machine-learning-tutorial
2. https://machinelearningmastery.com/start-here/
3. https://www.mygreatlearning.com/blog/machine-learning-tutorial/
4. https://onlinecourses.nptel.ac.in/noc23_cs18/preview
5. https://onlinecourses.nptel.ac.in/noc21_cs85/preview
6. https://youtu.be/i_LwzRVP7bg?si=_InbwVhpKK5u0j1b

Pedagogy

Chalk and talk, Discussion, Quiz, Assignment & PPT

Course Designer

Dr. K. Reka

Semester : III	Internal Marks:25		External Marks:75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22PCS3CC7	**CLOUD COMPUTING**	**CORE**	**6**	**5**

Course Objective

- To provide an in-depth and comprehensive knowledge of the Cloud Computing fundamental issues, technologies, applications and implementations.
- To motivate students to do programming and experiment with the various cloud computing environments
- To introduce about the Cloud Standards

Prerequisites

Distributed and Grid Computing

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Understand and discuss the fundamentals of various cloud models	K1, K2
CO2	Determine the applications and the architectures of cloud	K3, K5
CO3	Identify and Examine services and appropriate virtualization concepts	K3, K4
CO4	Explore and recommend cloud solutions for mobile cloud and mobile web services	K4, K5
CO5	Justify and Enhance real time cloud applications to its appropriate environment	K5, K6

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	2	3	2	3	3	2	3	2
CO2	3	3	2	3	2	3	3	2	3	2
CO3	3	3	2	3	3	3	3	2	3	3
CO4	3	3	2	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Defining Cloud Computing**- Cloud Types: The NIST model - The Cloud Cube Model -Deployment models - Service models - Examining the Characteristics of Cloud Computing: Paradigm shift- Benefits of cloud computing - Disadvantages of cloud computing – **Assessing the Value Proposition**: Measuring the Cloud's value: The laws of cloudonomics - Cloud computing obstacles - Behavioral factors relating to cloud adoption – Measuring cloud computing costs – Avoiding Capital Expenditures – Computing the Total Cost of Ownership – Specifying Service Level Agreements.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**Understanding Cloud Architecture**: Exploring the Cloud Computing Stack–Composability- Infrastructure – Platforms - Virtual Appliances - Communication Protocols –Applications – Connecting to the Cloud. **Understanding Services and Applications by Type**: Defining Infrastructure as aService (IaaS) - Defining Platform as a Service (PaaS) - Defining Software as a Service (SaaS) –SaaS characteristics- Salesforce.com and CRM SaaS – Defining Identity as a Service (IDaaS).	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	**Understanding Abstraction and Virtualization**: Using Virtualization Technologies – Load Balancing and Virtualization: Advanced load balancing - The Google cloud – Understanding Hypervisors: Virtual machine types-VMware vSphere-Understanding Machine Imaging –Porting Applications: The Simple Cloud API-AppZero Virtual Application Appliance. **Capacity Planning**-Load testing-Resource ceilings - Network Capacity - Scaling.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	**Understanding Service Oriented Architecture**: Introducing Service Oriented Architecture – Defining SOA Communications – Managing and Monitoring SOA**. Using the Mobile Cloud:** Working with Mobile Devices – Defining the Mobile Market–Using Smartphones with the Cloud. **Working with Mobile Web Services**: Understanding Service Types– Performing Service Discovery – Using SMS – Defining WAP and other Protocols –Performing Synchronization	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	**Cloud Programming and Software Environments**: Parallel and Distributed Programming Paradigms – Programming support of Google App Engine – Programming on Amazon AWS and Microsoft Azure – **Ubiquitous Clouds and the Internet of Things:** Cloud Trends in Supporting Ubiquitous Computing.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Using Media and Streaming**: Understanding the Streaming process- Protocols in use – The cloud computing advantages -Audio Streaming – Working with VoIP applications-Skype – Google Voice and Google Talk-Video Streaming – Television in the cloud- Streaming video formats – YouTube	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Books

1. Barrie Sosinsky.(2011).*Cloud Computing Bible*. Wiley Publishing Inc.**(Unit I – IV)**
2. Kai Hwang, Geoffrey C.Foxand Jack J.Dongarra (2013). *Distributed and Cloud computing: From parallel processing to the Internet of Things.* Morgan Kaufmann **(Unit V)**

Reference Books:

1. Michael Miller(2012).*Cloud Computing*. 7th Edition, Pearson Education Inc.
2. Rajkumar Buyya & Co,(2011). *Cloud Computing Principles and Paradigms*, John Wiley & Sons Publications

Web References

1. https://www.tutorialspoint.com/cloud_computing/index.htm
2. https://data-flair.training/blogs/cloud-computing-tutorial/

Pedagogy

Chalk & Talk, Discussion, Quiz, Assignment & PPT

Course Designer

Ms. S. Udhaya Priya

Semester : III	Internal Marks:25		External Marks:75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22PGCS3CCC2A	**CYBER SECURITY**	**CORE CHOICE**	**3(T) + 2(P)**	**4**

Course Objective

- To develop skills in students that can help them plan, implement, and monitor cyber security mechanisms to ensure the protection of information technology assets.
- To expose students to governance, regulatory, legal, economic, environmental, social, and ethical contexts of cyber security.
- To expose students to the responsible use of online social media networks.
- To systematically educate the necessity to understand the impact of cyber-crimes and threats with solutions in a global and societal context.
- To select suitable ethical principles, commit to professional responsibilities and human values, and contribute value and wealth for the benefit of society

Prerequisites

Basic Knowledge of Cyber Security

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Understand the cyber security threat landscape	K1,K2
CO2	Develop a deeper understanding and familiarity with various types, cyber crimes, vulnerabilities, and remedies thereto.	K2, K3
CO3	Analyse and evaluate existing legal frameworks and laws on cyber security.	K4, k5
CO4	Analyse and evaluate the digital payment system security and remedial measures.	K4, K5
CO5	Analyse and evaluate the cyber security risks, plan suitable security controls	K4, k5

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	P0 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	2	3	3	3	3	2
CO4	3	3	3	3	2	3	3	3	3	2
CO5	3	3	3	3	2	3	3	3	3	2

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation

SyllabusTheory:

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Overview of Cyber Security: Cyber security increasing threat landscape, -Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker., Non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyber warfare, Case Studies.	9	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Cyber Crimes: Cyber Crimes targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach., Online scams and frauds- email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/credit card fraud, Online payment fraud, Cyberbullying, website defacement, Cyber-squatting, Pharming, Cyber espionage, Cryptojacking, Darknet-illegal trades, drug trafficking, human trafficking., Social Media Scams & Frauds- impersonation, identity theft, job scams, misinformation, fake news cyber crime against persons –cyber grooming, child pornography, cyber stalking., Social Engineering attacks, Cyber Police stations, Crime reporting procedure, Case studies.	9	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Cyber Law: Cyber Crime and legal landscape around the world, IT Act, 2000 and its amendments. Limitations of IT Act, 2000. Cyber Crime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies- AI/ML, IoT, Blockchain, Darknet and Social media, Cyber Laws of other countries, Case Studies.	9	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Data Privacy and Data Security: Defining data, meta-data, big data, non-personal data. Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR),2016 Personal Information Protection and Electronic Documents Act (PIPEDA). Social media- data privacy and security issues.	9	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Cyber security Management, Compliance and Governance: Cyber security Plan-cyber security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy.	9	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **Case Studies**: Largest Cyber Attacks : Yahoo Data Breach, Equifax Data Breach, WannaCry Malware Attack, Simple Locker.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Reference Books

1. Vivek Sood, (2017). *Cyber Law Simplified*. McGraw Hill Education
2. Sumit Belapure and Nina Godbole, (2011). *Computer Forensics and Legal Perspectives*. Wiley India Pvt. Ltd.
3. Dorothy F. Denning, (1998). *Information Warfare and Security*. Addison Wesley.
4. Henry A. Oliver, (2015). *Security in the Digital Age: Social Media Security Threats and Vulnerabilities*.Create Space Independent Publishing Platform.
5. Natraj Venkataramanan and Ashwin Shriram, (2016). *Data Privacy Principles and Practice*. 1st Edition, CRC Press.
6. W.Krag Brothy, (2008). *Information Security Governance, Guidance for Information Security Managers*. 1st Edition, Wiley Publication.
7. Martin Weiss, Michael G.Solomon, (2015). *Auditing IT Infrastructures for Compliance*. 2nd Edition, Jones & Bartlett Learning.

Web References

1. https://www.tutorialspoint.com/principles-of-information-system-security
2. https://www.geeksforgeeks.org/principle-or-information-system-secutiry/
3. https://www.techtarget.com/searchsecurity/definition/cybersecurity
4. https://www.ukessays.com/essays/computer-science/analysis-of-the-yahoo-data-breaches.php
5. https://www.csoonline.com/article/3444488/equifax-data-breach-faq-what-happened-who-was-affected-what-was-the-impact.html
6. https://www.techtarget.com/searchsecurity/definition/WannaCry-ransomware
7. https://www.cloudflare.com/learning/ddos/syn-flood-ddos-attack/

Practicals:

List of Exercises: (Not included for End Semester Examinations)

1. Platforms for reporting cyber crimes.
2. Checklist for reporting cyber crimes online
3. Setting privacy settings on social media platforms.
4. Do's and Don'ts for posting content on Social media platforms.
5. Registering complaints on a Social media platform.
6. Prepare password policy for computer and mobile device.
7. List out security controls for computer and implement technical security controls in the personal computer.
8. List out security controls for mobile phone and implement technical security controls in the personal mobile phone.
9. Log into computer system as an administrator and check the security policies in the system.

Web References

1. https://cybercrime.gov.in/
2. https://cybercrime.gov.in/webform/crime_onlinesafetytips.aspx
3. https://www.digitalvidya.com/blog/social-media-dos-and-donts/
4. https://www.medianama.com/2023/02/223-platform-grievance-appellate-committees-social-media/
5. https://www.ibm.com/topics/security-controls
6. https://docs.oracle.com/cd/E19683-01/817-0365/concept-2/index.html

Pedagogy

Chalk and Talk, Group discussion, Seminar & Assignment.

Course Designer

From UGC SYLLABUS

Semester: III	Internal Marks:25		External Marks:75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS/WEEK**	**CREDITS**
22PCS3CCC2B	**IoT**	**CORE CHOICE**	**5**	**4**

Course Objective

- To understand the technology behind Internet of Things
- To get familiar with the design principles of connected devices
- To know about IoT platforms and design methodologies

Prerequisites

Basic Knowledge in Communication Technologies

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Understand and Describe the basic concepts of IoT	K1,K2
CO2	Apply and Analyze the IoT based sensor systems	K3,K4
CO3	Illustrate and Analyze the various IoT enabling Technologies	K3,K4
CO4	Design and Evaluate portable IoT using Raspberry /equivalent boards	K4,K5
CO5	Create and Design real time applications	K5,K6

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	3	3	2	3	3	3	3	2
CO2	3	3	3	3	2	3	3	3	3	2
CO3	3	3	3	2	2	3	3	3	3	2
CO4	3	3	2	2	2	2	2	2	2	2
CO5	3	3	2	2	2	2	2	2	2	2

"1"–Slight(Low) Correlation "2"–Moderate(Medium) Correlation
"3"–Substantial(High) Correlation "-" Indicates there is no Correlation

Syllabus

UNIT	CONTENT	HOURS	Cos	COGNITIVE LEVEL
I	**Introduction to IoT**: Physical Design of IoT – Logical Design of IoT – IoT Enabling Technologies –IoT Levels & Deployment Templates– **Domain Specific IoTs**: Home Automation–Cities–Environment–Energy–Logistics – Retail – Agriculture.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**IoT and M2M**: Introduction–M2M–Difference between IoT and M2M – SDN and NFV for IoT–**IoT System Management with NETCONF- YANG:** Need for IoT systems management -Simple Network Management Protocol (SNMP)-Network operator Requirement–NETCONF–YANG-NETOPEER–**Developing IoT**: IoT platforms design methodology–IoT Design Methodology.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	IoT Systems – **Logical Design using Python**:Introduction - Python Packages of interest for IoT – **IoT physical Devices and Endpoints** : What is an IoT Device – Exemplary Devices - Raspberry pi Interfaces – Programming Raspberry pi with Python –other IoT Devices.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Data Analytics for IOT**: Apache Hadoop –Using Hadoop MapReduce for Batch Data Analysis–Apache oozie-Apache Spark– Apache Storm-Using Apache Storm for Real–time Data Analysis.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**IoT Physical Servers and Cloud Offerings:** Introduction to Cloud Storage Models & Communication APIs–WAMP–AutoBahn for IoT- Xively cloud for IoT–Designing a RESTful web API-**Amazon Web Services for IoT-Tools for IoT:** Chef – Chef Case studies-Puppet–Puppet Casestudy Multi Tier deployment - NETCONF-YANG Case Studies	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **APPLICATIONS:** The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - **Resource Management in the Internet of Things:** Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book

1. Arshdeep Bahga, Vijay Madisetti, (2014),"*Internet of Things – A hands on approach*", Universities Press

Reference Books

1. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds),(2011) "*Architecting the Internet of Things*", Springer
2. Jan Holler, Vlasios Tsiatis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Aves and David Boyle, (2014) ,"*From Machine-to Machine to the Internet of Things – Introduction to a New Age of Intelligence*", Elsevier
3. David Easley and Jon Kleinberg,(2010) "*Networks, Crowds, and Markets: Reasoning About a Highly Connected World*" - Cambridge University Press
4. Olivier Hersent, David Boswarthick, Omar Elloumi ,(2012),"*The Internet of Things – Key applications and Protocols*", Wiley

Web References

1. https://github.com/connectiot/iottoolkit
2. https://www.arduino.cc/
3. https://www.tutorialspoint.com/
4. https://www.guru99.com/
5. https://www.pythonforbeginners.com/

Pedagogy

Chalk and Talk, Seminar, e-Contents

Course Designer

Ms.K.Pradeepa

Semester : III	Internal Marks:25		External Marks:75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22PCS3CCC2C	**NATURAL LANGUAGE PROCESSING**	**CORE CHOICE**	**5**	**4**

Course Objective

- To understand the Natural Language Processing (NLP) techniques
- To be familiarized with the data structures and algorithms used in NLP
- To understand the process of raw text and apply categorizing tagging words for classification
- To apply text analytics grammar approaches for real-time applications
- To know the basics of first order logic and propositional logic

Prerequisites

Basic understanding of mathematics concepts, statistics, machine learning, python programming and data structures

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Understand how key concepts from NLP and linguistics are used to describe and analyze language	**K1, K2,K4**
CO2	Identify the suitable data structures and algorithms used in NLP	**K3**
CO3	Analyze data stored in standard formats	**K4**
CO4	Analyze and compare the methods and algorithms used to process different types of textual data	**K4, K5**
CO5	Formulate how to extract grammatical features and to know the basics of first order logic and propositional logic	**K6**

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	2	2	3	3	3	2	3	2
CO2	3	3	3	2	2	3	3	3	3	2
CO3	2	3	3	2	2	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	2	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction:** Natural Language Processing and its Neighbors-Three themes in Natural Language Processing- **Language Processing and Python**: Computing with Language: Texts and Words - A Closer Look at Python: Texts as Lists of Words - Computing with Language: Simple Statistics - Back to Python: Making Decisions and Taking Control -Automatic Natural Language Understanding. **Accessing Text Corpora and Lexical Resources**: Accessing Text Corpora- Conditional Frequency Distributions -More Python: Reusing Code - Lexical Resources – WordNet.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**Processing Raw Text**: Accessing Text from the Web and from Disk - Strings: Text Processing at the Lowest Level- Text Processing with Unicode- Regular Expressions for DetectingWord Patterns- Useful Applications of Regular Expressions - Normalizing Text - Regular Expressions for Tokenizing Text - Segmentation –Formatting: From Lists to Strings .**Writing Structured Programs** : Back to the Basics- Sequences- Questions of Style - Functions: The Foundation of Structured Programming - Doing More with Functions- Program Development- Algorithm Design-A Sample of Python Libraries.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	**Categorizing and Tagging Words**: Using a Tagger-Tagged Corpora- Mapping Words to Properties Using Python Dictionaries-Automatic Tagging- N-Gram Tagging-Transformation Based Tagging- Determine the Category of a Word. **Learning to Classify Text**: Supervised Classification- Examples of Supervised Classification-Evaluation-Decision Trees-Naive Bayes Classifiers- Maximum Entropy Classifiers-Modeling Linguistic Patterns.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	**Extracting Information from Text**: Information Extraction- Chunking-Developing and Evaluating Chunkers- Recursion in Linguistic Structure- Named Entity Recognition-Relation Extraction. **Analyzing Sentence Structure**: Some Grammatical Dilemmas-Use of Syntax - Context-Free Grammar-Parsing with Context-Free Grammar-Dependencies and Dependency Grammar- Grammar Development.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

V	**Building Feature-Based Grammars:** Grammatical Features-Processing Feature Structures-Extending a Feature-Based Grammar. **Analyzing the Meaning of Sentences:** Natural Language Understanding- Propositional Logic-First-Order Logic- The Semantics of English Sentences- Discourse Semantics. **Applications and Case Studies:** Question Answering and Machine Reading- Machine Translation- Text Generation	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	**Self Study for Enrichment:** (Not included for End Semester Examinations) Life Cycle of a Corpus-Language Processing versus Symbol Processing-Contemporary Philosophical Divides-NLTK Roadmap-Envoi.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Books

1. Steven Bird, Ewan Klein and Edward Loper (2009).*Natural Language Processing with Python*. 1st Edition, O'Reilly Media. (Unit 1: Chapter 1, 2; Unit 2: Chapter 3,4; Unit 3: Chapter 5, 6 ; Unit 4: Chapter 7, 8; Unit 5: Chapter 9,10)
2. Jacob Eisenstein (2019). *Introduction to Natural Language Processing*. Kindle Edition, MIT Press.(Unit 1: Chapter 1; Unit 5: Chapter17: (17.5), Chapter 18,19)

Reference Books

1. Daniel Jurafsky and James H.Martin(2013).*Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition.* 2nd Edition, Pearson Education.
2. Nitin Hardeniya, Jacob Perkins, Deepti Chopra, Nisheeth Joshi, Iti Mathur (2016). *Natural Language Processing: Python and NLTK*.1st Edition, Packt Publishing.
3. Akshar Bharati, Vineet Chaitanya, Rajeev Sangal (1996). *Natural Language Processing – A Paninian Perspective*. Prentice Hall of India.
4. Clark, A., Fox, C., & Lappin, S. (2013). *The handbook of computational linguistics and Natural Language Processing*. John Wiley & Sons.
5. Bender, E. M., & Lascarides, A. (2019). *Linguistic fundamentals for Natural Language Processing II: 100 essentials from semantics and pragmatics. Synthesis Lectures on Human Language Technologies*, 12(3), 1-268.
6. Hapke, H. M., Lane, H., & Howard, C. (2019). *Natural Language Processing in Action: Understanding, analyzing and generating text with Python*. Kindle Edition, Manning Publications Co.
7. Indurkhya, N., & Damerau, F. J. (2010). *Handbook of Natural Language Processing*. 2nd Edition, Chapman and Hall/CRC Press.
8. James Allen (2002).*Natural Language Understanding*, 2nd Edition,Pearson Education.

Web References

1. https://tjzhifei.github.io/resources/NLTK.pdf
2. https://www.google.co.in/books/edition/Introduction_to_Natural_Language_Process/72yuDwAAQBAJ?
3. https://towardsdatascience.com/data-to-text-generation-with-t5-building-a-simple-yet-advanced nlg-model-b5cce5a6df45
4. https://archive.nptel.ac.in/courses/106/101/106101007/
5. https://books.google.co.in/books/about/Introduction_to_Natural_Language_Process.html?id=72yuDwAAQBAJ&;redir_esc=y

Pedagogy

Chalk & Talk, PPT, Group Discussion, Seminar and Assignment

Course Designer

Dr.K.Reka

Semester : III	Internal Marks:40		External Marks:60	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
23PCS3CC3P	**CLOUD COMPUTING (P)**	**CORE**	**5**	**4**

Course Objective

- To develop web applications in cloud
- To learn the design and development process involved in creating a cloud-based application
- To learn to implement and use parallel programming using Hadoop

Prerequisites

Java, Python, HTML and Linux

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	List and illustrate the usage of Python and HTML Tags in web applications	K1,K2
CO2	Demonstrate and make use of Google App Engine (GAE) in web applications	K2,K3
CO3	Apply and Compare python for cloud-based applications	K3,K4
CO4	Examine and Evaluate the web applications with CloudSim	K4,K5
CO5	Interpret and Develop web application using Hadoop	K5,K6

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	2	3	3	3	3	2
CO2	3	3	2	3	2	3	2	2	3	2
CO3	3	3	2	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation

Exercises

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install GAE. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using TryStack.
8. Install Hadoop single node cluster and run simple applications like wordcount.
9. i) Explore JustCloud, Amazon Drive file storage and sharing solutions.
   ii) Work with YouTube, a cloud service to upload your own educational video(s) and use appropriate settings to make it public.

Web References

1. https://www.iitk.ac.in/nt/faq/vbox.htm
2. https://www.javatpoint.com/virtualbox-installation
3. https://cloud.google.com/appengine/docs/flexible/python/create-app
4. https://edwardsamuel.wordpress.com/2014/10/25/tutorial-creating-openstack-instance-in-trystack/
5. https://www.geeksforgeeks.org/how-to-install-single-node-cluster-hadoop-on-windows/
6. https://www.edureka.co/blog/install-hadoop-single-node-hadoop-cluster

Pedagogy

Demonstration

Course Designer

Ms. S. Udhaya Priya

Semester: III	Internal Marks: -		External Mars: 100	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
22PCS3DSE3A	COMPUTER SCIENCE FOR COMPETITIVE EXAMINATIONS	DISCIPLINE SPECIFIC ELECTIVE	5	3

Course Objective

- To understand the need for preparing competitive exams
- To study the basic concepts of core subjects in computer science
- To inculcate the knowledge of implementation of various concepts

Prerequisites

Basic concept of core computer science

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Explain concepts of computer science core subjects	K2
CO2	Apply the knowledge to solve various types of problems	K3
CO3	Examine various computer science concepts on real time applications	K4
CO4	Develop a scientific aptitude and sense of reasoning	K6
CO5	Develop students with professional and ethical attitude	K6

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	2	3	3	2	3	3	3	3	3
CO3	3	3	3	3	2	3	3	3	3	3
CO4	3	3	3	2	2	3	3	3	3	3
CO5	3	3	3	3	2	3	3	3	3	2

"1" – Slight (Low) Correlation
"2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation
"-" –indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Number Systems- Series Completion -Coding & Decoding- Problems on Ages - Blood Relation - Probability – Permutation & Combination - Data Interpretation - ICT (Information and Communications Technology-Logical Reasoning & Non – Verbal Reasoning. **Programming Languages**- Programming in C- Object Oriented Programming – Programming in C++/JAVA - Web Programming	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Mathematical Logic:** Propositional and PredicateLogic - Predicates and Quantifiers-Rules of Inference- Sets and Relations: Set Operations, Representation and Properties of Relations, Equivalence Relations, Partially Ordering. Counting, Mathematical Induction and Discrete-Probability - Group Theory –Graph Theory – Minimum Spanning Tree – Graph Algorithms- Optimization- **Digital Logic:** Number systems- Boolean Algebra – Map Simplification - Combinational Circuits – Sequential Circuits. **Memory Hierarchy:** Main Memory - Auxilliary Memory - Associative Memory - Cache Memory - Virtual Memory	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Operating System:** Threads – CPU Scheduling - Disk Scheduling– Deadlocks - Paging– Process Management- Memory Management – Storage Management – File and Input/output Systems – Security – Kernel modules - Linux – **Data Structures and Algorithms:** Time and Space Complexity,Linked Lists, Stacks and Queues – Trees- Search and Sorting Algorithms – Hashing – Algorithm design techniques: Greedy Approach, Dynamic Programming - Divide and Conquer – Graph Search, Minimum Spanning trees, Shortest paths – Complexity Theory(P and NP Class problem)	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Data Communication and Computer Networks:** Concept of Layering – Network Types & Models – Functions of OSI & TCP/IP Layers - Flow and Error Control techniques, switching – IPV4/IPV6, routers and routing algorithms – TCP/UDP and sockets, congestion controls. Application Layer Protocols (WWW, DNS, SMTP, POP, FTP, and HTTP) -Network Security: authentication- basics of public key- cryptography- digital signatures and certificates- firewalls. **Database Management Systems:** Basic concepts – Data Modeling – SQL – Normalization- Data models.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

V	**Theory of Computation:** Finite Automata and Regular Languages–Context Free Languages and Push down Automata–Recursive Enumerable sets and Turing Machines – Syntax & Semantic Analysis-**Compiler Design:** Lexical Analysis and Parsing – Syntax Directed Translation- Intermediate code generation – Code optimization **Approaches to AI**: Turing Test and Rational Agent Approaches- State SpaceRepresentation of Problems - Heuristic Search Techniques - Min-Max Search - Alpha Beta Cutoff Procedures.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self-Study for Enrichment:** (Not included for End Semester Examinations) **Estimation and Scheduling of Software Projects:** Software Sizing - LOC and FP based Estimations. Estimating Cost and Effort- Estimation Models-Constructive Cost Model (COCOMO).**Computer Organization and Architecture:** Machine Instruction and Addressing Modes – ALU & Data Path, CPU Control Design – Memory & I/O Interface – Instruction Pipeline – Secondary Storage – Microprocessor- Computer Graphics: **2-DGeometrical Transforms and Viewing-** 3-D Object Representation, Geometric Transformations and Viewing	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Reference Books:

1. Dr.R.S.Aggarwal, (2017), *Quantitative Aptitude for Competitive Examinations* ,S.Chand Publishing
2. Dr.R.S.Aggarwal,(2020), *A modern Approach to verbal & Non-verbal Reasoning*, S.Chand Publishing
3. R.Gupta,(2015), *UGC – NET/SET Computer Science &Applications*, R.Gupta
4. Surbhi Sharma, Kailasah Chandra Gurunani,(2018), *UGC NET Computer Science and Applications*, Arihant Publication
5. Trishna Knowledge Systems, (2019),*GATE Computer Science and Information Technology- GATE 2020*, Pearson

Web References

1. https://www.careerbless.com/aptitude/qa/home.php
2. https://www.sawaal.com/aptitude-reasoning/quantitative-aptitude-arithmetic-ability-questions-and-answers.html
3. https://www.indiabix.com/non-verbal-reasoning/questions-and-answers/
4. https://www.geeksforgeeks.org/ugc-net-cs-preparation/
5. http://www.netugc.com/ugc-net-solved-question-papers-in-computer-science-and-applications
6. https://gatecse.in/
7. https://gateoverflow.in/

Pedagogy

Chalk and Talk, PPT, Discussion, Assignment, Quiz and Seminar

Course Designer

Ms.Rita Jenifer, Ms.S.Saranya and Ms.R.Ramya

Semester III	Internal Marks:40		External Marks:60	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS/WEEK**	**CREDITS**
22PCS3DSE3BP	**IoT (P)**	**DISCIPLINE SPECIFIC ELECTIVE**	**5**	**3**

Course Objective

- To create IoT program to turn ON/OFF LED
- To implement IoT program for object detection
- To develop IoT programs for agricultural purpose
- To create web server program for local hosting
- To design IoT application for health monitoring

Prerequisites

Java , C,C++

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Understand the basic concepts of IoT	K2
CO2	Design Embedded platforms in IoT using Microprocessor	K3
CO3	Apply wireless peripherals for exchange of data.	K4
CO4	Apply Cloud Platform to Upload and Analyze the Sensor Data	K5
CO5	Deploy simple application of IoT for Realtime	K6

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO5
CO1	3	3	3	3	3	3	3	3	2	3
CO2	3	3	3	3	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3	3	2	3
CO4	3	3	3	3	2	3	3	3	3	2
CO5	3	3	3	3	3	3	3	3	2	2

"1"–Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"–Substantial(High) Correlation "-"indicates there is no Correlation.

Exercises

1. To develop an IoT program to turn ON/OFF LED light (3.3V)
2. To develop an IoT program using IR sensor (Smart Garbage Monitoring, Detecting Parking Availability, etc.)
3. To develop an IoT program using Humidity and Temperature Monitoring (Forest fire Detection, Weather Monitoring)
4. To develop an IoT web server program for local hosting
5. To develop an IoT program using Soil Moisture Sensor
6. To develop an IoT program using Ultrasonic Sensor (Distance Measurement, etc.)
7. To develop a real-time IoT program using Relay Module (Smart Home Automation with 230V)
8. To develop an IoT program for Fire Detection (Home, Industry, etc.)
9. To develop an IoT program for Gas Leakage detection (Home, Industry, etc.)
10. To develop an IoT program using Heartbeat Sensor

Web References

1.https://www.comsoc.org/publications/best-readings/internet-things
2.https://mitpress.mit.edu/books/internet-things
3.https://circuitdigest.com/internet-of-things-iot-projects

Pedagogy

Live Demonstration, You Tube Videos, Tutorials

Course Designer

Ms.K.Pradeepa

Semester : III	Internal Marks:40		External Marks:60	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22PCS3DSE3CP	**NATURAL LANGUAGE PROCESSING (P)**	**DISCIPLINE SPECIFIC ELECTIVE**	**5**	**3**

Course Objective

- To learn the fundamentals of Natural Language Processing (NLP)
- To understand the use of Context Free Grammar (CFG)
- To gain practical experience in the Natural Language Toolkit (NLTK)
- To design and implement applications based on NLP

Prerequisites

Basic knowledge on python and different types of parsing techniques

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Understand NLP pipeline	**K2**
CO2	Apply different Machine translation techniques for translating a source to target language(s)	**K3**
CO3	Analyze and compare the methods and algorithms used to process different types of textual data	**K4, K5**
CO4	Determine the concepts of morphology, syntactic analysis, semantic interpretation and pragmatics of the language, and understanding them to apply in different research areas	**K5**
CO5	Design an innovative application using NLP components	**K6**

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2	3	3	2	3	2
CO2	3	3	3	3	3	3	3	3	3	2
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation

Exercises

Using Python

1. Installation
2. Frequency Distribution Histogram Plotting using WordNet
3. NLP preprocessing such as tokenization, stemming, lemmatization
4. Perform Morphological Analysis
5. POS Tagging
6. Bigrams and N-Gram Tagging
7. Text Classification using Naive Bayes Classifier
8. Named Entity Recognition
9. Context Free Grammars
10. Large Context Free Grammars and Parsing

Web References

1. https://www.coursehero.com/file/87991863/18CS3167-NLP-LAB-MANUAL-pdf/
2. http://www.nltk.org/install.html
3. https://www.scribd.com/document/570254598/NLP-Lab-Manual#

Pedagogy

Demonstration

Course Designer

Dr.K.Reka

Semester : III	Internal Marks:40		External Marks:60	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22PCS3GEC1P	**DATA ANALYSIS (P)**	**GENERIC ELECTIVE**	**3**	**2**

Course Objective

- To provide fundamental concepts of data analysis
- To interpret, summarize and present numerical data using Excel
- To explore, analyse, and visualise data in Python

Prerequisites

Basic Computer Knowledge

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Recall and understand the different types of data analysis and their use cases	**K1, K2**
CO2	Apply Exploratory Data Analysis on a real-world dataset	**K3**
CO3	Analyze the various methods and functions in Excel	**K4**
CO4	Compare and recommend external libraries in Python for analysing the data	**K4, K5**
CO5	Create powerful and dynamic Excel dashboard	**K6**

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	2	3	3	2	3	3	2	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	2	3	3	2	2	3	2	3	2
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	2

"1" – Slight (Low) Correlation
"2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation
"-" indicates there is no correlation

Exercises

Using MS-Excel

1. Importing data
2. Demonstrate the usage of essential Functions and methods
3. Publish worksheet as web page with interactivity
4. Using PivotTables and Charts to create dashboards
5. Connect multiple slicers to the pivot tables

Using Python

1. Working with libraries
2. Importing and exporting data
3. Cleaning and preparing data
4. Replacing strings with numbers
5. Exploratory Data Analysis

Web References

1. https://www.analyticsvidhya.com/blog/2021/11/a-comprehensive-guide-on-microsoft-excel-for-data-analysis/
2. https://www.academia.edu/34282340/Excel_data_analysis_tutorial
3. https://www.datacamp.com/courses/data-analysis-in-excel?
4. https://www.myexcelonline.com/blog/connect-slicers-to-multiple-excel-pivot-tables/
5. https://www.geeksforgeeks.org/data-analysis-with-python/
6. https://www.geeksforgeeks.org/data-analysis-with-scipy/?ref=rp

Pedagogy

Demonstration

Course Designer

Dr.K.Reka

SEMESTER IV

Semester: IV	Internal Marks: 25		External Marks:75	
COURSECODE	**COURSE TITLE**	**CATEGORY**	**HOURS / WEEK**	**CREDITS**
22PCS4CC8	**BIG DATA ANALYTICS**	**CORE**	**6**	**5**

Course Objective

- To provide knowledge about Big data Analytics
- To study the basic concepts on Data Science & Analytical Technologies
- To understand about Hadoop & MAPREDUCE fundamentals
- To inculcate knowledge about MongoDB & Analytics with R Machine

Prerequisites

Basic knowledge in Analytics, Data Mining, Database and Machine learning concepts

Course Outcome and Cognitive Level Mapping

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

CONumber	CO Statement	Cognitive Level
CO1	Understand the fundamentals of Big data analytics	K2
CO2	Describe the Hadoop architecture and Filesystem	K2
CO3	Apply the MapReduce Programming model for real-world problems	K3
CO4	Explore the concepts of NoSQL databases	K4
CO5	Design and assess a complete business data analytics solution	K5,K6

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO5
CO1	3	3	3	2	2	3	1	3	2	2
CO2	3	3	3	2	3	3	3	3	3	3
CO3	3	3	2	3	3	3	3	3	3	3
CO4	2	3	3	3	2	3	3	3	2	3
CO5	3	3	3	3	3	3	2	3	3	3

"1"-Slight (Low) Correlation
"2"– Moderate (Medium) Correlation
"3"-Substantial (High) Correlation
"-"- indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Types of Digital Data**: Classification of Digital Data – **Introduction to Big Data:** Characteristics of Data-Evolution of Big Data – Definition of Big Data - Challenges with Big Data – Other characteristics of data - Need for Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop Environment.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**Understanding Analytics and Big Data:** Comparing reporting and analysis - Types of Analytics – Points to consider during analysis – Developing an analytic team – Understanding text analytics.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	**Big data Technology**: Hadoop. Introduction to Hadoop: Introducing Hadoop – Need for Hadoop-Limitations of RDBMS – RDBMS versus HADOOP-History of Hadoop – Hadoop overview - Interacting with Hadoop ecosystem – HDFS - Processing Data with Hadoop MapReduce – Managing resources and applications with Hadoop YARN - Introduction to MAPREDUCE programming.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	**Introduction to MongoDB**: Need for MongoDB -Terms used in RDBMS and MongoDB - Data types in MongoDB - MongoDB Query Language.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	**Reading Datasets and Exporting Data from R**: Using the c() Command - Using scan() Command – Reading multiple data values from large files - Reading data from R Studio – Exporting data from R.**Working with Functions and Packages in R:** Using functions instead of scripts – Using arguments in Functions – Built-in Functions in R – Introducing Packages – Working with Packages.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** Exploring R .Manipulating and Processing Data in R - Introduction to Cassandra.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Books

1. Seema Acharya, Subhashini Chellappan, (2015). *Bigdata and Analytics*, Wiley India Pvt. Ltd (Unit I, III-IV)
2. DT Editorial Services, (2017), *Big Data Black Book*, Dream Tech Press. (Unit- II, V)

Reference Books

1. V. Bhuvaneswari, T. Devi (2016). *Bigdata Analytics – A Practioner's Approach*, Bharathiyar University, Coimbatore
2. Michael Minelli, Michele Chambers, Ambiga Dhiraj (2013). *Big data Big Analytics*, Wiley
3. Bart Baesens (2014). *Analytics in a BigdataWorld*, Wiley

Web References

1. https://webopedia.com/TERM/B/big_data_analytics.html
2. https://www.coursera.org/learn/big-data-introduction
3. https://hadoop.apache.org/
4. https://www.tutorialspoint.com/cassandra/index.htm
5. https://www.edureka.co/blog/mapreduce-tutorial/

Pedagogy

Chalk and Talk, Group discussion, Seminar, Quiz & Assignment.

Course Designer

Ms**.** A. Sahaya Jenitha

Semester: IV	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS / WEEK**	**CREDITS**
22PCS4CCC3A	**ROBOTIC PROCESS AUTOMATION**	**CORE CHOICE**	**6**	**4**

Course Objective

- Understand the RPA and differentiate from other types of automation
- Outline the benefits of RPA and its various platforms
- Summarize the Risks and Challenges of RPA

Prerequisites

Knowledge in Programming languages and algorithmic way of understanding and thinking capability

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	List and Interpret RPA, where it can be applied	K1, K2
CO2	Explain and Identify the usage of AI	K2, K3
CO3	Make use of and distinguish the process and its automation	K3, K4
CO4	CompareandEvaluate the bots	K4, K5
CO5	Assess the RPA and its use cases in various domains	K5

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO5
CO1	3	3	2	3	2	3	3	2	2	3
CO2	2	2	3	3	3	3	3	2	3	3
CO3	3	3	2	3	1	3	3	3	2	1
CO4	2	2	3	2	3	3	2	1	3	3
CO5	3	3	2	2	1	3	3	2	1	1

"1"–Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation "-" indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**INTRODUCTION TO ROBOTIC PROCESS AUTOMATION**: Definition-Benefits of RPA, Types of RPA, RPA tools-Automation Anywhere-CRM Automation-Extracting the customer list from CRM-Looking up customer information	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**MODERATING SOCIAL MEDIA USING AI**: Reading parameters from the configuration file-passing the configuration parameters to the main workflow-reading image files from input and create a list-setting up the google cloud vision API services-looping through images and invoking google cloud vision API-updating the image sheet with API results-passing the parameters and invoking safesearch -Testing the automation-**PURCHASE ORDER PROCESSING WITH UIPATH REFRAMEWORK**: Purchase order performer-init state changes-process state changes-	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**SALES ORDER PROCESSING:** Creating the parent bot-creating the child bot for SO processing-invoking the child bot and updating excel sheet-**ERP USER ADMINISTRATION**: creating the child bot for new user creation-**EMPLOYEE EMERGENCY NOTIFICATIONS**:-create a child bot to send messages-create the parent bot-testing the automation	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**INTELLIGENT DOCUMENT PROCESSING-** Uipath Document understanding-creating the IQ Bot learning instance-uploading invoices to IQ Bot-Downloading Structured data from IQ bot	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**RPA IN ENTERPRISE:** Security and Error Handling-robot platform security-cognitive automation technology and smart process automation-**BRINGING YOUR ROBOTS TO LIFE-THE DEVELOPMENT PROCESS:** Scoping an RPA project-robotic validations-becoming an automation consultant	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** **RPA Use cases**: Retail -Healthcare-Finance and Accounting-BPO-Web application Automation	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Nandan Mullakara and Arun Kumar Asokan(2020). *Robotic Process Automation Projects.* Packt Publishing.(UNITS I-IV)
2. Richard Murdoch (2018). *Robotic Process Automation*. RPA Ultra.(UNIT V)

Reference Books

1. Frank Casale, Rebecca Dilla, Heidi Jaynes, Lauren Livingston (2015). *Introduction to Robotic Process Automation: a Primer.* 1st Edition, Institute of Robotic Process Automation.
2. Richard Murdoch (2018). *Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks and become an RPA Consultant.* 1st Edition, Independently Published.
3. Srikanth Merianda (2018). *Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation*. 1st Edition, Consulting Opportunity Holdings LLC.
4. Lim Mei Ying (2018). *Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes.* 1st Edition, Packt Publishing.

Web References

1. https://www.uipath.com/rpa/robotic-process-automation
2. https://www.academy.uipath.com
3. https://www.edureka.co/blog/rpa-tutorial/
4. https://www.udemy.com/course/robotic-process-automation/
5. https://www.guru99.com/robotic-process-automation-tutorial.html
6. https://www.automationanywhere.com/in/robotic-process-automation
7. https://www.uipath.com/blog/learning-robotic-process-automation-through-video tutorials
8. https://onlinecourses.nptel.ac.in/noc21_me32/preview

Pedagogy

Chalk and Talk, PPT, Discussion, Assignment, Quiz and Seminar

Course Designer

Dr. D. Radhika

Semester: IV	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS / WEEK**	**CREDITS**
22PCS4CCC3B	**VIRTUAL AND AUGMENTED REALITY**	**CORE CHOICE**	**6**	**4**

Course Objective

- Learn the fundamental Computer Vision, Computer Graphics and Human-Computer interaction Techniques related to Virtual Reality (VR)/Augmented Reality (AR)
- To review the Virtual Environment and the various types of Hardware and Software in Virtual Reality systems
- To Simulate and Apply Virtual/Augmented Reality to varieties of Applications

Prerequisites

Numerical & Statistical Methods, Artificial Intelligence & Machine Learning and Computer Aided Engineering

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	Understand and Identify the fundamental Computer Vision, Computer Graphics and Human - Computer Interaction Techniques related to VR/AR	K1,K2
CO2	Interpret and Analyze various Geometric Modeling Techniques	K2,K3
CO3	Apply and Analyze the Virtual Environment	K3,K4
CO4	Analyze the VR/AR Technologies	K4
CO5	Examine the VR/AR Technologies on real time applications	K5

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO5
CO1	3	3	3	2	2	3	3	3	2	2
CO2	3	3	3	2	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

"1"- Slight (Low) Correlation "2"– Moderate (Medium) Correlation

"3"- Substantial (High) Correlation "-"- indicates there is no Correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Introduction: **Defining Virtual and Augmented Reality**: Introducing Virtual Reality and Augmented Reality – Other types of Virtual and Augmented Reality –History – Father of Virtual Reality – Early Virtual Reality failures-Virtual Reality breaks through – Augmented reality hits the mainstream – Evaluating the Technology Hype Cycle.	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**Exploring the Current State of Virtual Reality & Augmented Reality:** Looking at Available forms factors – Focusing on features – Considering controllers – Recognizing the current issues with VR – Assessing adoption rates	16	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Consuming Content in Virtual Reality** : Exploring Consumers-Grade Virtual Reality – Identifying Near-Future Hardware – Comparing Current and Future options. **Consuming Content in Augmented Reality** : Exploring Consumers-Grade Augmented Reality – Identifying Near-Future Hardware – Comparing Current and Future options.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Evaluating Your Project**: Choosing Virtual Reality – Choosing Augmented Reality. **Planning Virtual Reality Projec**t – Defining your Virtual Reality Project- Exploring Design Principles in Virtual Reality. **Planning Augmented Reality Projec**t – Defining your Augmented Reality Project – Exploring Design Principles in Augmented Reality – Defining your Social Experience.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**Industries Transformed by Virtual and Augmented Reality:** Travel – Museums – Aerospace – Retail – Military – Education – Entertainment - Real estate – Advertising and Marketing. – **Mobile Apps for Experiencing Augmented Reality:** Google translate – Amazon AR view –AR city – Ingress and Pokemon Go – Sketch AR – Find your car & Car finder AR	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** Exploring Virtual Reality use cases – Exploring Augmented Reality use cases -Future of Virtual and Augmented reality	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book

1. Paul Mealy (2018),*Virtual& Augmented Reality For Dummies*, John Wiley & Sons,

Reference Books

1. Bruno Arnaldi, Guillaume Moreau, Pascal Guitton, (2018), *Virtual Reality and Augmented Reality: Myths and Realities*, Wiley

Web References

1. https://nptel.ac.in/courses/121106013
2. https://www.youtube.com/watch?v=zLMgdYI82IE
3. https://www.youtube.com/watch?v=MGuSTAqlZ9Q

Pedagogy

Chalk and Talk, Group discussion, Seminar & Assignment

Course Designer

Ms. K. Pradeepa

Semester: IV	Internal Marks: 25		External Mars: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS / WEEK**	**CREDITS**
22PCS4CCC3C	**DIGITAL IMAGE PROCESSING**	**CORE CHOICE**	**6**	**4**

Course Objective

- To impart the knowledge of image fundamentals and mathematical transforms necessary for image processing
- To understand the image enhancement techniques
- To study image compression procedures
- To study the image segmentation and representation techniques

Prerequisites

Basic Programming Skills, Linear Algebra, Differential Equations & Basics of Digital Electronics

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	Recall and understand the algorithmic approach to illustrate the concepts of image processing	K1, K2
CO2	Understand the fundamental to the processing of digital images for specific tasks	K2
CO3	Solve real world problems by using digital image processing	K3
CO4	Analyze the images by using fundamental and advanced aspects of image processing	K4
CO5	Develop and evaluate the simplified tools for image processing	K5, K6

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	2	3	3	2	3
CO2	3	2	2	2	2	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" –indicates there is no Correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction to Image Processing:** Overview of Image Processing - Nature of Image Processing - Image Processing and Related Fields - Digital Image Representation - Types of Images – Digital Image Processing Operations – Fundamental Steps in Image Processing – Image Processing Applications- **Colour Image Processing:** Colour Models – Colour Quantization.	14	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**Digital Imaging System:** Overview of Digital Imaging System - Physical Aspects of Image Acquisition - **Digital Image Transforms:** Need for Image Transforms – Properties of Fourier Transform – Discrete Cosine Transform –Discrete Sine Transform –Walsh Transform – Hadamard Transform – Haar Transform – Slant Transform – SVD and KL Transforms.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	**Image Enhancement:** Image Quality and Need for Image Enhancement – Image Enhancement Operations - Spatial Filtering Concepts – Image Smoothing in Frequency Domain Filtering. **Image Restoration** Image Degradation Model –Image Restoration in Presence of Noise only – Image Restoration Techniques	19	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	**Image Segmentation:** Introduction –Classification of Image Segmentation Algorithms - Detection of Discontinuities - Edge Detection: Stages in Edge Detection, Types of Edge Detectors, First-order Edge Detection Operators, Second – order Derivative Filters, Edge Operator Performance- Hough Transforms and Shape Detection - CornerDetection - Principlesof Thresholding – Principles of Region-growing – Active Contour Models	19	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	**Image Compression:** Image Compression Model–Compression Algorithms and its types– Types of Redundancy – Lossless Compression Algorithms – Lossy Compression Algorithms – Image and Video Compression Standards	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	**Self-Study for Enrichment:** **(Not included for End Semester Examinations)** **Case study**: Face Recognition - Iris Recognition- Finger print Recognition - Signature Verification	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Book

2. Dr. S. Sridhar.(2016). *Digital Image Processing. 2*nd Edition, Oxford University Press

Reference Books

4. Anil Jain K. (2011). *Fundamentals of Digital Image Processing.* PHILearningPvt.Ltd
5. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins.(2011). *Digital Image Processing Using MATLAB.* 3rd Edition, TataMcGrawHillPvt. Ltd.
6. MalayK. Pakhira (2011). *Digital Image Processing And Pattern Recognition*, 1st Edition PHI Learning Pvt. Ltd.

Web References

1. https://www.cs.nmt.edu/~ip/lectures.html
2. https://archive.nptel.ac.in/courses/117/105/117105135/
3. https://www.geeksforgeeks.org/digital-image-processing-basics/
4. https://www.javatpoint.com/digital-image-processing-tutorial
5. https://github.com/FlagArihant2000/dip-notes

Pedagogy

Chalk and Talk, PPT, Discussion, Assignment, Quiz, Seminar

Course Designer

Ms. R. Sangeetha

Semester: IV	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
22PCS4CC4P	FOSS (P)	CORE	6	5

Course Objective

- To expose students to FOSS environment
- To use and modify existing programs using open source packages/Technologies
- To inculcate knowledge in developing new software

Prerequisites

Knowledge in Programming Languages

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO 1	Ability to install and run open-source operating systems	K1
CO 2	Explain open source project structure and how to successfully setup a project	K2
CO 3	Use Github for Software development projects	K3
CO 4	Analyze various FOSS options for any software requirement	K4
CO 5	Develop and testing an applications using open source code	K5, K6

Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	2	3	2	3	3	2	3	3
CO 2	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	2	3	3
CO 4	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" - indicates there is no Correlation

Syllabus

1. Linux
2. GIMP: GNU Image Manipulation Program
3. Shotcut
4. Apache Struts
5. Perl
6. Ruby
7. Mongo DB
8. PHP
9. Selenium

Web References

1. https://www.vmware.com/
2. https://www.cyberciti.biz/tips/linux-unix-bsd-documentations.html
3. https://developer.gimp.org/api/2.0/
4. https://struts.apache.org/
5. https://www.tutorialspoint.com/perl/perl_references.html
6. https://www.ruby-lang.org/en/documentation/
7. https://docs.mongodb.com/manual/reference/database-references/
8. https://shotcut.org/tutorials/
9. https://www.nptelvideos.com/php/php_video_tutorials.php
10. https://www.coursera.org/learn/selenium-webdriver-python

Pedagogy

Demonstration

Course Designer

Dr.K.Reka

Semester: IV	Internal Marks: 40		External Marks: 60	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS / WEEK**	**CREDITS**
22PCS4GEC2P	**ANIMATION (P)**	**GENERIC ELECTIVE COURSE**	**3**	**2**

Course Objective

- To give an overall view of animation tools
- To learn the basic concepts of animation as an art.
- Explore the various photo editing features and animation techniques
- To create different types of animation using Flash

Prerequisites

Basic Computer Skills

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	Understand the basic concepts behind animation	K2
CO2	Develop an animated movie	K3
CO3	Analyze the tools and techniques to create 2D and 3D animation	K4
CO4	Recommend the suitable methods available to create, render, and present images with professional quality	K5
CO5	Create simple shapes and videos using animation editing software	K6

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	2	3	3	3	3	2
CO2	3	3	3	3	2	3	3	2	3	2
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	2	3	2	3	3	3	3	3

"1" – Slight (Low) Correlation
"2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation
"-" –indicates there is no Correlation.

List of Exercises

USING PHOTOSHOP

1. Create a logo using shapes, texture and filling colors.
2. Develop a banner of recent activity in your college or any festival.
3. Perform an animation on still photo.
4. Develop a collage and apply Morphing, Merging and Overlapping on the images.
5. Design a visiting card containing at least one graphic and text information.
6. Create a dancing doll using Frame by Frame Animation.
7. Develop a Webpage.

USING FLASH

1. Create an application using shapes, colors, text and images.
2. Design a Virtual Drumbeat using audio and video.
   (Draw a circle to represent a drum and edit as required on one layer. Insert another layer, draw suitable drum sticks and position them appropriately. Give visual effects. Also provide audio effect by selecting the sound item from Flash library Sounds.fla, so as to integrate audio and video clips)
3. Design a Sunset
   (Create a suitable background with clouds and mountains on one layer. Draw the Sun on another layer. On the third layer draw birds. Provide animation to show the birds flying across the Sun that keeps fading)
4. Create a Stickman Walk using Motion Tweening
5. Design an animation using Shape Tweening.
6. Create Morphing and Masking effects in images
7. Create a Bouncing Ball using Frame by Frame animation

Web References

1. https://www.adorama.com/alc/how-to-edit-your-photos-5-photoshop-editing-steps-for-beginners/
2. https://www.youtube.com/watch?v=ceAGVMn-syQ
3. https://www.geeksforgeeks.org/types-of-animations-in-flash/
4. https://www.photoshopessentials.com/basics/
5. https://www.guru99.com/photoshop-tutorials.html
6. https://www.instructables.com/Basics-of-Photoshop/

Pedagogy

Power Point Presentation, Live Demonstration

Course Designer

Ms. R. Sangeetha

Semester: IV	Internal Marks: -		External Marks:100	
COURSECODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
23PCS4PW	PROJECT WORK	PROJECT	9	4

Course Objective

- To understand the problem identification from the real world requirements
- To inculcate technical skills through the suitable application development environment for modeling real-world problems
- To expose the students to analyze various software testing tools and techniques before deploying the product

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	Identify the problem	K2
CO2	Discover the relevant literature and frame the hypotheses	K3
CO3	Select appropriate design and utilize time management	K4
CO4	Test the hypotheses wherever applicable	K5
CO5	Develop project accustomed to professional environment	K6

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

"1"-Slight (Low) Correlation "2"– Moderate (Medium) Correlation
3"-Substantial (High) Correlation "-" - indicates there is no Correlation

Project Evaluation

The project work shall be done by an individual student. Two componentswill be considered in assessing the project work:

- Dissertation
- Viva Voce

The Dissertation / Project work submitted will be evaluated based on the following components:

- Problem Identification
- Domain Knowledge
- Documentation
- Presentation