



VIT[®]
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

B. Sc. Computer Science

(B.Sc. CS)

Curriculum

(AY 2023-2024 Admitted Students)



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

INDEX

Sl.No.	Contents	Page No.
1	Vision and Mission Statement of Vellore Institute of Technology	3
2	Vision and Mission School of Computer Science Engineering and Information Systems	4
3	Programme Educational Objectives(PEOs)	5
4	Programme Outcomes (POs)	6
5	Programme Specific Outcomes (PSOs)	7
6	Credit Structure	8
7	Curriculum	9-14
8	List of Core Courses and Syllabi	15-64
9	List of Elective Courses and Syllabi	65-172



VISION STATEMENT OF VELLORE INSTITUTE OF TECHNOLOGY

- Transforming life through excellence in education and research.

MISSION STATEMENT OF VELLORE INSTITUTE OF TECHNOLOGY

- **World class Education:** Excellence in education, grounded in ethics and critical thinking, for improvement of life.
- **Cutting edge Research:** An innovation ecosystem to extend knowledge and solve critical problems.
- **Impactful People:** Happy, accountable, caring and effective workforce and students.
- **Rewarding Co-creations:** Active collaboration with national & international industries & universities for productivity and economic development.
- **Service to Society:** Service to the region and world through knowledge and compassion.



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

VISION STATEMENT OF THE SCHOOL OF COMPUTER SCIENCE ENGINEERING AND INFORMATION SYSTEMS

- To be a center of excellence in education and research in Information and Technology, producing global leaders for improvement of the society

MISSION STATEMENT OF THE SCHOOL OF COMPUTER SCIENCE ENGINEERING AND INFORMATION SYSTEMS

- To provide sound fundamentals, and advances in Information Technology, Software Engineering, Digital Communications and Computer Applications by offering world class curricula.
- To create ethically strong leaders and trend setters for next generation IT.
- To nurture the desire among faculty and students from across the globe to perform outstanding and impactful research for the benefit of humanity and, to achieve meritorious and significant growth.



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

B. Sc. Computer Science

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. To equip the students with the skills and knowledge to get employment in the software industry as well as government departments by imparting the requisite technical skills.
2. To build the capability to work harmoniously as team members be able to become entrepreneur, leadership positions in the industry, with ethical responsibility.
3. To motivate them to pursue higher education in renowned universities across the globe.



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

PROGRAMME OUTCOMES (POs)

PO_01: Having a clear understanding of the subject related concepts and of contemporary issues

PO_02: Having problem solving ability- solving social issues and computer domain specific problems

PO_03: Having adaptive thinking and adaptability

PO_04: Having a clear understanding of professional and ethical responsibility

PO_05: Having cross cultural competency exhibited by working in teams

PO_06: Having a good working knowledge of communicating in English

PO_07: Having interest in lifelong learning



VIT[®]
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

PROGRAMME SPECIFIC OUTCOMES (PSOs)

On completion of B. Sc. (Computer Science) programme , graduates will be able to

1. PSO1: Ability to understand the programming concepts and methodologies in the field of computer science and apply the algorithmic, mathematical and scientific reasoning to solve wide range of computational problems
2. PSO2: Ability to use the emerging software development techniques and tools of computer science to provide real time solutions for latest applications.



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

CREDIT STRUCTURE

Category-wise Credit distribution

Programme Credit Structure	Credits	B.Sc (Honours)
Discipline Core Courses	60	80
Discipline Elective Courses	24	32
Ability Enhancement Courses	08	08
Skill Enhancement Elective Courses	09	09
Value Added Courses	08	08
Open Elective Courses	09	09
Project and Internship	02	14
Total Graded Credit Requirement	120	160

Note : * Students those who wish to continue for the fourth year have to complete three courses (12 Credits) from 4th level Courses in Discipline Elective basket to meet the credit requirement to become eligible for "Honours" degree.



Discipline Core Courses

S. No.	Course Code	Course Title	L	T	P	C
1	UMAT101L	Discrete Mathematics	3	0	0	3
2	UMAT102L	Probability and Statistics	3	0	0	3
3	UMAT201L	Linear Algebra	3	0	0	3
4	UCSC101L	Programming in Python	3	0	0	3
	UCSC101P	Programming in Python Lab	0	0	2	1
5	UCSC102L	Software Engineering	3	0	0	3
6	UCSC103L	Computer Organization and Architecture	3	1	0	4
7	UCSC104L	Data Structures and Algorithms	3	0	0	3
	UCSC104P	Data Structures and Algorithms Lab	0	0	2	1
8	UCSC105L	Object Oriented Programming	3	0	0	3
	UCSC105P	Object Oriented Programming Lab	0	0	2	1
9	UCSC201L	Operating Systems	3	0	0	3
	UCSC201P	Operating Systems Lab	0	0	2	1
10	UCSC202L	Database Management Systems	3	0	0	3
	UCSC202P	Database Management Systems Lab	0	0	2	1
11	UCSC203L	Computer Networks	3	0	0	3
	UCSC203P	Computer Networks Lab	0	0	2	1
12	UCSC204L	Programming in Java	3	0	0	3
	UCSC204P	Programming in Java Lab	0	0	2	1
13	UCSC205L	Web Development	3	0	0	3
	UCSC205P	Web Development Lab	0	0	2	1
14	UCSC206L	Full Stack Application Development	3	0	0	3
	UCSC206P	Full Stack Application Development Lab	0	0	2	1
15	UCSC301L	Software Testing	3	0	0	3
	UCSC301P	Software Testing Lab	0	0	2	1
16	UCSC398J	Project	0	0	0	4
Total Credits						60



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Discipline Honours Core Courses

S.No.	Course Code	Course Title	L	T	P	C
1	UCSC401L	Design and Analysis of Algorithms	3	0	0	3
	UCSC401P	Design and Analysis of Algorithms Lab	0	0	2	1
2	UCSC402L	Theory of Computation	3	1	0	4
3	UCSC403L	Natural Language Processing	3	1	0	4
4	UCSC404L	High Performance Computing	3	1	0	4
5	UCSC405L	Optimization Techniques	3	1	0	4
Total Credits						20



Discipline Elective Courses

S.No.	Course Code	Course Title	L	T	P	C
1	UCCA116L	Organizational Behaviour	3	0	0	3
2	UCSC207L	Visual Programming	3	0	0	3
	UCSC207P	Visual Programming Lab	0	0	2	1
3	UCSC208L	Linux programming	3	0	0	3
	UCSC208P	Linux programming Lab	0	0	2	1
4	UCSC209L	Data Mining	3	0	0	3
5	UCSC210L	Software Project Management	3	0	0	3
6	UCSC211L	Object Oriented Analysis and Design	3	0	0	3
7	UCSC302L	Mobile Application Design and Development	3	0	0	3
	UCSC302P	Mobile Application Design and Development Lab	0	0	2	1
8	UCSC303L	Cloud Application Development	3	0	0	3
	UCSC303P	Cloud Application Development Lab	0	0	2	1
9	UCSC304L	Internet of Things	3	0	0	3
	UCSC304P	Internet of Things Lab	0	0	2	1
10	UCSC305L	Game Programming	3	0	0	3
	UCSC305P	Game Programming Lab	0	0	2	1
11	UCSC306L	Soft Computing	3	0	0	3
12	UCSC307L	Cyber Forensics	3	0	0	3
13	UCSC308L	Wireless Networks	3	0	0	3
14	UCSC309L	Edge Computing	3	0	0	3
15	UCSC310L	Advanced Java Programming	3	0	0	3
	UCSC310P	Advanced Java Programming Lab	0	0	2	1
16	UCSC406L	Computer Graphics and Multimedia	3	0	0	3
	UCSC406P	Computer Graphics and Multimedia Lab	0	0	2	1
17	UCSC407L	System Programming	3	0	0	3
	UCSC407P	System Programming Lab	0	0	2	1
18	UCSC408L	Robotics	3	1	0	4
19	UCSC409L	Cyber Physical Systems	3	1	0	4
20	UCSC410L	Augmented Reality and Virtual Reality	3	1	0	4
21	UCSC411L	Blockchain Technologies	3	1	0	4
22	UCSC412L	Malware Analysis	3	1	0	4



Discipline Elective Courses (Artificial Intelligence and Machine Learning)

S.No.	Course Code	Course Title	L	T	P	C
1	UCSC311L	Artificial Intelligence	3	1	0	4
2	UCSC312L	Machine Learning	3	0	0	3
	UCSC312P	Machine Learning Lab	0	0	2	1
3	UCSC313L	Image Processing	3	0	0	3
	UCSC313P	Image Processing Lab	0	0	2	1
4	UCSC314L	Deep Learning	3	0	0	3
	UCSC314P	Deep Learning Lab	0	0	2	1
5	UCSC315L	Human Computer Interaction	3	1	0	4
6	UCSC316L	Computer Vision	3	1	0	4

Discipline Elective Courses (Data Science)

S. No.	Course Code	Course Title	L	T	P	C
1	UCSC312L	Machine Learning	3	0	0	3
	UCSC312P	Machine Learning Lab	0	0	2	1
2	UCSC317L	Big Data Technologies	3	0	0	3
	UCSC317P	Big Data Technologies Lab	0	0	2	1
3	UCSC318L	Exploratory Data Analytics	3	0	0	3
	UCSC318P	Exploratory Data Analytics Lab	0	0	2	1
4	UCSC319L	Data Visualization	3	1	0	4
5	UCSC320L	NoSQL Databases	3	0	0	3
	UCSC320P	NoSQL Databases Lab	0	0	2	1
6	UCSC321L	Social Network Analytics	3	1	0	4



Ability Enhancement Courses

S No	Course Code	Course Name	L	T	P	C
1	UENG101L	Effective English Communication	2	0	0	2
2	UENG102L	Technical English Communication	2	0	0	2
3	UENG102P	Technical English Communication Lab	0	0	2	1
4	UIFL100L	Indian/Foreign Language	3	0	0	3
Total credits						08

Skill Enhancement Courses

S No	Course Code	Course Name	L	T	P	C
1	USTS101P	Qualitative Skills	0	0	3	1.5
2	USTS102P	Quantitative Skills	0	0	3	1.5
3	USTS201P	Advanced Competitive Coding -I	0	0	3	1.5
4	USTS202P	Advanced Competitive Coding -II	0	0	3	1.5
5	UENG201L	Content Writing	3	0	0	3
6	UCCA321L	Digital Marketing	3	0	0	3
7	UCSC226L	Animation and VFX	3	0	0	3
Total credits						09

Value added Courses

S No	Course Code	Course Name	L	T	P	C
1	USSC101L	Indian Constitution	2	0	0	2
2	UCHY101L	Environmental Science	2	0	0	2
3	UCSC225L	Cyber Security	3	0	0	3
4	UCXC100V	Co-Curricular Course	0	0	0	1
Total credits						08

Open Elective Courses

Management | Humanities | Science | Social Sciences

Total credits 09



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Project and

Internship

S No	Course Code	Course Name	C
1	UCSC399J	Summer Internship	2
2	UCSC499J	Research Project/Dissertation	12
Total credits			14



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

DISCIPLINE CORE COURSES



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC101L	Programming in Python	3	0	0	3
Prerequisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To design and apply programming constructs in Python 2. To learn the usage of decision statements, looping statements and loop manipulation in Python 3. To apply string and file handling functions for solving real world problems					
Course Outcomes:					
1. Understand and comprehend the basic programming constructs of Python programming 2. Implement a given algorithm using Python's building blocks and control structures 3. Demonstrate the implications of specialized data structures in Python 4. Solve real time problems using Strings and Regular Expressions 5. Develop applications using functions and file handling mechanism in python					
Module:1	Introduction and Parts of Python	7 hours			
History of Python, Unique features of Python, Demo on IDLE, Jupiter, Spyder, Identifiers, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, reading input, Print output, Type Conversions					
Module:2	Control Flow Statements	5 hours			
Decision control flow statements, Loops: while loop, for loop, Continue and break statements					
Module:3	List and Tuples	6 hours			
Lists - Create, Basic list operations, Indexing and Slicing in Lists, Built-in functions used on lists, List methods, the del method, List comprehensions; Tuples - Create, Basic tuple operations, Indexing and Slicing in tuples, Built-in functions used on tuples, Relation between Lists and Tuples, Tuple methods					
Module:4	Dictionaries & Sets	6 hours			
Dictionary - Create, accessing and modifying key:value pair in dictionaries, built in functions used in dictionaries, dictionary methods, the del method; Sets - Creation and operations, Sets methods, Frozenset					
Module:5	Strings & Regular Expressions	7 hours			
Creating and Storing strings, Basic string operations, accessing characters by index, String slicing and Joining, String methods, Formatting strings; Regular Expressions – Using special characters, Regular expression methods, Named groups in Python regular Expressions, Regular Expression with glob module					
Module:6	Python Functions	6 hours			
Functions – Built in functions, commonly used modules, Function definition and calling the function, The return statement and void function, Scope of variables, Default parameters, Keyword arguments, Command line arguments, Lambda Function					
Module:7	Files and Packages	6 hours			
Files – Types of files, Crating and Reading text data, File methods to read and write data, Reading and writing files; Packages – Basics of NumPy and pandas.					
Module:8	Contemporary Issues	2 hours			
Guest Lecture from Industry and R & D Organizations					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

	Total Lecture hours:	45 hours
Text Book(s)		
1.	Gowrishankar S. Veena A, "Introduction to Python Programmin",2019, First Edition, CRC press.	
Reference Books		
1.	Martic C Brown,"Python: The Complete Reference",2018, Fourth Edition, McGraw Hill Publishers.	
2.	Eric Matthes,"Python Crash Course: A Hands-On, Project-Based Introduction to Programming",2023, Third Edition, No starch Press.	
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar		
Recommended by Board of Studies	30-05-2023	
Approved by Academic Council	No. 70	Date 24.06.2023

Course Code	Course Title	L	T	P	C
-------------	--------------	---	---	---	---



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

UCSC101P	Programming in Python Lab			0	0	2	1
Pre-requisite				Syllabus version			
				v.1.0			
Course Objectives:							
<ol style="list-style-type: none"> To design and apply programming constructs in Python To learn the usage of decision statements, looping statements and loop manipulation in Python To apply string and file handling functions for solving real world problems 							
Course Outcomes:							
<ol style="list-style-type: none"> Understand and comprehend the basic programming, control structures and functions Demonstrate the implications of specialized data structures in Python Solve real-time problems using Strings and Regular Expressions Develop applications using strings and file handling mechanisms in Python 							
Indicative Experiments						Hours	
1.	Python Operators, Expressions and Flow controls			4 Hours			
2.	Python Lists, Tuples			6 Hours			
3.	Dictionaries & Sets			4 Hours			
4.	Python Strings & Regular Expressions			6 Hours			
5.	Python Functions and Files			6 Hours			
6.	Python Packages			4 Hours			
Total Laboratory Hours						30 Hours	
Text Book(s)							
1	Gowrishankar S. Veena A., "Introduction to Python Programming", 2019, First Edition, CRC press.						
2	Eric Matthes, "Python Crash Course: A Hands-On, Project-Based Introduction to Programming", 2023, Third Edition, No starch Press.						
Mode of assessment: CAT, Exercises, FAT							
Recommended by Board of Studies			30-05-2023				
Approved by Academic Council			No. 70	Date	24.06.2023		

Course Code	Course Title	L	T	P	C
--------------------	---------------------	----------	----------	----------	----------



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

UCSC102L	Software Engineering	3	0	0	3
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
<ol style="list-style-type: none"> To understand the fundamental concepts of software engineering process, product and project To develop appropriate knowledge of requirements specification and design solutions for the given problem To examine the quality standards in the software development process 					
Course Outcomes:					
<ol style="list-style-type: none"> Demonstrate the basics of software engineering process, ethics, and development Illustrate the concept of various process models, activities, and its improvements Analyze the various aspects of software requirement engineering and system models Summarize and analyse the decisions about the system architectural design process Inspect a computer-based system to meet the desired needs of the customer with proper understanding of the critical systems development 					
Module:1	Introduction to Software Engineering	5 hours			
Professional software development- Software engineering ethics, Software process models, Process activities, Coping with change, Process improvement					
Module:2	Requirements Engineering	5 hours			
Functional and non-functional requirements- Requirements Engineering Process- Requirements elicitation- Requirements Specification-Requirements Validation-Requirements change					
Module:3	Architectural Design and Modeling	7 hours			
System modeling-Context models- Interaction Models-Structural Models-Behavioural models- Model-driven architecture- Architectural design decisions-Architectural Views-Architectural patterns, and Application architectures- Object-oriented design using UML-Design patterns- Implementation Issues-Open source development					
Module:4	Validation and Evolution	7 hours			
Development testing, Test-driven development- Release testing, User Testing-Evolution processes- Legacy Systems-Software Maintenance-Software Reuse					
Module:5	Software Project Management	7 hours			
Risk management- managing people-Teamwork-Project planning- Software Pricing-Plan-driven development-Project Scheduling-Agile Planning-Estimation techniques- COCOMO cost modeling					
Module:6	Software Quality Management	6 hours			
Software quality- Software standards- Reviews and inspections-Quality management- Software measurement					
Module:7	Software Configuration Management	6 hours			
Version management-System Building-Change management- Release management					
Module:8	Contemporary Issues	2 hours			
Guest Lecture from Industry and R & D Organizations					
		Total Lecture hours:			45 hours
Text Book(s)					
1.	Ian Sommerville, "Software Engineering", 2017, Tenth Edition, Addison-Wesley.				



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Reference Books			
1.	Roger S. Pressman and Bruce Maxim, "Software Engineering", 2019, Seventh Edition, McGraw Hill.		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies	30-05-2023		
Approved by Academic Council	No. 70	Date	24.06.2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC103L	Computer Organization and Architecture	3	1	0	4
Pre-requisite		Syllabus version			
		V.1.0			
Course Objectives:					
1. To understand computer design and data processing 2. To Construct the design principles of central processing and memory Units. 3. To function the parallelism, GPU architectures and contemporary processor design					
Course Outcomes:					
1. Understand data representation and micro-operations, design of the computer. 2. Apply the instruction set for problems with the design of the central processing unit. 3. Choose the various operations for computer arithmetic metrics. 4. Design the cache memory and virtual memory for the performance enhancement of the CPU. 5. Examine the functionalities of parallelism, contemporary architectures, and the GPU.					
Module:1	Data Representation and Microoperations	6 hours			
Introduction to number system, Binary, Hexa, Octal Addition, Subtraction, Multiplication, Division. Basic logic gates, Universal logic gates, Flip-flops and Types, Combinational logic circuits.					
Module:2	Basic Computer Organization and Design	6 hours			
Evolution of Computer Architecture- Basic computer organization and design - Registers- Instruction set - Timing and Control - Instruction cycle - Memory Reference Instructions- Input - Output Interrupt - Design of the basic computer.					
Module:3	Design of the Central Processing Unit	7 hours			
Central processing unit- Instruction format and Types - Addressing modes - Stack operation - Program Status word - Data Transfer operations - RISC and CISC processors and their differences					
Module:4	Computer Arithmetic	6 hours			
Computer Algorithms, Signed and unsigned addition, Booth's Multiplication algorithm, Restoring and non-restoring division, Decimal and Floating-point arithmetic operations.					
Module:5	Memory organization and Design	6 hours			
Memory Types, RAM and ROM, Auxiliary memories, Cache memory organization and architecture- Types and numerical problems.					
Module:6	I/O Device Interfacing	6 hours			
Input Output: Input-Output Organization Peripheral devices I/O Interface Isolated I/O and Memory mapped I/O, Asynchronous Data Transfer Strobe and handshaking methods					
Module:7	Data-Level Parallelism in Vector, SIMD, and GPU Architectures	6 hours			
The Development of SIMD Supercomputers, Vector Computers, Multimedia SIMD Instruction Extensions, and Graphical Processor Units, types and architectures.					
Module:8	Contemporary issues:	2 hours			
Guest Lecture from Industry and R & D Organizations					
				Total Lecture hours:	45 hours
				Total Tutorial hours:	15 hours
Text Book(s)					
1	Morris Mano, Rajib Mall, "Computer System Architecture", 2020, Fourth Edition, Pearson Publication.				
2	Hennessy, J. L., Patterson, D. A, "Computer Architecture: A Quantitative Approach. Amsterdam", 2017, Sixth edition, Morgan Kaufmann.				
Reference Books					
1	Stallings, W., "Computer Organization and Architecture", 2021, Pearson Education.				
2	Govindarajalu, B, "Computer Architecture and organization: Design principles and applications", 2010, Tata McGraw-Hill.				
Mode of Evaluation: CAT / written assignment / Quiz / FAT / Project / Seminar / group discussion / field work					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Recommended by Board of Studies	30-05-2023		
Approved by Academic Council	No. 70	Date	24.06.2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC104L	Data Structures and Algorithms	3	0	0	3
Prerequisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To understand and apply suitable data structures in all possible applications					
2. To develop and design algorithms using the data structures concept					
3. To analyze the efficiency of algorithms developed					
Course Outcomes:					
1. Understand the basic concepts of data structures and algorithms					
2. Derive the efficiency of algorithms					
3. Choose appropriate linear and non-linear data structures to develop any application					
4. Apply the suitable sorting and searching algorithms in real world applications					
5. Create effective solution for challenging real world problems					
Module:1	Introduction to Data Structures and Algorithms	7 hours			
Arrays - Structures - Pointers - Data structures and its types - Abstract Data Type - Algorithms - Asymptotic notations - Time complexity analysis - Algorithm efficiency					
Module:2	Stacks	6 hours			
Introduction - Array implementation of stack operations – Balancing symbols - Infix to Postfix conversion - Infix to Prefix conversion - Evaluation of Postfix expression - Evaluation of Prefix expression					
Module:3	Queues	5 hours			
Introduction - Types of Queues - Array implementation of Linear Queue operations - Circular Queue and its implementation - Applications of Queue					
Module:4	Lists	6 hours			
Array implementation of List operations - Linked list and its types - Singly Linked list operations - Linked list implementation of Stack - Linked list implementation of Queue					
Module:5	Trees	7 hours			
Basic Terminologies - Binary tree construction from General trees - Binary Tree representation - Expression Trees - Binary Tree Traversals - Binary Search Tree and its operations					
Module:6	Graphs	6 hours			
Basic Terminologies - Graph representation - Graph Traversals - Topological sorting - Dijkstra's Algorithm					
Module:7	Sorting and Searching	6 hours			
Bubble sort - Selection sort - Insertion sort - Shell sort - Radix sort - Quick sort - Heap sort - Merge sort - Linear search - Binary search					
Module:8	Contemporary Issues	2 hours			
Guest Lecture from Industry and R & D Organizations					
Total Lecture hours:					45 hours
Text Book(s)					
1.	Narasimha Karumanchi, "Data Structures and Algorithms Made Easy", 2017, Fifth Edition, Career Monk.				
Reference Books					
1.	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 2019, Fourth Edition, Pearson.				
2.	Ellis Horowitz, SartajSahni and Anderson, "Fundamentals of Data Structure in C", 2008, Second Edition, University Press.				
3.	ReemaThareja, "Data Structures using C", 2017, Second Edition, Oxford Universities Press.				
Mode of Evaluation: CAT, Written Assignment, Quiz, and FAT.					
Recommended by Board of Studies		30-05-2023			



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Approved by Academic Council	No. 70	Date	24.06.2023
------------------------------	--------	------	------------



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC104P	Data Structures and Algorithms Lab	0	0	2	1
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To understand and apply suitable data structures in all possible applications.					
2. To develop and design algorithms using the data structures concept.					
Course Outcomes:					
1. Choose appropriate linear and non-linear data structures to develop any application.					
2. Apply the suitable sorting and searching algorithms in real world applications.					
3. Create effective solution for challenging real world problems.					
Indicative Experiments					Hours
1.	Arrays and Structures.				3 Hours
2.	Stack operations using arrays and its applications.				6 Hours
3.	Queue and Circular queue operations using arrays.				2 Hours
4.	List operations using arrays, Linked List operations, Stack using linked list and Queue using linked list.				4 Hours
5.	Creation of Binary Search Tree, implementation of its operations and Traversing it.				3 Hours
6.	Graph Traversals.				2 Hours
7.	Implementation of sorting algorithms.				8 Hours
8.	Implementation of searching algorithms.				2 Hours
Total Laboratory Hours					30 hours
Text Book(s)					
1.	Narasimha Karumanchi, "Data Structures and Algorithms Made Easy", 2017, Fifth Edition, Career Monk.				
2.	Reema Thareja, "Data Structures using C", 2014, Oxford Universities Press, Second Edition.				
Mode of assessment: CAT, Exercises, FAT					
Recommended by Board of Studies		30-05-2023			
Approved by Academic Council		No. 70	Date	24.06.2023	



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC105L	Object Oriented Programming	3	0	0	3
Prerequisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To learn the fundamentals of object oriented programming concepts and methodologies 2. To code, document, test, and implement a well-structured, robust computer program and reusable modules					
Course Outcomes:					
1. Understand the principles of object oriented programming, input and output stream 2. Identify and distinguish control structures between sequential, repetition and selection statements 3. Declare and manipulate arrays, pointers, and dynamic memory allocation 4. Apply Object Oriented Design and Programming concepts using encapsulation, inheritance, polymorphism and exception handling 5. Develop effective programs using virtual functions, file handling and pointer concepts.					
Module:1	Principles of Object-Oriented Programming				5 hours
Object-Oriented Programming (OOPs) Paradigm, Basics of Object-Oriented programming, Application of OOP					
Module:2	Tokens, Expressions and Control Structures				5 hours
Keyword, Identifiers, User defined data types, Derived data type, Constant, Operators , Scope resolution operator, Memory Management operators, Expression and their types, Operator Precedence, Control Structures					
Module:3	Classes and objects				6 hours
Introduction, Class creation, Access modifiers, Defining member functions, Nested class, static data member, arrays within class, array of object, this pointer.					
Module:4	Constructors, Destructors & Exception Handling				7 hours
Constructor Types, Destructor, Basics of Exception Handling, Exception Handling Mechanism-throw and catch mechanisms					
Module:5	Polymorphism				7 hours
Overloading-Function overloading, Operator overloading- Binary, unary Insertion, Extraction operator					
Module:6	Inheritance: Extending Classes				7 hours
Inheritance- Base class, Derived class, Types of inheritance-Single, Multiple, Multilevel, Hybrid, Hierarchical, Diamond problem					
Module:7	Pointers, Virtual Functions & File handling				6 hours
Pointers, Pointers to objects, Pointer to derived class, Virtual Functions, Pure virtual Functions, Classes for file stream operation, Opening and closing a file, detecting End-of-file, reading and writing a file.					
Module:8	Contemporary Issues				2 hours
Guest Lecture from Industry and R & D Organizations					
				Total Lecture hours:	45 hours
Text Book(s)					
1.	E.Balagurusamy, "Object Oriented Programming with C++", 2020, Eighth Edition, TataMcGrawHill.				
Reference Books					
1.	Herbert Schiidt,"C++: The Complete Reference",2017, Fourth Edition, McGraw Hill.				
2.	Stanely Lippman and Josee Lajoie , "C++ Primer", 2012, Fifth Edition, Addison-Wesely.				
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar					
Recommended by Board of Studies		30-05-2023			



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Approved by Academic Council	No. 70	Date	24.06.2023
------------------------------	--------	------	------------



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC105P	Object Oriented Programming Lab	0	0	2	1
Pre-requisite		Syllabus version			
		v. 1.0			
Course Objectives:					
1. To understand and implement object oriented concepts 2. To strengthen problem solving ability by using the characteristics of an object-oriented approach 3. To design real time applications using object oriented features					
Course Outcomes:					
1. Demonstrate class, object, inheritance and polymorphism. 2. Implement function and operator overloading. 3. Construct generic classes using template concepts.					
Indicative Experiments					Hours
1.	i. Write a program that reads in a month number and outputs the month name. ii. Write a program to reverse the digits of a given number. iii. Write a program to convert an amount in figures to equivalent amount in words. <ul style="list-style-type: none"> a. Convert an amount (in millions) to equivalent amount in words b. Convert an amount (in billions) to equivalent amount in words iv. Write a program to input 20 arbitrary numbers in one dimensional array. Calculate the frequency of each number. Print the number and its frequency in a tabular form.	5 Hours			
2.	i. Write a program to define class complex having two data members viz real and imaginary part. ii. Write a program to define class Person having multiple data members for storing the different details of person e.g. name, age, address, height.	5 Hours			
3.	Assume that XYZ Bank allows to open an account with an initial amount of Rs.5000 and you can add some more amount to it. Create a class 'AddAmount' with a data member named 'amount' with an initial value of Rs.5000. Now make two constructors of this class as follows: <ul style="list-style-type: none"> • AddAmount()- without any parameter - no amount will be added to the XYZ Bank account • AddAmount(int n) - having a parameter which is the amount that will be added to the XYZ Bank account Write a program to create an object of the 'AddAmount' class, call these two constructors and display the final amount in the XYZ Bank.	5 Hours			
4.	In an organization in computation of its performance and which directly helps in calculating their salary. Assume the Basic Salary is 10000 and if an employee achieved sales of 100 percent of target the employee is provided with 100 percent of basic pay as performance incentive, if the employee achieved 75 percent and above as sales target, he/she gets 50 percent of basic pay as performance incentive and if the employee achieves less than 75 percent, he/she gets only ten percent as performance incentive. Write a program using inheritance and abstract class to compute the salary of employees.	5 Hours			
5.	Write a program to create parent class Shape, derive Triangle, Square and Circle from the Shape class, and then calculate area of these shapes using pure virtual function.	5 Hours			
6.	Write a program to create a simple calculator which can add, subtract, multiply and divide two numbers using function template.	5 Hours			
Total Laboratory Hours					30Hours



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC201L	Operating Systems	3	0	0	3
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To understand different types and structures of operating systems designed for mobile, desktop and high-performance computing servers 2. To identify the core functionalities of operating systems such as process management, memory management and file system management 3. To analyze core functionalities of operating system to cater the need of end users and services effectively					
Course Outcomes:					
1. Understand the services and functionalities of operating system with process and thread creation mechanism 2. Explore the synchronization mechanism and providing solutions to critical sections 3. Apply various process scheduling algorithm to improve CPU utilization and throughput. 4. Categorize various physical/virtual memory management techniques to optimize memory allocation to processes 5. Inspect the various disk scheduling algorithms and file system management approaches					
Module: 1	Operating system structure and Organization	7 hours			
Computer-System Organization- Architecture - Structure and operations of Operating System - Services - Interface between user and operating system -System Calls -System Boot					
Module:2	Process and Thread Management	6 hours			
Process states -context switching-process control bloc – scheduling - Operations on Processes - Inter-process Communication - Threads Overview, Multithreading Models					
Module:3	Process synchronization	7 hours			
Race Condition - Critical section problem, Peterson’s Solution, Mutex Locks, Semaphores, Classic Problems of Synchronization- Producer-Consumer problem, Readers-writer problem, Dining Philosopher’s problem					
Module:4	CPU Scheduling and Deadlock	7 hours			
Scheduling Algorithms - Pre-emptive and Non-Pre-emptive scheduling -Deadlocks- System Model, Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance					
Module:5	Main Memory Management	6 hours			
Swapping- Contiguous Memory Allocation - First Fit, Best Fit, Worst Fit- Segmentation- Paging					
Module:6	Virtual Memory	4 hours			
Demand Paging -Page Fault - FIFO, LRU, OPR Page Replacement Algorithms, -Allocation of Frames –Thrashing					
Module:7	Storage Management	6 hours			
File-System Interface- File Concept, File-System Mounting, Allocation Methods, Disk structure, Disk Scheduling Algorithms					
Module:8	Contemporary Issues	2 hours			
Guest Lecture from Industry and R & D Organizations					
		Total Lecture hours:			45 hours
Text Book(s)					
1.	A.Silberschatz, P.B. Galvin & G. Gagne,“Operating system concepts”, 2018, Tenth Edition, John Wiley.				
Reference Books					
1	W. Stallings,“Operating systems-Internals and Design Principles”, 2018, Ninth Edition, Prentice-Hall.				
2	Tanenbaum , “Modern Operating Systems”, 2022,Fifth Edition, PrenticeHall.				



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Mode of Evaluation: CAT / written assignment / Quiz / FAT			
Recommended by Board of Studies		30-05-2023	
Approved by Academic Council	No. 70	Date	24.06.2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC201P	Operating Systems lab	0	0	2	1
Pre-requisite		Syllabus version v.1.0			
Course Objectives:					
1. To understand operating system concepts such as scheduling, deadlock management, file management and memory management					
2. Develop and implement C programs using Unix system calls					
Course Outcomes:					
1. Experiment with Unix commands and shell programming					
2. Analyze process management and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority, Deadlock management					
3. Evaluate memory management schemes and page replacement schemes					
4. Interpret different file allocation methods and disk scheduling algorithms					
Indicative Experiments					Hours
1.	Basic Unix, Shell commands Unix commands - shell commands				4 Hours
2.	Process Management Concepts Process creation – Parent process – child process				4 Hours
3.	Multi-Threads Concept Thread creation - Execute a process and kernel				4 Hours
4.	CPU Scheduling Concepts FCFS - Round Robin- SJF -Priority Scheduling				4 hours
5.	Deadlocks and Synchronization Concept Dead Lock prevention - Dead Lock Detection				4 Hours
6.	Memory and Virtual Memory Concepts Memory Allocation methods - Page Replacement Algorithm				6 Hours
7.	File management Concepts Disk scheduling Algorithms - File Allocation				4 Hours
Total Laboratory Hours					30 hours
Text Book(s)					
1.	Abraham Silberschatz, Greg Gagne, Peter B. Galvin, “Operating System Concepts”, 2020, Tenth Edition, Wiley.				
Reference Books					
1.	Andrew S. Tanenbaum, “Modern Operating Systems”, 2016, Fourth Edition, Pearson.				
2.	William Stallings, “Operating Systems: Internals and Design Principles”, 2021, Pearson, Ninth Edition.				
Mode of assessment: Continuous assessment / FAT / Exercises					
Recommended by Board of Studies		30-05-2023			
Approved by Academic Council		No. 70	Date	24.06.2023	



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC202L	Database Management Systems	3	0	0	3
Prerequisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To understand the basics of database management systems (DBMS), with an emphasis on how to organize, maintain and retrieve efficiently, and effectively the information from a DBMS 2. To examine the fundamental concepts of the relational model, including relations, attributes, domains, keys, foreign keys, entity integrity and referential integrity 3. To inspect the basic issues of transaction processing, concurrency control and database security					
Course Outcomes:					
1. Identify the basic concepts of database and various data models used in DB design 2. Design conceptual models to represent simple database application scenarios 3. Construct high-level conceptual model to relational data model and to improve a database design by normalization 4. Develop a query database using SQL and PL/SQL and Implementing the database using PL/SQL Statements 5. Elaborate the concepts of transaction and security control in data base					
Module:1	Introduction to Database				6 hours
Introduction to Database – Characteristics - Application of Database Systems - Data Models ,Data Abstraction ,Instance and Schemas ,Three Schema Architecture - Database Languages - User Interfaces – Database Architecture - Classification					
Module:2	Data Modeling using E-R Model				6 hours
High-Level Conceptual Data Models for Database Design - Entity Types - Entity Sets - Attributes and Keys - Relationship Types - Relationship Sets - Roles and Structural Constraints - Weak Entity Types - ER Diagrams					
Module:3	Relational Data Model				6 hours
Relational Model Constraints - Update Operations - Dealing with Constraint Violations - Database Design Using ER – to - Relational Mapping					
Module:4	SQL				7 hours
Data Definition and Data Types - Constraints in SQL - Basic Queries – SQL Functions, Aggregate Functions – SET Operations - Complex Queries – Views					
Module:5	PL/SQL				6 hours
PL/SQL Block – Data Types - Control Structure – Function – Procedure – Cursors – Exception Handling – Trigger					
Module:6	Relational Database Design				6 hours
Informal Design Guidelines for Relation Schemas – Data Anomalies - Functional Dependencies - Inference Rules - Normal Forms – 1NF, 2NF, 3NF and BCNF – Properties of Relational Decompositions – Algorithms					
Module:7	Transaction Processing & Security				6 hours
Introduction - Desirable Properties of Transactions – Schedules – Transactions support in SQL – Need for Concurrency Control and Recovery – Database Security - Discretionary Access Control Based on Granting and Revoking Privileges					
Module:8	Contemporary Issues				2 hours
Guest Lecture from Industry and R & D Organizations					
Total Lecture hours:					45 hours
Text Book(s)					
1.	Abraham Silberschatz, Henry F. Korth and S. Sudarshan, “Database System Concepts”, 2020, Seventh Edition, McGraw Hill.				



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Reference Books			
1.	Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", 2007, Third Edition, McGraw Hill.		
2.	RamezElmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", 2016, Seventh Edition, Pearson.		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies	30-05-2023		
Approved by Academic Council	No. 70	Date	24.06.2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC202P	Database Management Systems Lab	0	0	2	1
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To understand, analyze and design databases 2. To examine the existing database system, and create new relational database and analyze the design.					
Course Outcomes:					
1. Apply SQL interface of a RDBMS package to create, secure, populate and query of Database 2. Formulate query using SQL, solutions to a usage of query and data update problem 3. Utilize procedural language to develop comprehensive solutions for all type of applications					
Indicative Experiments					Hours
1.	Database creation Creating Tables - Viewing all Tables in a Database - Dropping / Truncating/Renaming Tables.				2 Hours
2	Schema Refinement Changing structure of the existing table using Alter command - Assigning constraints - drop the constraints/modify constraints.				2 Hours
3.	Schema Design using Tools (ER and Relation Model)				2 Hours
4.	Database manipulation Inserting / Updating / Deleting Records in a Table – View the table using Select - Transaction control commands – commit, rollback and save point				4 Hours
5.	For a given set of relation schemes, perform the following Simple Queries - Simple Queries with Aggregate functions - group by and having clause.				4 Hours
6.	SET Operators and Built-in Functions Union, Intersection, Minus, and Queries involving Date Functions - String Functions and Math Functions				4 Hours
7.	Complex Queries (Nested and Join Queries) Join Queries-Inner Join, Outer Join - Subqueries-With IN clause				4 Hours
8.	PL/SQL Programs Sample program using loops - Conditionals – Exception Handling				4 Hours
9	PL/SQL– Block Cursor, Procedure, and Functions				2 Hours
10.	PL/SQL – Trigger				2 Hours
Total Laboratory Hours					30 hours
Text Book(s)					
1	Bob Bryla, Kevin Loney, “Oracle Database 12c The Complete Reference”, 2013, Illustrated Edition, McGraw-Hill.				
2	Steven Feuerstein, Bill Pribyl, “Oracle PL/SQL Programming”, 2018, Sixth Edition, O'Reilly.				
Mode of assessment: CAT, Exercises, FAT					
Recommended by Board of Studies		30-05-2023			
Approved by Academic Council		No. 70	Date	24.06.2023	



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC203L	Computer Networks	3	0	0	3
Pre-requisite		Syllabus Version			
		v 1.0			
Course Objectives:					
<ol style="list-style-type: none"> To understand the basic terms and concepts of network models and functions of different layers To analyze the design and performance matters allied with the network and data link layers. To evaluate the IP addressing and the necessities of transport and application layer protocols 					
Course Outcomes:					
<ol style="list-style-type: none"> Understand the fundamental concepts of network models Analyze the internetworking devices Evaluate the function of Data Link layer and Medium Access Control Construct the network with an IP address and identify the shortest path, transport layer protocols and congestion control algorithms Inspect the rudiments of Application Layer Protocol and network security 					
Module:1	Layered Network Architecture	6 hours			
Evolution of data Networks – Network Topologies –Switching Techniques – Multiplexing – Types of network – ISO/OSI Reference Model – TCP/IP Model – Addressing – Network performance metrics					
Module:2	Internetworking devices	5 hours			
Repeaters – Hubs – Bridges -Transparent and Source Routing- Spanning tree algorithm- Layer -2 Switches – Layer -3 Switches /Routers					
Module:3	Data Link Layer- Logical Link Control	6 hours			
Error Detection Techniques – Parity-Cyclic Redundancy Check - Checksum-Automatic Repeat Request protocols: Stop and wait, Go back-n and Selective Repeat – Framing					
Module:4	Medium Access Control and LAN technologies	8 hours			
Scheduling approaches to MAC - Random access Protocols – Carrier Sense Multiple Access- Ethernet- Wireless LAN- Bluetooth					
Module:5	Network Layer	8 hours			
Internetworking – IP Addressing – Subnetting – IPv4 and IPv6– Routing – Distance Vector and Link State Routing – Routing Protocols					
Module:6	Transport Layer	5 hours			
Connection oriented and Connectionless Service – User Datagram Protocol – Transmission Control Protocol – Congestion Control – Quality of Service parameters					
Module:7	Application Layer	5 hours			
Domain Name System – Simple Mail Transfer Protocol – File Transfer Protocol – Hypertext Transfer Protocol; Introduction to Network Security and Cryptography					
Module:8	Contemporary Issues	2 hours			
Guest Lecture from Industry and R & D Organizations					
Total Lecture hours:					45 hours
Text Book(s)					
1.	Behrouz A Forouzan, “Data Communications and Networking”, 2017, Fifth Edition, Tata McGraw-Hill.				
Reference Books					
1.	Dimitri P. Bertsekas & Robert Gallager, “Data Networks”, 2013, Second Edition, Prentice Hall.				
2.	W. Stallings, “Data and Computer Communications”, 2017, Tenth Edition, Pearson Prentice Hall.				
3.	Alberto Leon-Garcia, “Communication Networks”, 2017, Second Edition, Tata McGraw-Hill.				
Mode of Evaluation: Continuous Assessment Test, Digital Assignment, Quiz and Final Assessment Test					
Recommended by Board of Studies		30-05-2023			
Approved by Academic Council		No. 70	Date	24.06.2023	

Course Code	Course Title	L	T	P	C
-------------	--------------	---	---	---	---



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

UCSC203P	Computer Networks Lab	0	0	2	1
Prerequisite		Syllabus Version			
		v.1.0			
Course Objectives:					
<ol style="list-style-type: none"> 1. To understand the basic terms and concepts of network models and functions of different layers 2. To analyze the design and performance matters allied with the network and data link layers. 3. To examine the IP addressing and the necessities of transport and application layer protocols 					
Course Outcomes:					
<ol style="list-style-type: none"> 1. Understand the functioning of internetworking devices and network topologies utilizing simulation tools 2. Inspect the performance of error detection and medium access control protocols utilizing simulation tools 3. Analyze the routing algorithms and transport layer protocols utilizing simulation tools 					
Indicative Experiments					
1	Study of basic network commands and demonstrate the functionalities of all network devices via simulator	4 hours			
2	Analyze the spanning tree algorithm by varying the priority among the switches	4 hours			
3	Simulation of framing and error detection schemes. Simulation of different Medium Access Control and flow control schemes	4 hours			
4	Examine the network: <ul style="list-style-type: none"> • Identify Connectivity Problems- Use the ping command to test network connectivity. • Router configuration • Troubleshoot Network Connections router. • Examine the router to find possible configuration errors. • Use the necessary commands to correct the router configuration. • Verify the logical configuration. • Begin troubleshooting at the host connected to the router. • Examine the router to find possible configuration errors. • Use the necessary commands to correct the router configuration. • Verify the logical configuration. 	4 hours			
5	Implementation of various routing algorithms to compute the shortest path	4 hours			
6	Simulation of congestion control algorithms	4 hours			
7	Developing simple applications using TCP and UDP socket programming	6 hours			
Total Laboratory Hours					30 hours
Text Book(s)					
1	Behrouz A Forouzan, "Data Communications and Networking", 2017, Fifth Edition, Tata McGraw-Hill.				
2	Alberto Leon-Garcia, "Communication Networks", 2017, Second Edition, Tata McGraw-Hill.				
Mode of Assessment: Continuous Assessment and Final Assessment Test					
Recommended by Board of Studies		30-05-2023			
Approved by Academic Council		No. 70	Date	24.06.2023	



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C	
UCSC204L	Programming in Java	3	0	0	3	
Pre-requisite		Syllabus version				
		v.1.0				
Course Objectives:						
<ol style="list-style-type: none"> To apply the core Java fundamentals to learn the concepts in J2SE To handle exceptions and create multithreaded applications, dynamic and interactive graphical applications using JavaFX To apply the concept of file handling, data framework and databases connectivity to solve the problems 						
Course Outcomes:						
<ol style="list-style-type: none"> Provide a basic understanding and solving the computational problems using Java programming Handle object oriented concepts and run-time errors Execute collection framework, multi-processes using threads and handle files Design interactive GUI applications using JavaFX Create database programs to perform CRUD operations 						
Module:1	Introduction to Java Programming	3 hours				
Overview of Java programming language, History of Java programming language. Java environment setup – JVM- Javadoc – Structure of a Java program-Features of Java programming language- Variables and its Scope -Keywords-Data Types- Identifiers – Operators – Precedence – Command line arguments – final - Simple computational problems						
Module:2	Conditionals, Looping, Arrays, and Strings	6 hours				
Decision-making statements - Looping statements - Jump statements - Arrays in Java-1D and 2D arrays –Strings						
Module:3	Object Oriented Programming concepts in Java	7 hours				
Classes- Objects- Constructors- Inheritance- Interfaces- Polymorphism- abstract class-Garbage collection-finalize() method						
Module:4	Packages and Exception Handling in Java	7 hours				
User-defined packages, Inner classes. Exception vs Error, Purpose of Exception handling-Try, throw, throws, finally with different cases and catch statements-Predefined exception handling classes- user-defined exception handling-Thread life cycle-Creating multi-threads and synchronization						
Module:5	Threads, File handling and Collection	6 hours				
Thread life cycle-Creating multi-threads and synchronization - I/O basics - Reading Console Input - Writing Console output - Reading and Writing files - Generic class and methods-Collections framework-List, set, and map interface						
Module:6	GUI and Java Streams	7 hours				
Creating the GUI Components using JavaFX - Different types of Layouts - Event handling - java streams interface - java stream operations						
Module:7	Database connectivity in Java using JDBC	7 hours				
JDBC architecture, establishing connectivity and working with connection interface, working with statements, Creating and executing SQL statements, Working with Result Set. Accessing databases and performing CRUD operations using Java						
Module:8	Contemporary Issues	2 hours				
Guest Lecture from Industry and R & D Organizations						
		Total Lecture hours:			45 hours	
Text Book(s)						



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

1.	Herbert Schildt, "The Complete Reference-Java", 2017, Eleventh Edition, Tata Mcgraw-Hill.		
Reference Books			
1.	Cay S. Horstman, "Core Java Volume-1, Fundamentals", 2020, Eleventh Edition, Oracle Press.		
2.	Nicholas S. Williams, "Professional Java for Web Applications", 2014, first edition, Wrox Press.		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies		30-05-2023	
Approved by Academic Council		No. 70	Date 24.06.2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC204P	Programming in Java Lab	0	0	2	1
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
<ol style="list-style-type: none"> To apply the core Java fundamentals to learn the concepts in J2SE To handle exceptions and create multithreaded applications, dynamic and interactive graphical applications using JavaFX To apply the concept of file handling, data framework and databases connectivity to solve the problems 					
Course Outcomes:					
<ol style="list-style-type: none"> Provide a basic understanding and solving the computational problems, Handle run-time errors Execute collection framework, multi-processes using threads and handle files Design interactive GUI applications, database programs 					
Indicative Experiments					
1.	Operators- Datatypes-Keywords-Reading different values from the user-Solving Simple Computational Problems	3 Hours			
2.	Decision-making statements (if-else, switch-case)- Looping statements (while, do-while, for and enhanced for loop)- Jump statements (break, continue, return)	3 Hours			
3.	Arrays – Classes – Objects - String class - Constructors	3 Hours			
4.	Inheritance- Polymorphism-abstract class	3 Hours			
5.	User-defined packages and Interfaces	3 Hours			
6.	Exception handling-Predefined exception handling classes- user-defined exception handling	3 Hours			
7.	File handling in Java	3 Hours			
8.	Generic class and methods-Collections framework-List, set and map interface	3 Hours			
9.	Creating the GUI Components using JavaFX, Java Streams and event handling	3 Hours			
10.	Database - CRUD operations	3 Hours			
Total Laboratory Hours					30 hours
Text Book(s)					
1.	Herbert Schildt, "The Complete Reference-Java", 2017, Eleventh Edition, Tata Mcgraw-Hill.				
Reference Books					
1.	Cay S. Horstman, "Core Java Volume-1, Fundamentals", 2020, Eleventh Edition, Oracle Press.				
2.	Nicholas S. Williams, "Professional Java for Web Applications", 2014, First Edition, Wrox Press.				
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar					
Recommended by Board of Studies		30-05-2023			
Approved by Academic Council		No. 70	Date	24.06.2023	



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC205L	Web Development	3	0	0	3
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To acquire the skills and knowledge necessary to create websites and online applications 2. To understand the fundamental design principles, data, products, and services for websites based on client server technologies 3. To explore and use key programming concepts to build a dynamic website using PHP					
Course Outcomes:					
1. Understand the fundamentals of HTML webpage design and learn how to build a website 2. Design websites using properly formatted HTML and the appropriate CSS layout/styling pattern 3. Apply the concept of JavaScript to create highly responsive interfaces that enhance user experience and provide dynamic functionality 4. Integrate DOM to improve website functionality and establish a standard programming interface 5. Develop a dynamic and interactive webpage using PHP and databases					
Module-1	Web Basics	5 hours			
WWW–Sticking with the standards-The Internet Versus the Web-The Anatomy of a Web Page-Creating Web Content- Understanding Web Content Delivery-Selecting a Web Hosting Provider-Testing with Multiple Web Browsers-The Request/Response Procedure–Content strategy-Testing Web Content - Responsive Web Design					
Module-2	HTML 5	6 hours			
Creating a Simple page-HTML Document Structure-Marking Up Text-Paragraphs-Headings-Thematic Breaks-Lists-Organizing Page Content-Adding Links-Adding Images-Table Markup-Forms-Working with Fonts, Text Blocks, and Lists-Using Tables to Display Information-Using External and Internal Links-Working with Colors, Images, and Multimedia					
Module-3	Cascading Style Sheets	8 hours			
Introduction-The Benefits of CSS– Internal Style Sheets and Inline Style Sheets–More CSS Techniques-Styling Forms-Styling Tables-Image Replacement Techniques–Formatting Text- Colors and Backgrounds-Placing List Item Indicators-Creating Image Maps with List Items – The CSS Box Model-Margin, Border, Padding – Creating Vertical Navigation with CSS- Creating Horizontal Navigation with CSS					
Module-4	JavaScript Basics	6 hours			
Understanding JavaScript- Exploring JavaScript's Capabilities –Using Variables–Understanding Expressions and Operators- Data types- Converting Between Data Types-Using String Objects-Working with Substrings-Using Numeric Arrays and String Arrays-Sorting a Numeric Array-Using Functions-Using Objects to Simplify Scripting-Controlling Flow with Conditions and Loops					
Module-5	JavaScript DOM and Event Handling	6 hours			
Understanding the Document Object Model (DOM) -Using window Objects-Working with the document Object-Accessing Browser History-Working with the location Object -More About the DOM Structure - Working with DOM Nodes- Creating Positionable Elements-Hiding and Showing Objects-Modifying Text Within a Page--Adding Text to a Page - Responding to Events – Cookies – Validating User Input with JavaScript Regular Expressions					
Module-6	PHP Basics	6 hours			
The Structure of PHP–Basic Syntax-Variables-Operators-Variable Assignment-Multiple-Line Commands-Variable Typing-Constants-Predefined Constants-The Difference Between the echo and print Commands-Variable Scope- Expressions and Control Flow in PHP-Functions and Arrays					
Module-7	PHP Advanced Concepts with Database	6 hours			
File Handling-Form Handling – Uploading Files– Sending E-mail- Generating Images- Cookies and Sessions in PHP- MySQL Basics- Summary of Database Terms-Accessing MySQL via the Command Line-Using the Command-Line Interface-MySQL Commands-Designing and Creating Web Database-					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Working with MySQL- Accessing MySQL Database from the Web with PHP			
Module-8	Contemporary Topics		2 hours
Guest Lecture from Industry and R & D Organizations			
	Total Lecture hours:		45 hours
Text Book(s)			
1	Julie Meloni, Jennifer Kyrnin, "HTML, CSS, and JavaScript All in One: Covering HTML5, CSS3, and ES6", 2019, Sams.		
2	Robin Nixon, "Learning PHP, MySQL & JavaScript", 2018, 5 th Edition, O'Reilly.		
Reference Books			
1	Jennifer Niederst Robbins, "Learning Web Design: A Beginner`S Guide To HTML, CSS, JavaScript, And Web Graphics", 2018,Fifth Edition, O'Reilly.		
2	Robin Nixon, "Learning PHP, MySQL & JavaScript: A Step-by-Step Guide to Creating Dynamic Websites", 2021, Sixth Edition, O'Reilly.		
3	Luke Welling Laura Thomson,2017, "PHP and MySQL Web Development", Fifth edition, Addison-Wesley.		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies		30-05-2023	
Approved by Academic Council		No. 70	Date 24.06.2023



VIT[®]

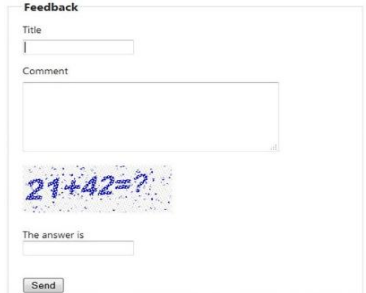
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC205P	Web Development Lab	0	0	2	1
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To understand, analyze and design websites and online applications 2. To explore and use key programming concepts to build a dynamic website using PHP					
Course Outcomes:					
1. Design websites using properly formatted HTML and the appropriate CSS layout/styling pattern 2. Apply the concept of JavaScript to create highly responsive interfaces that enhance user experience and provide dynamic functionality 3. Develop a dynamic and interactive webpage using PHP and databases					
Indicative Experiments					Hours
1.	Program to illustrate Nested ordered list and Definition lists. a. Solid gray banner along the top of the browser window i. Company logo ii. Product image b. A text-based navigation menu i. Links to each of the site's web documents c. A content area i. A heading that identifies page content ii. A paragraph for displaying content iii. A copyright notice	2 Hours			
2	Program to illustrate links. A. Create links to five different already created pages. B. Create a page with a link at the top of it that when clicked will jump all the way to the bottom of the page. At the bottom of the page there should be a link to jump back to the top of the page. C. Write an HTML code to create a Home page having three links: About Us, Our Services and Contact Us. Create separate web pages for the three links	2 Hours			
3.	Write CSS code to implement the following: (a) Colorize text of a paragraph where RGB value is (51, 204, 0). (b) Place a background image rose.jpeg behind a single word "TEXT" written with a font size of 39 pixels. (c) Place an image in the background of a page such that the image tiles only in the horizontal direction and the starting position is horizontal and vertical center of the page	4 Hours			
4.	Create a web page for online book shopping that allows the user to select one or more books by using checkboxes. Display the name of each book and its price. Display the current total in a text box at the bottom of the page. When a book is selected (or unselected), update the total. Use JavaScript to perform any arithmetic operations. Additionally display the book details on mouse hover like author and description of the book. Use CSS to design the webpage	2 Hours			
5.	Create an application that allows the user to customize the web page. Your design must include CSS. The application should consist of three files as follows: a. Ask the user to login and read from the database to determine the authentication. If the user is not known, the second file is loaded asking the user to fill up the form to store personal data b. Write a Java script to check the user is known user	4 Hours			



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

	Use cookies for storing the user details and display the username when the user moves on to the next page	
6.	Create a dynamic web page using CSS and JavaScript for admission in an institution. It must consist of the following: a) A page which gives the information about the institution (like course offered, and course duration etc.) b) A page to check for the availability of seats for a program against the JavaScript values. If the seat is available, then an alert should be displayed that the seat is available for the respective course chosen by the user.	4 Hours
7.	A parking garage charges a \$2.00 minimum fee to park for up to three hours. The garage charges an additional \$0.50 per hour for each hour or part thereof in excess of three hours. The maximum charge for any given 24-hour period is \$10.00. Assume that no car parks for longer than 24 hours at a time. Write a script that calculates and displays the parking charges for each customer who parked a car in this garage yesterday. You should input from the user the hours parked for each customer. The program should display the charge for the current customer and should calculate and display the running total of yesterday's receipts. The program should use the function Calculate-Charges to determine the charge for each customer. Use a text input field to obtain the input from the user	4 Hours
8.	Design a HTML form to accept a student register number, name, course (select from the given course list) and the elective subject names he/she is opting for. Write a PHP script to print the student name if he/she has opted for more than four electives	2 Hours
9.	Develop the PHP script to upload image files of size not exceeding 350MB. The code should ensure that there is no duplication of file and on successful upload display the image file extension used and image file name. Write an HTML form to select the file	2 Hours
10	Develop a web page for employee information system with the following details using PHP with MYSQL: i) Create an Employee table containing the details of Empname, Empid [should be unique], Age, Department, Salary per month ii) Store the above data in database using html form. iii) Print the Employees whose name starts with 'sri' iv) Retrieve all the employees whose age is below 50. v) Print the Employees whose salary is between 10k and 20k. vi) Calculate the total salary per year for each employee and display it.	2 Hours
11.	Write a PHP script to generate following contact form with a captcha based on math using GD and authenticate the user through session handling mechanism. 	2 Hours
Total Laboratory Hours		30 hours
Text Book(s)		



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

1	Julie Meloni, Jennifer Kyrmin, "HTML, CSS, and JavaScript All in One: Covering HTML5, CSS3, and ES6", 2019, Sams.		
2	Robin Nixon, "Learning PHP, MySQL & JavaScript: A Step-by-Step Guide to Creating Dynamic Websites", 2021, sixth Edition, O'Reilly.		
Reference Books			
1	Jennifer Niederst Robbins, "A Beginner'S Guide To HTML, CSS, JavaScript, And Web Graphics", 2018, Fifth Edition, O'Reilly.		
2	Luke Welling Laura Thomson, "PHP and MySQL Web Development", 2017, Fifth edition, Addison-Wesley Professional.		
Mode of assessment: CAT, Exercises, FAT			
Recommended by Board of Studies	30-05-2023		
Approved by Academic Council	No. 70	Date	24.06.2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	c
UCSC206L	Full Stack Application Development	3	0	0	3
Pre-requisite		Syllabus Version			
		v.1.0			
Course Objectives:					
<ol style="list-style-type: none"> To gain an overview of the full stack web application development To build a strong expertise to develop front end application using Bootstrap along with jQuery To design and development of web application using MERN stack 					
Course Outcomes:					
<ol style="list-style-type: none"> Develop responsive web pages using Bootstrap Use JQuery to create dynamic web pages Familiarize the format of data transfer using JSON Develop the server-side business logic to handle client request using NodeJS and MongoDB Build interfaces for web application using open-source JavaScript library ReactJS 					
Module:1	Essentials of Full Stack Development	6 hours			
The Modern Web – Application vs. Websites– Designing systems – System architectures, Identifying concepts, Identifying user interactions, Component Interactions, Tools - Security – Security checklists – Deployment – Twelve factor apps					
Module:2	Bootstrap	6 hours			
Introduction to Bootstrap – Grid System – Components – Labels – Buttons – Forms – Form elements					
Module:3	Dynamic web page design using jQuery	6 hours			
Introduction to jQuery –Common jQuery actions and Methods – Understanding the basic behavior of jQuery Scripts – Traversing DOM elements – Creating and Inserting of DOM elements					
Module:4	Introduction to JavaScript Object Notation (JSON)	6 hours			
Introduction to JavaScript Object Notation (JSON) – Working with JSON – Converting JSON to JavaScript Objects– Converting JavaScript Objects to JSON – Implementing a Simple JSON File and Using the http Service					
Module:5	MongoDB	6 hours			
MongoDB Basics – Installation, The Mongo Shell – MongoDB CRUD operations – MongoDB Node.js Driver – Reading from MongoDB – Writing to MongoDB					
Module:6	Node JS	7 hours			
Getting Started with Node.js – Using Events, Listeners, Timers, and Callbacks in Node.js – Handling Data I/O in Node.js – Accessing the File System from Node.js – Implementing HTTP Services in Node.js					
Module:7	ReactJS	6 hours			
Introduction to ReactJS – React Components - React State – Event Handling - Designing Components – State vs Props – React Router – Simple Routing					
Module:8	Contemporary Issues	2 hours			
Guest Lecture from Industry and R & D Organizations					
Total Lecture hours:					45 hours
Text Book					
1.Front-End Back-End Development with HTML, CSS, JavaScript, jQuery, PHP, and MySQL, 2022, First Edition, Wiley.					
2. Vasan Subramanian, “Pro MERN Stack - Full Stack Web App Development with Mongo, Express, React, and Node”, 2017,First edition, Apress.					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Reference Books			
1. Chris Northwood, "The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer", 2018, First Edition, Apress.			
2. Brad Dayley, Brendan Dayley, Caleb Dayley, "Node.js, MongoDB and Angular Web Development", 2017, Second Edition, Addison-Wesley.			
Mode of Evaluation: CAT, Assignment, Quiz, FAT			
Recommended by Board of Studies	30-05-2023		
Approved by Academic Council	No. 70	Date	24.06.2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC206P	Full Stack Application Development Lab	0	0	2	1
Pre-requisite		Syllabus version			
		V.1.0			
Course Objectives:					
<ol style="list-style-type: none"> To gain an overview of the full stack web application development To build a strong expertise to develop front end application using Bootstrap along with jQuery To design and development of web application using MERN stack 					
Course Outcomes:					
<ol style="list-style-type: none"> Develop responsive web pages using Bootstrap, JQuery to create dynamic web pages Familiarize the format of data transfer using JSON, the server-side business logic to handle client request using NodeJS and MongoDB Build interfaces for web application using open-source JavaScript library ReactJS 					

S.No	Indicative Experiments	Hours
1.	Develop a simple college web site including all the department information using Bootstrap layout.	4 hours
2.	Design the personal web page like resume format using Bootstrap table and list.	2 hours
3.	Design and validate the following fields of the Registration page using JQuery. a) First Name (Name should contains alphabets and the length should not be less than 6 characters). b) Password (Password should not be less than 6 characters length). c) E-mail id (should not contain any invalid and must follow the standard pattern (name@domain.com)) d) Mobile Number (Phone number should contain 10 digits only).	2 hours
4.	Creating and inserting elements using JQuery and DOM.	2 hours
5.	Creating and manipulating JSON objects using JQuery.	4 hours
6.	Create a simple HTTP web server using Node.js to generate a dynamic response.	2 hours
7.	Design web applications with dynamic routing using Node JS, and Express framework	2 hours
8.	Develop a three tier web application model and data manipulations using Node Js, Express, and Mongo DB.	4 hours
9.	Design component-based user interface using ReactJS	4 hours
10.	Develop a simple full stack application for voting system.	4 hours
Total Laboratory Hours		30 hours
Text Book		
1.	Chris Northwood "The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer" 2018, First edition, Apress.	
2.	Vasan Subramanian "Pro MERN Stack - Full Stack Web App Development with Mongo, Express, React, and Node", 2017, First edition, Apress.	
Reference Books		
1.	Front-End Back-End Development with HTML, CSS, JavaScript, jQuery, PHP, and MySQL, 2022, First Edition, Wiley.	
2.	Brad Dayley, Brendan Dayley, Caleb Dayley "Node.js, MongoDB and Angular Web Development", Second Edition, Addison-Wesley.	



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Mode of Evaluation: CAT, Exercises, FAT			
Recommended by Board of Studies	30-05-2023		
Approved by Academic Council	No. 70	Date	24.06.2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC301L	Software Testing	3	0	0	3
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
<ol style="list-style-type: none"> To understand and analyze the software testing fundamentals and its different types of testing To present the knowledge about test management and the overview of the bug and its effect in a project To create and execute the test cases using different testing tools 					
Course Outcomes:					
<ol style="list-style-type: none"> Analyze the problem by using various testing methods and design its test cases Perform unit, integration and system testing Examine and implement various test processes for improving the quality Manage the various test process Test the systems by using recent automation testing tools 					
Module:1	Basics of Software Testing				5 hours
Definitions – Test Cases – Software Testing Life Cycle (STLC) – Testing Principles – Fault Taxonomies – Psychology and Economics of Testing – Levels of Testing – Verification and Validation					
Module:2	Black Box Testing				5 hours
Boundary Value Analysis – Equivalence Class Partitioning – State Based Testing – Decision Table Based Testing – Cause-Effect Graph Testing					
Module:3	White Box Testing				7 hours
Program Graphs – Code Coverage Testing – Basic Path Testing – Data Flow Based Testing – Slice Testing – Mutation Testing – Graph Matrices – Software Complexity – Cyclomatic Complexity					
Module:4	Levels of Testing				7 hours
Unit Testing – Integration Testing – System Testing – Acceptance Testing – Debugging – Agile Testing – Regression Testing – Object Oriented Testing – Performance Testing – Web Based Testing – Security Testing					
Module:5	Static Testing				6 hours
Software Technical Reviews – Roles in Review – Effective Technical Review – Technical Inspections – Inspection Process – Audits – Structured Walkthroughs					
Module:6	Test Management				6 hours
Test Planning – Test Management – Test Process – Building a Testing Group – The Structure of Testing Group – Testing Activities – Test Progress Monitoring – Test Reporting Test Control					
Module:7	Test Automation				7 hours
Scope of Automation – Design of Automation – Challenges in Automation – Test Metrics and Measurements. – Test Automation Approach – Testing Frameworks – Recent Trends in Automation					
Module:8	Contemporary Topics				2 hours
Guest Lecture from Industry and R&D Organizations					
Total Lecture hours:					45 hours
Text Book(s)					
1.	Paul C. Jorgensen, “Software Testing: A Craftsman’s Approach”, 2021, Fifth Edition, Auerbach Publications..				
2.	Sandeep Desai and Srivastava Abhishek, “Software Testing: A Practical Approach”, 2016, Second edition, PHI Learning Publication.				
Reference Books					
1.	Dorothy Graham, “Foundations of Software Testing”, 2020, Fourth Edition, Cengage Publication.				



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies	30-05-2023		
Approved by Academic Council	No. 70	Date	24.06.2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC301P	Software Testing Lab	0	0	2	1
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
<ol style="list-style-type: none"> To create test plan and test cases using various testing methods To apply different testing tools to perform black box and white box testing To identify the automation testing tools to test the various applications 					
Course Outcomes:					
<ol style="list-style-type: none"> Design the test cases and create a test plan to improve software quality Generate test cases for software systems using black box and white box testing techniques. Evaluate and test the web-based applications using recent automation testing tools. 					
Indicative Experiments					Hours
1.	Design the test cases for any application using manual testing				4 Hours
2.	Create test plan for any applications				4 Hours
3.	To perform Regression Testing using RFT tool.				8 Hours
4.	To perform Unit Testing using JUnit testing tool.				4 Hours
5.	To perform load and security testing using Selenium Automation Testing tool.				4 Hours
6.	To Perform performance testing using Apache JMeter testing tool				6 Hours
Total Laboratory Hours					30 hours
Text Book(s)					
1	Maurício Aniche, "Effective Software Testing; A developer guide", 2022, Fourth Edition.				
2.	Naresh Chauhan, "Software Testing: Principles and Practices", 2017, Second Edition, Oxford University Press.				
Mode of assessment: CAT, Exercises, FAT					
Recommended by Board of Studies		30-05-2023			
Approved by Academic Council		No. 70	Date	24.06.2023	



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

CAPSTONE PROJECT



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC398J	Project	0	0	0	4
Pre-requisite		Syllabus version			
		1.0			
Course Objectives:					
1. To provide sufficient hands-on learning experience related to design, development and analysis					
2. To develop product and to enhance the technical skills sets in the chosen field					
Course Outcomes:					
1. Formulate specific problem statements with reasonable assumptions and constraints					
2. Perform literature survey for acquiring in-depth knowledge in the chosen domain					
3. Design a suitable solution methodology for the problem					
4. Conduct experiments, implement and perform analysis					
5. Synthesize the results and arrive at scientific conclusions/products					
6. Document the result in the form of technical report and presentation					
Module Content		(Project duration: One semester)			
1. Capstone project may be carried out through theoretical analysis, modeling & simulation, experimentation & analysis, correlation and analysis of data, software development, applied research and any other related activities					
2. Project can be 5 months duration based on the completion of required number of credits as per academic regulations					
3. Should be team work					
4. Carried out inside or outside the university, in any relevant industry or research institution					
5. Publications in reputed journals/international conference will be an added advantage					
Mode of Evaluation: Periodic reviews, Presentation, Final oral viva, Poster design					
Recommended by Board of Studies		01-11-2023			
Approved by Academic Council		No. 72	Date	13-12-2023	



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

DISCIPLINE HONORS COURSES



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC401L	Design and Analysis of Algorithms	3	0	0	3
Pre-requisite		Syllabus version v 1.0			
Course Objectives:					
1. To provide mathematical foundations for analyzing the complexity of the algorithms. 2. To impart knowledge on various design strategies that can help in solving real world problems efficiently. 3. To develop efficient algorithms for use in a variety of science and engineering design settings.					
Course Outcomes:					
1. Analyze the worst-case running times of algorithms using asymptotic analysis. 2. Apply suitable data structures and algorithm design paradigms to solve problems efficiently. 3. Use of searching and sorting in various real-life applications. 4. Apply algorithmic paradigms to various real-world optimisation problems. 5. Explain the hardness of real-world problems with respect to algorithmic design.					
Module:1	Fundamentals of the Analysis of Algorithm Efficiency	6 hours			
The Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Nonrecursive Algorithms, Mathematical Analysis of Recursive Algorithms					
Module:2	Brute Force and Exhaustive Search	7 hours			
Sorting: Selection Sort and Bubble Sort, Sequential Search and Brute-Force String Matching, Exhaustive Search: Traveling Salesman Problem, Knapsack Problem.					
Module:3	Divide and Conquer	7 hours			
Sorting Problem: Mergesort, Quicksort, Binary Tree Traversals and Related Properties, Multiplication of Large Integers and Strassen's Matrix Multiplication, The Closest-Pair problem.					
Module:4	Dynamic Programming	7 hours			
Coin-row problem, Change-making problem, Coin-collecting problem, The Knapsack Problem and Memory Functions, Warshall's and Floyd's Algorithms.					
Module:5	Greedy Technique	6 hours			
Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees and Codes					
Module:6	Backtracking	5 hours			
Backtracking: n-Queens Problem, Hamiltonian Circuit Problem, Subset-Sum Problem					
Module:7	Branch-and-Bound	5 hours			
Assignment Problem, Knapsack Problem, Traveling Salesman Problem					
Module:8	Contemporary Topics	2 hours			
Guest Lecture from Industry and R & D Organizations					
Total Lecture hours:					45 hours
Text Book(s)					
1.	Levitin, Anany. "Introduction to the Design and Analysis of Algorithms ."2017, Third Edition, Pearson Education.				
Reference Books					
1.	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 2019, fourth Edition, Pearson Education, Delhi.				
2.	Baase, Sara. "Computer algorithms: introduction to design and analysis".2009, Pearson Education India.				
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar					
Recommended by Board of Studies		01-11-2023			
Approved by Academic Council		No. 70	Date	24.06.2023	



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC401P	Design and Analysis of Algorithms lab	0	0	2	1
Pre-requisite		Syllabus version			
		v 1.0			
Course Objectives:					
<ol style="list-style-type: none"> To provide mathematical foundations for analyzing the complexity of the algorithms To impart the knowledge on various design strategies that can help in solving the real world problems effectively. 					
Course Outcomes:					
<ol style="list-style-type: none"> Demonstrate the major algorithm design paradigms Use of searching and sorting in various real-life applications. Implementation of graph algorithms in various real-life applications. Implementation of simple game applications. Apply algorithmic paradigms to various real-world optimisation problems 					
Indicative Experiments					Hours
1.	Brute Force: Selection Sort, Bubble Sort and Sequential Search				2 hours
2.	Brute-Force: String Matching Exhaustive Search: Knapsack Problem.				2 hours
3.	Divide and Conquer: Mergesort, Quicksort				2 hours
4.	Divide and Conquer: Multiplication of Large Integers and Strassen's Matrix Multiplication				4 hours
5.	Dynamic Programming: Coin-row problem, Change-making problem, Coin-collecting problem				4 hours
6.	Dynamic Programming: The Knapsack Problem and Memory Functions				2 hours
7.	Dynamic Programming: Warshall's and Floyd's Algorithms				4 hours
8.	Greedy Technique: Prim's Algorithm, Kruskal's Algorithm				2 hours
9.	Greedy Technique: Dijkstra's Algorithm, Huffman Trees and Codes				4 hours
10.	Backtracking: n -Queens Problem				2 hours
11.	Branch-and-Bound: Assignment Problem				2 hours
Total Laboratory Hours					30 hours
Text Book(s)					
1.	Levitin, Anany. "Introduction to the Design and Analysis of Algorithms", 2017, Third Edition, Pearson Education.				
Reference Books					
1.	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 2019, Fourth Edition, Pearson Education, Delhi.				
	Baase, Sara. "Computer algorithms: introduction to design and analysis", 2009, Pearson Education India.				
Mode of assessment: CAT, Exercises, FAT					
Recommended by Board of Studies		01-11-2023			
Approved by Academic Council		No. 70	Date	24.06.2023	



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC402L	Theory of Computation	3	1	0	4
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To provide an understanding of the basic concepts in theoretical computer science and automation theory. 2. To learn how the compiler works over the phases of lexical analyzer and syntax analyzer. 3. To Design a computational model.					
Course Outcomes:					
1. Designing all forms of automata according to the conditions. 2. Analyzing languages and validating languages through regular expression. 3. Understanding the need of grammars and formulating the grammars. 4. Analyzing and Designing Turing machines. 5. Undecidable problems and proof of undecidability using Post Correspondence Problems.					
Module:1	Introduction of Theory of Computation	3 hours			
Symbols, Alphabets, Strings, Languages, Grammar, Closure representations					
Module:2	Finite Automata	8 hours			
Introduction of Finite Automata, DFA, NFA with null moves, NFA without null moves, Conversion of ϵ -NFA to NFA without null moves, Conversion of NFA without null moves to DFA, Minimization of DFA, Equivalence of DFA's.					
Module:3	Regular Expressions and Languages	8 hours			
Languages, Languages to Finite Automata, Languages to Regular Expressions, Regular Expressions to Finite Automata, DFA to Regular Expression, Pumping Lemma for Regular language.					
Module:4	Grammars	8 hours			
Context Free Grammar (CFG), Derivations, Parse Tree, Ambiguity in CFG, Simplification of CFG, Normal Forms and types of normal form, CYK Algorithm, Pumping Lemma for Context Free Language (CFL)					
Module:5	Push Down Automata	6 hours			
Introduction to Push Down Automata, Design Deterministic Push Down Automata, Non-Deterministic Push Down Automata.					
Module:6	Turing Machine	6 hours			
Turing Machines (acceptor and transducer), Multi head and Multitape Turing Machines, Universal Language, The Halting problem					
Module:7	Recursive and Recursively Enumerable Languages	4 hours			
Recursive and Recursively Enumerable Languages, Chomsky Hierarchy, Undecidable problems, Post Correspondence Problem					
Module:8	Contemporary Topics	2 hours			
Guest Lecture from Industry and R&D Organizations					
Total Lecture hours:					45 hours
Total Tutorial hours:					15 hours
Text Book(s)					
1.	John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory, Languages, and Computation", 2008, Third edition, Pearson Education				
Reference Books					
1.	Peter Linz, "An Introduction to Formal Languages and Automata", 2017, Sixth edition, Jones & Bartlett Learning				
2.	K. Krithivasan and R. Rama, "Introduction to Formal Languages, Automata and Computation", 2009,				



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Pearson Education.			
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies	01-11-2023		
Approved by Academic Council	No. 70	Date	24.06.2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC403L	Natural Language Processing	3	1	0	4
Prerequisite		Syllabus version			
		v.1.0			
Course Objectives:					
<ol style="list-style-type: none"> 1. To introduce the fundamental concepts and techniques of natural language processing for analyzing text 2. To examine the NLP models and interpret algorithms for classification of NLP sentences by using both the traditional, symbolic and the more recent statistical approach 3. To get acquainted with the algorithmic description of the main language levels to be able to describe briefly the fundamental techniques for processing language 					
Course Outcomes:					
<ol style="list-style-type: none"> 1. Describe major concepts, trends, approaches-systems, and difficulties in Natural Language Processing and the study of language generally 2. Learn Text Preprocessing techniques and Syntax Parsing techniques 3. Understand language modeling and its applications 4. Understand and perform text classification and demonstrate understanding of information retrieval models and ranking algorithms 5. Perform opinion mining and sentiment analysis using various methods 					
Module:1	Introduction to NLP	5 hours			
Origins of NLP. Language and Knowledge. The Challenges of NLP. Language and Grammar. NLP Applications. Some Successful Early NLP Systems, Ambiguity					
Module:2	Text Processing	7 hours			
Regular Expressions, Text Normalization: Tokenization – Stemming – Lemmatization, Sentence Segmentation, Edit Distance					
Module:3	N-gram Language Models	6 hours			
N-grams - Evaluating Language Models - Sampling sentences from a language model - Generalization and Zeros - Smoothing.					
Module:4	Text Classification	6 hours			
Supervised Text Classification - Naive Bayes, Evaluation: Precision, Recall, F-measure. Avoiding Harms in Classification. Logistic Regression – The sigmoid function - Classification with Logistic Regression. Gradient Descent.					
Module:5	Parts of Speech and Named Entities	6 hours			
Part-of-Speech Tagging. Named Entities and Named Entity Tagging. Markov Models. Hidden Markov Models. HMM Part-of-Speech Tagging					
Module:6	Semantic Analysis	7 hours			
Lexical Semantics- Word Similarity- Word Relatedness- Semantic Frames and Roles- Connotation. Vector Semantics. Words and Vectors- Document Dimensions- Word Dimensions. Cosine for Measuring Similarity. TF-IDF					
Module:7	Advanced Topics in NLP	6 hours			
Machine Translation- Bias and Ethical Issues. Question Answering and Information Retrieval. Chatbots & Dialogue Systems - Properties of Human Conversation. Automatic Speech Recognition and Text-to-Speech.					
Module:8	Contemporary Issues	2 hours			
Guest Lecture from Industry and R & D Organizations					
Total Lecture hours:					45 hours
Total Tutorial hours:					15 hours
Text Book(s)					
1.	Daniel Jurafsky, James H. and Martin, “Speech and Language Processing”,2023, Third Edition,Pearson.				
Reference Books					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

1.	Siddiqui and Tiwary U.S., "Natural Language Processing and Information Retrieval", 2008, Oxford University.		
2.	Manning, Christopher, and Hinrich Schutze. "Foundations of statistical natural language processing". MIT press, 1999.		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies	01-11-2023		
Approved by Academic Council	No. 70	Date	24.06.2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC404L	High Performance Computing	3	1	0	4
Prerequisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To understand the modern architecture, data structures, and algorithms for high-performance computing 2. To create fast, powerful, energy-efficient programs that scale to tackle big data 3. To use parallel programming to utilize high-performing heterogeneous resources					
Course Outcomes:					
1. Appraise modern high performance architectures 2. Investigate the inherent potential and limitations of programs/applications 3. Design parallel programs/applications for multi-core processors 4. Develop parallel programs/applications for distributed systems 5. Examine tools and resources for Exa-scale performance					
Module:1	High Performance Computing (HPC) Architectures	6 hours			
Overview of Von-Neumann Architecture, Amdahl's Law, Pipelining, Multi-core, Vector Processing, SMP, GPU and TPU					
Module:2	Parallel Algorithms	8 hours			
Scientific Computing, Fork-Join, Divide and Conquer, Halo Exchange, Permutation, Embarrassingly Parallel Applications, Manager-Worker, and Task Dataflow					
Module:3	Shared Memory Programming	7 hours			
Share Memory Architecture, Coherence Protocols, OpenMP API: Parallel Constructs, Work-sharing Constructs, Synchronization Constructs, Profiling					
Module:4	Commodity Cluster Programming	6 hours			
Commodity clusters, Message Passing Interface (MPI): Data types, Non-Blocking Communication, Collective Communication, Profiling, Overview of Grid and Cloud Technologies					
Module:5	GPU Programming	5 hours			
Coprocesor, GPU: Memory Hierarchy, WARP, CUDA programming: Kernels, Blocks, Threads, Vector processing, Matrix processing, Unified Memory					
Module:6	Resource Management	6 hours			
Resource Job Management System (RJMS), SLURM, Portable Batch System					
Module:7	Benchmarking	6 hours			
Benchmark Suites, Flops, Graph500, GUPS, HPL, MiniApps, TEPS, Top500					
Module:8	Contemporary Issues	2 hours			
Guest Lecture from Industry and R&D Organizations					
		Total Lecture hours:		45 hours	
		Total Tutorial Hours		15 hours	
Text Book(s)					
1.	Thomas Sterling, Matthew Anderson, Maciej Brodowicz, "High-Performance Computing: Modern Systems and Practices", 2018, First Edition, Morgan Kaufmann Publications,				
Reference Books					
1.	Robert Robey and Yuliana Zamora, "Parallel and High Performance Computing", 2021, First Edition, Manning Publication				
2.	Georg Hager, Gerhard Wellein, "Introduction to High Performance Computing for Scientists and Engineers", 2019, Chapman & Hall/CRC Computational Science				
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Recommended by Board of Studies	01-11-2023		
Approved by Academic Council	No. 70	Date	24.06.2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC405L	Optimization Techniques	3	1	0	4
Pre-requisite		Syllabus version			
		1.0			
Course Objectives:					
<ol style="list-style-type: none"> 1. To acquire basic knowledge about optimization techniques and its importance of decision making. 2. To design linear and nonlinear optimization problems. 3. To choose and apply appropriate optimization method and solve real world problems. 					
Course Outcomes:					
<ol style="list-style-type: none"> 1. Comprehend different types of optimization techniques. 2. Formulate linear programming; maximization and minimization problems 3. Solve problems with single variable and multivariable nonlinear optimization problems. 4. Understand and analyze multi objective optimization problems. 5. Explore the various nature inspired optimization methods 					
Module:1	Introduction to Optimization				4 hours
Optimal problem Formulation - Engineering applications of optimization –Optimization techniques					
Module:2	Linear Programming				8 hours
Formulation of the LPP - Graphical method – Working Procedure – Canonical and standard forms of LPP – Simplex method - Artificial variable techniques - Duality Principle - Dual simplex method					
Module:3	Single-variable Nonlinear Optimization				7 hours
Classical method for single-variable optimization - Exhaustive search method - Bounding phase method - Fibonacci search method - Golden section search method					
Module:4	Multivariable Unconstrained Nonlinear optimization				6 hours
Unidirectional search method - Evolutionary search method - Simplex search method – Hook Jeeves pattern search method					
Module:5	Multivariable Constrained Nonlinear optimization				7 hours
Classical methods for equality constrained optimization – Lagrange Multiplier techniques – Inequality Constrained Optimization - Random search method – Sequential linear programming					
Module:6	Multi Objective Optimization				7 hours
Global criterion method- Utility function method -Inverted utility method- Bounded objective function method - Lexicographic model – Goal Programming method					
Module:7	Nature Inspired Optimization				4 hours
Introduction – Genetic Algorithm - Ant Colony Optimization- Particle Swarm Optimization					
Module:8	Contemporary Topics				2 hours
Guest Lecture from Industry and R&D Organizations					
Text Book(s)					
1.	Sukanta Nayak , Fundamentals of Optimization Techniques with algorithms,2020 , Academic Press				
Reference Books					
1.	Michel Bierlaire , Optimization: Principles and Algorithms , 2018, Second Edition, EPFL Press				
2	Singiresu S. Rao, Engineering Optimization - Theory and Practice, 2019, Fourth edition John Wiley & Sons, Inc.				
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar					
Recommended by Board of Studies		01-11-2023			
Approved by Academic Council		No. 70	Date	24.06.2023	



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

DISCIPLINE ELECTIVE COURSES



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCCA116L	Organizational Behaviour	3	0	0	3
Pre-requisite		Syllabus version			
		V 1.0			
Course Objectives:					
1. To provide basic knowledge on the management thoughts pertaining to organizational behaviour 2. To provide basic knowledge on the theories relating to organizational behaviour, for enabling them to function effectively 3. To learn how an organization can be designed and developed to deal with the challenges from environment, technology, and its own processes					
Course Outcomes:					
1. Develop knowledge about fundamental concepts related to management theories 2. Apply problem- solving skills to resolve the employee's relationship issues 3. Analyze the challenges of employee's relationship problems 4. Demonstrate leadership and team building skills 5. Integrate the knowledge and skills derived from the different functional areas of business					
Module: 1	Organizational Behaviour Introduction	3 hours			
Definition - need and importance of organizational behaviour – Nature and scope – Frame work – Organizational behaviour models. Disciplines that contribute to OB field. Challenges and opportunities for OB					
Module: 2	Individual Behaviour	7 hours			
Personality – types – Factors influencing personality–Theories– Learning– Types of learners – The learning process – Learning theories Emotions – Emotional Labour–Emotional Intelligence –Theories. Attitudes and Job Satisfaction – Characteristics – Components – Formation –Measurement – Values - Perceptions – Importance – Factors influencing perception – Interpersonal perception– Impression Management					
Module: 3	Motivation Concepts	7 hours			
Nature of Motivation - Process of Motivation - Theories of Motivation: Maslow's Hierarchy of Needs Theory, Herzberg's Two Factors Theory, Theory X and Theory Y - McClelland theory of Achievement motivation - Application in industries					
Module: 4	Foundations of Group Behaviour	7 hours			
Group dynamics–Emergence of informal leaders and working norms – Group decision making techniques–Team building – Interpersonal relations–Communication–Control. Organizational strategy– Organizational design –Alternative structures–Management process – Authority and organizational control mechanisms Understanding Culture – Strong and Weak Cultures – Types of Cultures – Importance of Culture--Creating and Sustaining Culture – Culture and Strategy					
Module: 5	Leadership and Power	6 hours			
Leadership styles – Theories – Leaders Vs Managers – Sources of power – Power centers – Power and Politics					
Module:6	Foundation of Organizational Behaviour	6 hours			
High-Performance Teams - Team Structure - Interpersonal Communication - Interpersonal Conflicts & Negotiations					
Module:7	Organizational System	7 hours			
Organizational Design – Determinants – Components – Types – Basic Challenges of design – The Role of Strategic Direction in Organization Design–A Framework for selecting Strategy and Design– Differentiation, Integration, Centralization, Decentralization, Standardization, Mutual adjustment– Mechanistic and Organic Structures– Technological and Environmental Impacts on Design– Importance					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

of Design – Success and Failures in design – Implications for Managers			
Module:8	Contemporary Topics	2 hours	
Guest Lecture from Industry and R & D Organizations			
Total Lecture hours:			45 hours
Text Book(s)			
1.	Stephen P. Robbins, Timothy A Judge & Neharika Vohra, “Organizational Behavior”, 2022, Eighteenth Edition, Pearson India Education Services Pvt Ltd		
Reference Books			
1.	Steven L McShane, Mary Ann Von Glinow and Himanshu Rai, “Organizational Behaviour”, 2022, McGraw Hill		
2.	Aswathappa k, “Organisational Behaviour”, 2016, Twelfth Revised Edition, Himalaya Publishing House		
3.	Dr.Christopher P. Neck, Jeffery D. Houghton and Emma L. Murray, “Organizational Behavior: A Skill-Building Approach”, 2019,Second Edition, SAGE Publications Inc		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies	01-11-2023		
Approved by Academic Council	No. 72	Date	13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC207L	Visual Programming	3	0	0	3
Pre-requisite		Syllabus version			
		1.0			
Course Objectives:					
1. To learn programming constructs in .NET 2. To solve object oriented and GUI programming in .NET 3. To understand and apply disconnected architecture of .NET					
Course Outcomes:					
1. Explore features of .NET and VB. NET 2. Analyze and solve GUI based applications using VB.NET 3. Comprehend and apply Object Oriented applications using VB.NET 4. Develop web applications using ASP.NET 5. Understand and solve database applications using ADO.NET					
Module:1	Introduction to .NET	4 hours			
Introduction to .Net - Data Types and Expressions – Debugging -Exception Handling - Code Refactoring					
Module:2	Object Oriented Programming in VB.NET	7 hours			
Class Fundamentals – Organizing types with names – modules- Structures and Enumeration – Inheritance – Interface - Delegates and Events – Manipulating files and streams – Namespace					
Module:3	GUI Programming	7 hours			
The Solution explorer – The Toolbox – Properties – The Start page -Windows Layout -The Editor Space – Code Editor -Code Navigation					
Module:4	Server Explorer, Project and Item Templates	4 hours			
Server Connections – Data Connections – SharePoint Connections – Creating Templates – Extending Templates – Starter kits					
Module:5	Windows Form Application	7 hours			
The Window Forms – Form Design Preference – Adding and qPositioning controls – Container controls -Docking and Anchoring controls -Window Presentation Foundation – Styling your application					
Module:6	ASP.NET Web Forms	7 hours			
Creating Web Projects – Designing web Forms -Web Controls -Master pages- Model View Controller					
Module:7	ADO.NET Entity Framework	7 hours			
Introduction to ADO.Net – Creating Entity model – Querying Entity Model -Advanced Functionality					
Module:8	Contemporary Topics	2 hours			
Guest Lecture from Industry and R & D Organizations.					
Total Lecture hours:					45 hours
Text Book(s)					
1.	Alessandro Del Sole , “Visual Basic 2015 Unleashed”,2015, First Edition, SAMS				
2.	Bruce Johnson, “Professional Visual Studio 2017”,2017, First Edition, Wrox publications				
Reference Books					
1.	Dirk Strauss, “C# 7 and .NET Core Cookbook”, 2017, Second Edition, Packt				
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar					
Recommended by Board of Studies		01-11-2023			
Approved by Academic Council		No. 72	Date	13-12-2023	

Course Code	Course Title	L	T	P	C
-------------	--------------	---	---	---	---



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

UCSC207P	Visual Programming Lab	0	0	2	1
Pre-requisite		Syllabus version			
		1.0			
Course Objectives:					
<ol style="list-style-type: none"> 1. To learn programming constructs in .NET 2. To solve object oriented and GUI programming in .NET 3. To understand and apply disconnected architecture of .NET 					
Course Outcomes:					
<ol style="list-style-type: none"> 1. Apply the features of .NET and VB. NET with GUI based applications 2. Comprehend and apply Object Oriented applications using VB.NET 3. Develop web applications using ASP.NET and solve database applications using ADO.NET 					
Indicative Experiments					Hours
1.	Develop a basic application using VB.NET				2 hours
2.	Understanding arrays and programming constructs of VB.NET				2 hours
3.	Develop Window based applications using VB.NET				4 hours
4.	Creating Object Oriented applications using VB.NET				4 hours
5.	Performing inheritance in VB.NET				2 hours
6.	Using Interfaces to develop application in VB.NET				2 hours
7.	Developing an event-based application using delegates				4 hours
8.	Developing a web application using ASP.NET				4 hours
9.	Creating database applications using ADO.NET				4 hours
10.	Creating stateful web application using ASP.NET				2 hours
Total Laboratory Hours					30 hours
Text Book(s)					
1.	Alessandro Del Sole , “Visual Basic 2015 Unleashed”,2015, First Edition, SAMS				
2.	Bruce Johnson, “Professional Visual Studio 2017”,2017, First Edition, Wrox publications				
Reference Books					
1.	Dirk Strauss, “C# 7 and .NET Core Cookbook”, 2017, Second Edition, Packt				
Mode of assessment: CAT, Exercises and FAT					
Recommended by Board of Studies		01-11-2023			
Approved by Academic Council		No. 72	Date	13-12-2023	

Course Code	Course Title	L	T	P	C
--------------------	---------------------	----------	----------	----------	----------



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

UCSC208L	Linux Programming	3	0	0	3
Pre-requisite		Syllabus version			
		1.0			
Course Objectives:					
<ol style="list-style-type: none"> To make the students familiar with Linux environment through commands and shell scripts To make students understand the file structure in Linux and be able to manage files and directories. To help students understand system calls, processes and inter-process communication and introduce the basics of socket programming 					
Course Outcomes:					
<ol style="list-style-type: none"> Understanding basic Linux commands and explore the Linux environment using the utilities. Develop shell scripts to perform complex tasks in Linux environment Understand the file systems and manage file and directories using system calls Implement various process management applications using C programs. Design Inter Process Communication in C using semaphores, named pipes, shared memory and client server application using sockets 					
Module:1	Linux Fundamentals	5 hours			
Introduction to Linux OS, Linux Commands, Understanding Linux Directories, File Management, File Permission-Basic Utilities/Commands- Text Processing utilities and backup					
Module:2	Shell Programming	7 hours			
Introduction to Shell and its types, Variables, Operators, Branching and Loop control Structures, Quoting Mechanism, Arrays, Shell Substitutions, I/O Redirection and Shell Functions					
Module:3	Environment Variables and System Calls	7 hours			
Environment Variables for Date, Time, Files, Host and User Logging. File System Hierarchy standard, System Calls and Device Drivers, Library Functions, Low Level File Access, Standard I/O Library, File and Directory Maintenance, Scanning Directories, errors, /proc file system, fctnl and mnap					
Module:4	File Management	7 hours			
Introduction to File system, inode (Index Node), file descriptors, File System calls File Management :File Structures, System Calls for File Management -Directory API					
Module:5	Process and Signals	6 hours			
Process, process identifiers, process structure: process table, viewing processes, system processes, process scheduling, starting new processes: waiting for a process, zombie processes, orphan process, fork, vfork, exit, wait, waitpid, exec, signals functions, unreliable signals, interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions, signal sets					
Module:6	Process Communication	6 hours			
Inter Process Communication: Pipe, process pipes, the pipe call, parent and child processes, and named pipes: fifos, semaphores: semget, semop, semctl, message queues: msgget, msgsnd, msgrcv, msgctl, shared memory: shmget, shmat, shmdt, shmctl, ipc status commands					
Module:7	Introduction to Socket Programming	5 hours			
Introduction to Sockets : Socket, socket connections - socket attributes, socket addresses, BSD Socket System Calls, Client/Server Programming					
Module:8	Contemporary Topics	2 hours			
Guest Lecture from Industry and R & D Organizations					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

	Total Lecture hours:	45 hours
Text Book(s)		
1.	Neil Mathew, Richar Stones, "Beginning Linux Programming", 2015, Fifth Edition, Wiley Publications	
Reference Books		
1.	Robert Love, "Lunx System Programming : Talking Directly to the kernel and C Library", 2013, Second Edition, O Reilly Media.	
2.	John Masters, Richard Blum, "Professional Linux Programming", 2007, Linux® Bible, Ninth Edition Published by John Wiley & Sons, Inc	
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar		
Recommended by Board of Studies	01-11-2023	
Approved by Academic Council	No. 72	Date 13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC208P	Linux Programming Lab	0	0	2	1
Pre-requisite		Syllabus version			
		1.0			
Course Objectives:					
1. To familiarize basic concepts of shell programming. 2. To demonstrate use of system calls for IPC. 3. To demonstrate Socket Programming.					
Course Outcomes:					
1. Use shell script to create files and handle text documents 2. Create child processes, background process and zombies 3. To Simulate the IPC and Socket Programming.					
Indicative Experiments		Hours			
1. Study and Practice on various commands like man, passwd, tty, script, clear, date, cal, cp, mv, ln, rm, unlink, mkdir, rmdir, du, df, mount, umount, find, unmask, ulimit, ps, who, who am i.		2 Hours			
2. Study and Practice on various commands like cat, tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, tar, cpio.		4 Hours			
a. Write a Shell Program to print all .txt files and .c files.					
b. Write a Shell program to move a set of files to a specified directory.					
c. Write a Shell program to display all the users who are currently logged in after a specified time.					
d. Write a Shell Program to wish the user based on the login time.					
3. Simulate the Process Management (Child Creation, Deletion ...)		2 Hours			
4. a) Simulate head command. b) Simulate tail command.		2 Hours			
5. a) Simulate mv command. b) Simulate nl command.		2 Hours			
6. Write a program to handle the signals like SIGINT, SIGQUIT, SIGFPE .		4 Hours			
7. Implement the following IPC forms					
i. FIFO (Named Pipes), Signals and PIPE		4 Hours			
ii. IPC Resources (Shared Memory, Message Queues and Semaphore)					
8. Implement message queue form of IPC.					
9. Implement shared memory form of IPC.		4 Hours			
10. Write a Socket program for any application (Using TCP/IP and UDP/IP)		2 Hours			
		4 Hours			
Total Laboratory Hours		30 hours			
Text Book(s)					
1.	Neil Mathew, Richar Stones, "Beginning Linux Programming", 2015, Fifth Edition, Wiley Publications				
Reference Books					
1.	Robert Love, "Lunx System Programming : Talking Directly to the kernel and C Library", 2013, Second Edition, O Reilly Media.				
2.	John Masters, Richard Blum, "Professional Linux Programming", 2007, Linux® Bible, Ninth Edition Published by John Wiley & Sons, Inc				



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Mode of assessment: CAT, Exercises and FAT			
Recommended by Board of Studies	01-11-2023		
Approved by Academic Council	No. 72	Date	13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC209L	Data Mining	3	0	0	3
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To introduce the fundamental processes and major issues in Data Mining. 2. To present the various descriptive techniques involved in Data Mining. 3. To understand the importance of distinct predictive modelling techniques used in Data Mining Applications.					
Course Outcomes:					
1. Recognize key areas and issues in data mining. 2. Prepare the data needed for data mining using preprocessing techniques. 3. Identify efficient descriptive data mining techniques and its importance. 4. Develop the solutions using predictive modelling algorithms for solving practical problems. 5. Apply various kinds of clustering algorithms for real-world application scenarios.					
Module:1	Introduction to Data Mining	6 hours			
Data mining : an essential step in knowledge discovery - Diversity of data types for data mining - Mining various kinds of knowledge - Data mining: confluence of multiple disciplines - Data mining and applications					
Module:2	Data Pre-processing	6 hours			
Data Types - statistics of data -similarity and distance measures - data quality, data cleaning and data integration – data transformation – dimensionality reduction					
Module:3	Association Rules	7 hours			
Market basket analysis - frequent itemsets and association rules - efficient and scalable frequent itemset mining methods: Apriori algorithm, generating association rules from frequent itemsets, FP Growth algorithm					
Module:4	Classification & Prediction	9 hours			
Basic Concepts - Decision Tree Induction: Attribute Selection Measures, Tree Pruning - Rule Based Classification - Using IF-THEN Rules for Classification, Rule Extraction from a Decision Tree - Bayes Classification Methods - Bayes' Theorem, Naive Bayesian Classification - Lazy Learner - Prediction - Linear Regression					
Module:5	Model Evaluation and Selection	6 hours			
Metrics for Evaluating Classifier Performance, Holdout Method and Random Sub-sampling, Cross - Validation, Bootstrap, Model Selection Using Statistical Tests of Significance, Comparing Classifiers Based on Cost – Benefit and ROC Curves					
Module:6	Clustering	6 hours			
Cluster analysis - Partitioning methods: k-means - Hierarchical methods: agglomerative and divisive clustering methods - Evaluation of clustering - Outlier detection - types of approaches					
Module:7	Applications of Data Mining	3 hours			
Applications - Data Mining for Financial Data Analysis - Data Mining in Science and Engineering - Data Mining and Recommender Systems					
Module:8	Contemporary Topics	2 hours			
Guest Lecture from Industry and R & D Organizations					
Total Lecture hours:					45 hours
Text Book(s)					
1.	Jiawei Han, Jian Pei, Hanghang Tong, “Data Mining : Concepts and Techniques”,2022, Fourth edition, Elsevier - Morgan Kaufmann Publications.				
Reference Books					
1.	Max Bramer, “Principles of Data Mining”,2020, Fourth Edition, Springer				
2.	Ian H.Witten, Eibe Frank, Mark A. Hall, Christopher J. Pal, “Data Mining Practical Machine Learning Tools and Techniques”, 2016, Fourth Edition, Morgan Kaufman Publications				



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies	01-11-2023		
Approved by Academic Council	No. 72	Date	13-12-2023

Course Code	Course Title	L	T	P	C
-------------	--------------	---	---	---	---



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

UCSC210L	Software Project Management	3	0	0	3
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
<ol style="list-style-type: none"> To understand software project evaluation, estimation, planning and risk management To apply process in team building, monitoring, and control of software projects To function the monitoring and control process in real time software projects 					
Course Outcomes:					
<ol style="list-style-type: none"> Identify the fundamentals of project management and software project types to plan efficiently Design a critical path for the project's activities before performing PERT for risk management Estimate the software effort, functions, and cost Examine visualization techniques for the monitoring and management of Software project activities Inspect the control activities of the project, manage contracts, people and team 					
Module:1	Introduction	5 hours			
Importance of SPM - Software Project vs other Projects - Activities in SPM – Plans, Methods and Methodologies – Stakeholders - Setting Objectives - Business Case - Traditional Vs. Modern Project Management Practices					
Module:2	Project Evaluation and Programme Management	8 hours			
Business case - Project Portfolio Management - Evaluation of Individual Projects - Cost-benefit Evaluation Techniques - Risk Evaluation - Programme Management - Strategic Programme Management - Benefits Management					
Module:3	Software Effort Estimation	7 hours			
Problems with Over and Under Estimates – Basics for Software Estimation - Software Effort Estimation Techniques – Bottom-up Estimating – Top-down approach and Parametric models - Albrecht Function Point Analysis, Cost Estimation – Staffing Pattern					
Module:4	Activity Planning	5 hours			
Objectives - Project Schedules - Projects and Activities - Sequencing and Scheduling Activities - Network Planning Models - Adding Time Dimension - Forward and Backward Pass - Identifying the critical path - Activity Float - Shortening the project duration – identifying the critical activities – Activity-on-Arrow Networks					
Module:5	Risk Management	6 hours			
Categories of Risk – A Framework for dealing with Risk - Identification - Assessment - Planning - Management – Evaluating Risks to the Schedule - Applying the PERT technique - Monte Carlo simulation - Critical chain concepts					
Module:6	Resource Allocation	6 hours			
The nature of resources - Identifying Resource Requirements - Scheduling Resources - Creating Critical Paths - Counting the cost - Publishing the Resource Schedule - Cost Schedule – Scheduling Sequence					
Module:7	Monitoring and Control	6 hours			
Creating the framework – Collecting the Data – Review - Project Termination Review - Visualizing Progress – Cost Monitoring – Earned Value Analysis - Prioritizing Monitoring - Change Control					
Module:8	Contemporary Topics	2 hours			
Guest Lecture from Industry and R & D Organizations					
		Total Lecture hours:			45 hours
Text Book(s)					
1.	Bob Hughes, Mike Cotterell, Rajib Mall, “Software project management”, 2017, Sixth Edition, Mc Graw Hill				
Reference Books					
1.	John Nicholas and Herman Steyn, “Project management for Engineering, Business and Technology”,				



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

	2021, Routledge		
2.	Ramesh Gopaldaswamy, "Managing Global Projects", 2017, First Edition, Tata McGraw Hill		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies	01-11-2023		
Approved by Academic Council	No. 72	Date	13-12-2023

Course Code	Course Title	L	T	P	C
UCSC211L	Object Oriented Analysis and Design	3	0	0	3



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Pre-requisite		Syllabus version
		v.1.0
Course Objectives:		
<ol style="list-style-type: none"> To understand the basic principles of object orientation and notation. To experiment with Unified Modeling Language. To analyze and design the requirements of software development using UML 		
Course Outcomes:		
<ol style="list-style-type: none"> Analyze the fundamentals of object-oriented design elements. Comprehend the limitations of object-oriented analysis and design. Recognize the object modeling and emerging phases of UML. Apply UML with static and dynamic behavior for an interactive design process. Design form which maps to implementation in the real-life applications. 		
Module:1	Introduction	6 hours
Object Oriented Systems Development - Object basics - Object Oriented Development Life Cycle		
Module:2	Object Oriented Methodologies	7 hours
Rumbaugh et al.'s object modeling technique - The Booch Methodology - The Jacobson et al. Methodologies - The Unified Approach		
Module:3	Unified Modeling Language	6 hours
Fundamentals of Modeling - Principles of modeling - Use-Case diagram - Class diagram – Identifying attributes, operations, Object diagram		
Module:4	Dynamic Modeling – I	6 hours
Activity diagram – Action States, Activity States, Swimlane activity diagram - Statechart diagram – States, events, triggers - Sequence diagram – Object Lifeline, Focus of Control		
Module:5	Dynamic Modeling – II	6 hours
Collaboration diagram - Component diagram – source code, executable program, user interface - Deployment diagram – runtime processing elements, software components		
Module:6	Object Analysis Classification	6 hours
Approaches for Identifying Classes – Noun Phrase Approach – Selecting Classes from the relevant and Fuzzy Categories - Common Class Patterns		
Module:7	Case Studies	6 hours
Library Management System - Online Shopping System - Weather Forecasting system - Employee payroll management system		
Module:8	Contemporary Issues	2 hours
Guest Lecture from Industry and R & D Organizations		
Total Lecture hours:		45 hours
Textbook(s)		
1	Ali Bahrami, "Object Oriented Systems Development", Tata McGraw-Hill, 2021.	
Reference Books		
1	Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston, "Object Oriented Analysis and Design with Application", 2011, Third edition, Addison Wesley.	
2	Grady Booch, Ivar Jacobson, James Rumbaugh, "The Unified Modelling Language User Guide", 2012, Second Edition, Pearson.	
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar		
Recommended by Board of Studies		01-11-2023
Approved by Academic Council		No. 72 Date 13-12-2023

Course Code	Course Title	L	T	P	C
UCSC302L	Mobile Application Design and Development	3	0	0	3



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Pre-requisite		Syllabus version
		v. 1.0
Course Objectives:		
<ol style="list-style-type: none"> To impart fundamental concepts of Mobile Application Design and Development. To design user interfaces for interacting with apps and triggering actions. To identify options to save persistent application data. 		
Course Outcomes:		
<ol style="list-style-type: none"> Design highly functional and modern user interfaces. Create, test and debug mobile application by setting up a development environment. Implement interactive user interfaces that work across a wide range of devices. Demonstrate methods for storing and retrieving data in mobile applications. Analyse performance of mobile applications and understand the role of permissions and security. 		
Module:1	UX design for Mobile	6 hours
Design Principles and General Design Planning - Mobile Patterns - Web application approaches - Mobile application design patterns - Mobile user interface design patterns -Mobile design behaviour patterns-Wireframes and Mockups		
Module:2	Introduction to Development Environment	6 hours
Introduction to Android - Obtaining the Required tools – Launching First Mobile Application – Exploring the IDE – Using Code Completion – Debugging the application		
Module:3	Activities, Fragments and Intents	6 hours
Understanding Activities – Linking Activities using Intents – Fragments- Adding Fragments Dynamically, Life Cycle of a Fragment- Displaying Notifications		
Module:4	Know the Android User Interface	6 hours
Understanding the Components of a Screen-Views and ViewGroups, Linear Layout, Frame Layout, Table Layout, Scroll View – Adapting to Display orientation – Utilizing the Action Bar		
Module:5	Designing User Interface with Views	7 hours
Using Basic Views – Using Picker Views – Using List Views to display Long Lists – Understanding Specialized Fragments - using a List Fragment, using a Dialog Fragment, using a Preference Fragment - Using Menus with Views- Options Menu, Context Menu		
Module:6	Data Persistence and Content Providers	6 hours
Saving and Loading User Preferences – Persisting Data to Files- Saving to Internal Storage, Saving to External Storage – Creating and Using Databases – Content Providers - Sharing Data in Android		
Module:7	Messaging and Location-Based Services	6 hours
SMS Messaging – Sending Email – Displaying Maps – Getting Location Data – Monitoring a Location		
Module:8	Contemporary Issues	2 hours
Expert Lecture from Industry and R & D Organizations		
	Total Lecture hours:	45 hours
Text Book		
1.	Pablo Perea, Pau Giner, “UX Design for Mobile”, 2017, First Edition, Packt Publishing.	
2.	J F DiMarzio, “Beginning Android Programming with Android Studio”, 2017, Fourth Edition, Wiley India Pvt. Ltd.	
Reference Books		
1.	Dawn Griffiths and David Griffiths, “Head First Android Development”, 2021, Third Edition, O’Reilly	



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

	SPD Publishers.		
2.	Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", 2017, Google Developer Training Team		
3.	Neil Smyth, "Android Studio 3.0 Development Essentials", eighth edition , 2017, Payload Media Inc.		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023

Course Code	Course Title	L	T	P	C
UCSC302P	Mobile Application Design and Development Lab	0	0	2	1



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Pre-requisite		Syllabus version	v.1.0
Course Objectives:			
1. To configure Android Studio to develop mobile application. 2. To understand and implement User Interface functions. 3. To create and store application data on database.			
Course Outcomes:			
1. Create, test and debug an Android application. 2. Implement adaptive and responsive user interface. 3. Demonstrate methods in storing, sharing and retrieving data. 4. Infer the role of permission and security for Android applications.			
Indicative Experiments			Hours
1.	UI Design	- linear layout, relative layout, constraint layout	2 hours
2.	Usage of Widgets	- checkbox, radio button, time picker, date picker	4 hours
3.	UI Operations	- button click, dialog handling, list item selection	4 hours
4.	Intent – Activities	moving to another activity, passing data between	4 hours
5.	Fragments	- list fragment, dialog fragment	4 hours
6.	Menu	- options menu, context menu	4 hours
7.	Custom ListView	- songs listview	4 hours
8.	Database	- SQLite database	4 hours
Total Laboratory Hours			30 hours
Text Book			
1.	Pablo Perea, Pau Giner, “UX Design for Mobile”, 2017, First Edition, Packt Publishing.		
2.	J F DiMarzio, “Beginning Android Programming with Android Studio”, 2016, Fourth Edition, Wiley India Pvt. Ltd.		
Reference Books			
1.	Dawn Griffiths and David Griffiths, “Head First Android Development”, 2021, Third Edition, O’Reilly SPD Publishers.		
2.	Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", 2017, Google Developer Training Team		
3.	Neil Smyth, “Android Studio 3.0 Development Essentials”, Eighth edition, 2017, Payload Media Inc.		
Mode of assessment: CAT, Exercises and FAT			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023

Course Code	Course Title	L	T	P	C
UCSC303L	Cloud Application Development	3	0	0	3



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Prerequisite		Syllabus version
		v.1.0
Course Objectives:		
1. To learn cloud computing concepts and techniques. 2. To emphasize the understanding of virtualization and cloud application frameworks. 3. To appreciate concepts of programming paradigms, streaming of data and machine learning applications in cloud environments.		
Course Outcomes:		
1. Understand cloud computing and virtualization concepts in clouds. 2. Develop applications in cloud environments. 3. Understand the concepts of cloud storage services. 4. Apply data analytics techniques in clouds. 5. Explore possible ways for streaming data, and using machine learning techniques cloud environments.		
Module:1	Introduction to Cloud Computing	4 hours
Characteristics- Cloud Models- Cloud Computing Concepts and Technologies- Cloud Computing Services and Platform- Case Studies		
Module:2	Virtual Machines & Compute Services	6 hours
Virtualization-Compute Services-Auto Scaling-Elastic Load Balancing-Virtual Private Cloud		
Module:3	Cloud Application Development	6 hours
Design Considerations - Cloud Application Design Methodologies - Reference Architectures - Designing a RESTful Web API- Serverless Applications		
Module:4	Cloud Storage Services	7 hours
Simple Storage Service - Elastic File System- Elastic Block Store- Storage Gateway- Relational (SQL) Databases- NoSQL Databases		
Module:5	Big Data Analytics in Clouds	7 hours
Analytics - Characteristics - Domain Specific Examples - Analytics Flow - Big Data Stack -Hadoop MapReduce - Oozie – Spark- Search.		
Module:6	Queues & Connectors	6 hours
Data Acquisition Considerations - Publish - Subscribe Messaging Frameworks- Big Data Collection Systems- Messaging Queues- Custom Connectors- Cloud Security		
Module:7	Machine Learning in the Cloud	7 hours
Spark Machine Learning Library- Azure Machine Learning Workspace- Amazon Machine Learning Platform- Deep Learning: A Shallow Introduction- Amazon MXNet Virtual Machine Image- Google TensorFlow in the Cloud.		
Module:8	Contemporary Issues	2 hours
Guest Lecture from Industry and R & D Organizations		
		Total Lecture hours: 45 hours
Text Book(s)		
1.	Arshdeep Bahga & Vijay Madisetti, "Cloud Computing Solutions Architect: A Hands-On Approach", First Edition, 2019, VPT Publisher	
2	Ian Foster and Dennis B. Gannon, "Cloud Computing for Science and Engineering", 2017, First Edition, The MIT Press, Cambridge, Massachusetts.	
Reference Books		



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

1	Douglas E. Comer, "The Cloud Computing Book: The Future of Computing Explained", 2021, First Edition, CRC Press, Florida.		
2.	Naresh Kumar Sehgal, Pramod Chandra P. Bhatt, John M. Acken, "Cloud Computing with Security Concepts and Practices", 2020, Second Edition, Springer Nature, Switzerland		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies	01-11-2023		
Approved by Academic Council	No. 72	Date	13-12-2023

\

Course Code	Course Title	L	T	P	C
UCSC303P	Cloud Application Development Lab	0	0	2	1
Pre-requisite		Syllabus version			
		v.1.0			



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Objectives:			
1. To understand, analyze and design cloud applications.			
2. To work on cloud programming paradigms.			
Course Outcomes:			
1. Create VMs to deploy cloud applications.			
2. Develop applications using MapReduce programming model.			
3. Use web APIs to develop cloud applications.			
Indicative Experiments			Hours
1	Create and host static websites using cloud service providers		3 hours
2	Create a VM and deploy an application		3 hours
3	Execute Simple Spark Programs		2 hours
4	Execute SQL commands using Python and Spark.		2 hours
5	Develop cloud application with python web application framework		4 hours
6	Develop applications using MapReduce programming model.		4 hours
7	Execute simple data analytics applications in cloud.		4 hours
8	Execute simple machine learning applications in cloud.		4 hours
	Develop real-world applications		4 hours
Total Laboratory Hours			30 hours
Text Book(s)			
1	Arshdeep Bahga & Vijay Madiseti, "Cloud Computing Solutions Architect: A Hands-On Approach", 2019, First Edition, VPT Publisher		
2	Ian Foster and Dennis B. Gannon, "Cloud Computing for Science and Engineering", 2017, First Edition, The MIT Press, Cambridge, Massachusetts.		
Mode of assessment: CAT, Exercises and FAT			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023

Course Code	Course Title	L	T	P	C
UCSC304L	Internet of Things	3	0	0	3
Prerequisite		Syllabus version			
		v.1.0			
Course Objectives:					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

<ol style="list-style-type: none"> To understand the architecture, protocols and operations of IoT To explore the IoT devices and its applications To comprehend the programming skills to implement IoT based application 			
Course Outcomes:			
<ol style="list-style-type: none"> Understand the concept and the layered architecture of IoT Build hardware platforms encompassing, sensors, actuators, microcontrollers and peripherals Analyze various communication access technologies and application protocols for IoT Analyze the sensor data using various data analytics Implement IoT based solutions for simple real world problems 			
Module:1	Introduction to Internet of Things		7 hours
Genesis of IoT - IoT and Digitization-Convergence of IT and OT - IoT Challenges- Drivers behind new Network Architectures - Simplified IoT Architecture - Core Functional IoT stack - Sensors and Actuators Layer, Communications Network Layer, Applications and Analytics Layer			
Module:2	Smart Objects: The Things in IoT		7 hours
Sensors – Actuators – MEMS (Micro - Electro - Mechanical Systems) - Smart Objects - Sensor Networks - Wireless Sensor Networks, Communication Protocols for WSN			
Module:3	Connecting Smart Objects		7 hours
Communications Criteria - IoT Access Technologies - IEEE 802.15.4 - LRWPAN - LoRAWAN – NB IoT - Bluetooth Low Energy (BLE) - WiFi/802.11 - IP for IoT Network Layer - Optimizing IP for IoT - 6LowPAN			
Module:4	Application Protocols for IoT		6 hours
Generic Web Based Protocols – IoT Application Layer Protocols - Constrained Application Protocol , Message Queue Telemetry Transport			
Module:5	Data and Analytics for IoT		5 hours
IoT Data Management and Compute Stack - Fog computing - Edge Computing - Hierarchy of Fog, Edge and Cloud - An Introduction to Data Analytics for IoT - Machine Learning - Big Data Analytics - Edge Streaming Analytics			
Module:6	Programming in IoT		6 hours
Development boards for IoT - Arduino, Arduino IDE - Serial Monitor - Arduino Interfacing with Sensors and Actuators - NodeMCU - Raspberry Pi – GPIO Pins - Remote Access to Raspberry Pi - Connecting to WiFi, Bluetooth.			
Module:7	Applications of IoT – Case Studies		5 hours
Smart Cities- Transportation- Health Care – Retail- Agriculture			
Module:8	Contemporary Issues		2 hours
Guest Lecture from Industry and R & D Organizations			
Total Lecture hours:			45 hours
Text Book(s)			
1.	Hanes, D., Salgueiro, G., Grossetete, P., Barton, R., & Henry, J. "IoT fundamentals: Networking technologies, protocols, and use cases for the internet of things" 2017, First Edition, Cisco Press		
Reference Books			
1.	Sudip Misra , Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", 2022, First Edition, Cambridge University Press		
2.	Simone Cirani, Gianluigi Ferrari, Marco Picone, Luca Veltri: "Internet of Things: Architectures, Protocols and Standards", 2018, Wiley–Blackwell		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC304P	Internet of Things Lab	0	0	2	1
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To explore various sensors and actuators used for IoT applications					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

2. To understand the use of IoT devices to derive solutions for real world problems			
Course Outcomes:			
1. Build simple Arduino programs for simple I/O interfaces			
2. Implement IoT based applications for simple real world problems			
Indicative Experiments			Hours
1.	Familiarization with Arduino Uno to get the values from sensors and turn on/off the actuators		2 Hours
2.	Program to interface Arduino Uno with temperature and humidity sensor		2 Hours
3.	Program to interface Arduino with ultrasonic sensor		2 Hours
4.	Program to interface Arduino with object detection sensor and LED		2 Hours
5.	Program to interface Arduino UNO soil moisture sensor and servo motor		2 Hours
6.	Program to interface Arduino with PIR sensor		4 Hours
7.	Program to interface Arduino with MQ-2 sensor and buzzer.		4 Hours
8.	Program to interface Arduino with relay switch		4 hours
9.	Program to implement automatic irrigation system using Arduino and integrate with Thingspeak/ Blynk application		4 Hours
10.	Program to implement water tank monitoring system using NodeMCU and integrate with Blynk application to get notification in mobile and Email.		4 Hours
Total Laboratory Hours			30 hours
Text Book(s)			
1.	Hanes, D., Salgueiro, G., Grossetete, P., Barton, R., & Henry, J. "IoT fundamentals: Networking technologies, protocols, and use cases for the internet of things" 2017, First Edition, Cisco Press		
Mode of assessment: CAT, Exercises and FAT			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023

Course Code	Course Title	L	T	P	C
UCSC305L	Game Programming	3	0	0	3
Prerequisite		Syllabus version			
		v.1.0			
Course Objectives:					



VIT[®]

Vellore Institute of Technology
 (Deemed to be University under section 3 of UGC Act, 1956)
 CHENNAI

1. To provide an in-depth introduction to technologies and techniques currently used in the game industry.
2. To understand game design and development.
3. To understand the processes, mechanics, issues in game design, and game engine development.

Course Outcomes:

1. Analyze the concepts of modeling, techniques, handling situations, and logic to demonstrate understanding
2. Examine the design specifications for games and synthesize them to design, develop, test, evaluate, debug, and modify code accordingly
3. Design unique gaming environments, levels and characters by choosing appropriate game strategies and patterns based on an analysis of past and present trends
4. Audit the techniques of using multiple scenes and data persistence to refine a game, based on the skills you learned for building and playing games

Module:1	Introduction to Game Programming	5 hours
Overview of game - Game engine - Structure of a Typical Game Team - Engine Differences Across Genres		
Module:2	Game Engine Architecture	6 hours
Real Time Game Architecture - Engine Support - Subsystem Start-Up and Shut-Down - Memory Management - Containers and Strings		
Module:3	Game Objects and Models	7 hours
Dimensions and Coordinate system - Game objects – Transforms – Translation – Rotation – Scaling – Textures - Shaders and Materials – Prefabs – Sprites		
Module:4	Graphics for game programming	7 hours
The Rendering Pipeline - Lighting and Global Illumination - Visual Effects and Overlays - Basics of Tile map - Palettes and Tiles		
Module:5	Game Physics and User Interfaces	7 hours
Physics in Game - Collision Detection System - Rigid Body Dynamics - Integrating a Physics Engine into Game - Basic UI Principles - The canvas - UI Elements – Images – Text – Buttons - Screen Space – Overlay - Camera		
Module:6	Scripting	7 hours
Variables – Operators – Conditionals – Iteration – Methods – Input - Accessing Local Components - Accessing other Components		
Module:7	Audio and Level Design	4 hours
Audio basics - Audio Sources - Audio Scripting - Managing scenes - Persisting data and objects		
Module:8	Contemporary Issues	2 hours
Guest Lecture from Industry and R & D Organizations		
Total Lecture hours:		45 hours

Text Book(s)

1. Jason Gregory, "Game Engine Architecture", 2018, Third Edition, A K Peters/CRC Press.



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

2.	Mike Geig, Sams "Teach Yourself, UNITY 2018 Game Development in 24 hours", 2018, Third Edition, Sams publishing
----	---

Reference Books

1.	Sellers M. "Advanced game design: a systems approach", 2017. Addison-Wesley Professional.		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies	01-11-2023		
Approved by Academic Council	No. 72	Date	13-12-2023

Course Code	Course Title	L	T	P	C
UCSC305P	Game programming Lab	0	0	2	1
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

1. To understand the processes, mechanics, issues in game design, and game engine development.
2. To understand modeling, techniques, handling situations, and logics
3. To build and integrate technologies such as multimedia, and physics modeling into a cohesive, interactive game application.

Course Outcomes:

1. Design, develop, test, evaluate, debug, and modify code to meet design specifications for games.
2. Design unique gaming environments, levels and characters by choosing appropriate game strategies and patterns based on an analysis of past and present trends.
3. Able to build and then integrate technologies such as multimedia, and physics modelling into a cohesive, interactive game application.

Indicative Experiments

	Hours
1. Game engine - UNITY Basics	3 hours
2. Model Creation	3 hours
3. 2D Game environment	3 hours
4. 3D Game environment	3 hours
5. Create a game environment to apply different types of light effects.	3 hours
6. Create a physics based game play to realize all basic Newtonian effects	3 hours
7. Incorporating User Interface elements	3 hours
8. Create a Tile map based Game environment	3 hours
9. Apply Multiple Levels for any of the Games developed	3 hours
10. Apply audio effects for events and background	3 hours

Total Laboratory Hours 30 hours

Text Book(s)

1. Mike Geig, Sams, "Teach Yourself, UNITY 2018 Game Development in 24 hours", Third Edition, 2018, Sams publishing

Reference Books

1. Felicia P, "Unity From Zero to Proficiency (Foundations): A step-by-step guide to creating your first game with Unity", 2017, Patrick Felicia;
2. Shankar AR, "Pro HTML5 Games: Learn to Build Your Own Games Using HTML5 and JavaScript", 2017, Apress.

Mode of assessment: CAT, Exercises and FAT

Recommended by Board of Studies 01-11-2023

Approved by Academic Council No. 72 Date 13-12-2023

Course Code	Course Title	L	T	P	C
UCSC306L	Soft Computing	3	0	0	3
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

1. To comprehend with the Neural Network models, understand their functionalities and apply these in real life situations.
2. To understand the importance of approximation over exactness through the Fuzzy set model, basic concepts and principles of Fuzzy sets.
3. To develop approximate reasoning and fuzzy rules with applications in fuzzy inference engine.
4. To illustrate the importance of evolutionary computation, its categories with special focus on Genetic algorithms and optimization techniques.

Course Outcomes:

1. Understand the fundamental concepts of neural networks to soft computing problems
2. Deploy the learning mechanism of neural networks for classification and clustering problems
3. Design the fuzzy inference systems for machine intelligence problems.
4. Develop applications using Fuzzy logic control to solve decision making problems
5. Demonstrate the concepts of genetic algorithm and hybrid systems for optimization problems

Module:1	Soft Computing Fundamentals	7 Hours
Introduction to Intelligent systems and Soft Computing - Artificial Neural Network - Biological Neural Networks - Introduction, Evolution - Basic Models - Mcculloch-Pitts Model, Hebb's Network-implementing OR, AND and XOR logic functions.		
Module:2	Supervised Neural Networks	6 Hours
Supervised Neural Networks – Perceptron-MLP- Adaline (Adaptive Linear Neuron)- Back-Propagation Network - Radial Basis Function Network.		
Module:3	Associative Memory Networks	6 Hours
Pattern Association - Memory Models -Auto-Associative and Hetero Associative Models - Bi Directional Associative Memory Model.		
Module:4	Unsupervised Neural Networks	6 Hours
Kohonen Self-Organizing Feature Maps, Learning Vector Quantization Network, Adaptive Resonance Theory Network		
Module:5	Fuzzy Sets and Fuzzy Relations	6 Hours
Introduction - Fuzzy Sets – Operations - Fuzzy Relations - Membership Functions -Fuzzification and Defuzzification.		
Module:6	Fuzzy Logic and Approximate Reasoning	6 Hours
Fuzzy Truth Values - Fuzzy Propositions, Fuzzy Rules, Formation, Decomposition and Aggregation of Rules, Fuzzy Reasoning - FIS.		
Module:7	Genetic Algorithm	6 Hours
Basic Concepts of Genetic Modeling - Encoding, Selection, Crossover, Mutation, Reproduction, Applications in Search and Optimization.		
Module:8	Contemporary Topics	2 hours
Guest Lecture from Industry and R & D Organizations		
Total Lecture hours:		45 hours

Text Book(s)

1. Sivanandam and S N Deepa, "Principles of Soft Computing", 2018, Third Edition, Wiley Publications.

Reference Books

1. S. Rajasekaran and G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & Applications", 2017, Second Edition., PHI Publication



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

2.	George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic: Theory and Application", 2015, Pearson Publication.		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies	01-11-2023		
Approved by Academic Council	No. 72	Date	13-12-2023

Course Code	Course Title	L	T	P	C
UCSC307L	Cyber Forensics	3	0	0	3
Prerequisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To understand the basics of cybercrime, Cyber forensics technology, systems and services.					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

2. To learn about Digital Evidence, Acquisition, Handling, Analysis and Admissibility.			
3. To familiar with different tools for cyber forensics acquisition and analysis.			
Course Outcomes:			
1. Illustrate the fundamentals of cybercrime, cyber forensics, digital evidence and quality control procedures.			
2. Demonstrate the process of forensic data acquisition and analysis and investigate artifacts in different scenarios.			
3. Apply the procedure to perform Recover, seize, analysis and admissibility of digital evidences using legal procedures and standards.			
4. Prepare for the documentation and presentation based on the legal perspectives.			
5. Experiment the forensic procedures with the tools efficiently .			
Module:1	Introduction to Cybercrime	5 hours	
Introduction - Role of ECD and ICT -Types - Classification -Strategies to Prevent Cybercrimes-Cyber War-Cryptocurrency-Blockchain- Ransomware- Deep Web and Dark Web.			
Module:2	Introduction to Cyber Forensics	5 hours	
Steps in Forensic Investigation - Forensic Examination Process - Classification-Incident and Incident Handling - Incident Response Team.			
Module:3	Digital Evidence	7 hours	
Types - Evidence Collection Procedure-Sources of Evidence - Operating Systems, Storage Medium, File Systems – Registry – Artifacts - Impediments to Collection- Challenges.			
Module:4	Acquisition and Handling of Digital Evidence	6 hours	
Preliminaries - Acquisition and Seizure- Chain of Custody - Collection Form- - Acquisition Procedure - Challenges- Handling - Precautions Involved.			
Module:5	Analysis and Admissibility of Digital Evidence	7 hours	
Capturing of Forensic Copy - Email Tracking - Role of Forensic Analyst- Electronic Record: Retention-Rules of Admissibility - Categorization- Pre-trial Preparation- Presenting- Summary of Investigation Process.			
Module:6	Introduction to Cyber Laws	6 hours	
Need - Cyber Laws and Legal Issues - Minimizing Risk - Initiatives Promoting Cyber Security- Terms and Terminologies- Indian Cyber Laws- International Cyber Laws.			
Module:7	Forensic Tools	7 hours	
Types- Drive Imaging and Validation- Integrity Verification- Data Recovery- Registry Analysis- Password Recovery- Network Analysis - Email Analysis-Metadata Processing.			
Module:8	Contemporary Issues	2 hours	
Guest Lecture from Industry and R & D Organizations			
			Total Lecture hours: 45 hours
Text Book(s)			
1.	Deje and Murugan, "Cyber Forensics", 2018, Oxford University Press,		
Reference Books			
1.	John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation", 2015, Second Edition, Charles River Media, Inc.		
2.	B. Nelson, A. Phillips, F. Enfinger, and C. Steuart, "Guide to Computer Forensics and Investigations", 2019, Sixth Edition. CENGAGE,		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC308L	Wireless Networks	3	0	0	3
Pre-requisite		Syllabus version			
		1.0			
Course Objectives:					
1. To learn the concepts of wireless network and communication					
2. To understand and solve problems of modulation and coding schemes					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

3. To learn cellular systems, WLAN, WPAN networks			
Course Outcomes:			
<ol style="list-style-type: none"> 1. Interpret the concepts of wireless communications and wireless networking 2. Explore and solve problems associated with modulation and coding schemes 3. Identify and analyse cellular concepts, WLAN and WPAN. 4. Analyse and solve fundamental problems in wireless networks and security 5. Explore reading good research papers in wireless networks 			
Module:1	Introduction	6 hours	
Global Cellular Network - Mobile Device Revolution - Transmission Fundamentals: Signals for conveying Information – Analog and Digital Data Transmission – Channel Capacity – Transmission media -Multiplexing			
Module:2	Overview of Wireless Communication	6 hours	
Wireless Channel Digital Signal Encoding Techniques – Coding and Error Control - Orthogonal Frequency Division Multiplexing - Spread Spectrum – Wireless Channel			
Module:3	Wireless LAN Technology	6 hours	
IEEE 802.11 Architecture - IEEE 802.11 Architecture and services – Medium Access Control – Physical Layer – Gigabit WI-FI – IEEE 802.11 standards – IEEE 802.11i Wireless LAN Security			
Module:4	Bluetooth and IEEE 802.5	6 hours	
The Internet of things – The Bluetooth motivation and overview – Bluetooth Specification – Bluetooth High Speed and Bluetooth Smart – IEEE 802.5 – Zigbee			
Module:5	Cellular Wireless Networks	6 hours	
Principles of Cellular Networks – First Generation Analog – Second Generation TDMA – Second Generation CDMA – Third Generation Systems			
Module:6	Fourth Generation Systems and LTE	7 hours	
Purpose, motivation and approach - LTE Architecture - Resource Management - Channel Structure and Protocol - Radio Access Network			
Module:7	Long Range Communication	6 hours	
Satellite parameters and configurations – Satellite capacity allocation – Satellite Application – Fixed Broadband wireless Access – WiMAX/IEEE802.16-Smart Grid			
Module:8	Contemporary Topics	2 hours	
Guest Lecture from Industry and R & D Organizations			
		Total Lecture hours:	45 hours
Text Book(s)			
1.	Cory Beard and William Stallings “Wireless Communication Networks and Systems” ,2016, Pearson Education.		
Reference Books			
1.	Krishnamoorthy Raghunandan, “Introduction to Wireless Communication and Networks A Practical Perspective”, 2022, Springer		
2.	Arumita Biswas and Mainak Chowdary , “Wireless Communication Theory and Applications” , 2017,Cambridge University press.		
3.	ITI Saha Misra, “Wireless Communications and Networks: 3G and Beyond”, 2017, McGraw Hill		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC309L	Edge Computing	3	0	0	3
Pre-requisite		Syllabus version			
		1.0			
Course Objectives:					
1. To understand the basic knowledge on IoT, Edge computing					
2. To analyze, design edge-based solutions.					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

3. To explore the entrepreneurial aspect of the Edge computing and its security			
Course Outcomes:			
1. Understand the basic requirements of edge computing protocols and modules			
2. Develop the key architectures and applications in edge computing			
3. To explore knowledge on communication protocols for edge base technologies			
4. Differentiate cloud and edge computing services.			
5. Identifying the machine learning concepts for edge computing			
Module:1	IoT and Edge Computing Definition and Use Cases	5 hours	
Introduction to IoT and Use cases -Example use cases and -deployment for edge computing- Far edge architecture-Edge layer architecture.			
Module:2	IoT Architecture and Core IoT Modules	5 hours	
A connected ecosystem-IoT versus machine-to-machine-IoT and edge architecture-Role of an architect-Core Modules: Sensing and power- Data communication-Edge computing-compute-analytics and machine learning-Threat and security			
Module:3	Communication protocols for edge computing	9 hours	
IP based WPAN and WLAN: 6LowPAN-IEEE802.11, 6LoWPAN topologies,6LowPAN protocol stack-WPAN IP-Thread- Long range communications and protocols (WAN): 4G LTE 5G-LoRA, LoRAWAN and Sigfox- Edge to Cloud protocols: MQTT- MQTT-SN- CoAP- Other protocols			
Module:4	Edge Computing, routing and networking	6 hours	
Edge computing purpose and definition-Edge platforms and use cases for edge computing-Edge routing and networking: TCP/IP Network functions at the edge.			
Module:5	Cloud and Fog Topologies	6 hours	
Cloud service model- public, private-hybrid cloud- open stack cloud architecture-Fog computing			
Module: 6	Data Analytics and Machine learning in the cloud and edge	4 hours	
Big data analytics in IoT- ML in IoT-Convolutional Neural Networks			
Module:7	Edge computing using Raspberry Pi & Edge Security	9 hours	
Cybersecurity vernacular-Anatomy of IoT cyber-attacks- Physical and hardware security-Block chains and cryptocurrencies-IoT security best practices-IoT Edge computing with RaspberryPi (Pi as camera and Image processing)-Industrial and Commercial IoT and Edge-Edge computing and solutions.			
Module:8	Contemporary Topics	2 hours	
Guest Lecture from Industry and R & D Organizations			
Total Lecture hours:			45 hours
Text Book(s)			
1.	Perry Lea, IoT and Edge Computing for Architects”,2020, Second Edition, Packt Publishing		
2.	Simon Monk, “Raspberry Pi Cookbook”, 2019, Third Edition O'Reilly Media, Inc		
Reference Books			
1.	David Jensen, “Beginning Azure IoT Edge Computing: Extending the Cloud to the Intelligent Edge, MICROSOFT AZURE”,2019, Apress		
2.	Rajkumar Buyya, Satish Narayana Srirama,”Fog and Edge Computing: Principles and Paradigms “,2019, Wiley		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC310L	Advanced Java Programming	3	0	0	3
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To apply the core Java fundamentals to learn the advanced concepts of Java programming					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

2. To design and develop web application and database connectivity using Servlets, JSP, and JDBC			
3. To understand the fundamental concepts of JavaBeans and Springs			
Course Outcomes:			
1. Design and develop server-side programming using Servlets			
2. Develop web applications using JSP			
3. Understanding the properties of JavaBeans and the creation of software components using the Java platform			
4. Demonstrate spring framework and use them in appropriate applications			
5. Apply various methods for web application development			
Module:1	Web Application Architecture Fundamentals		4 hours
HTTP-Web Application Architecture-Application Server- Web Server- Deployment Descriptor Overview-Deployment-Web Fragments - Configuring Tomcat server			
Module:2	Servlet API		6 hours
Introduction to Servlets- Life cycle of servlets, Servlet Configuration, Java Servlets Development Kit, Request and Response Handling, Compiling and running servlet, The servlet API: javax. servlet package, Reading the servlet Parameters, Reading Initialization parameter			
Module:3	Servlet and JDBC		6 hours
Session Management, Servlet Security, Error Handling, File upload and File download, Servlets and JDBC,			
Module:4	Java Server Pages		7 hours
Advantage of JSP technology, Introduction to J2EE Architecture, JSP Architecture, JSP Syntax (Directives, Declarations, Expression, Scriptlets, Comments)			
Module:5	JSP-Development and Management		7 hours
Implicit Objects, JSP Expressions, JSP Scriptlets, JSP Tag Libraries, JSP Exception Handling, Session Management, JSP and Servlet Integration, Custom tags - Using javabeans in JSP - MVC architecture			
Module:6	Overview of Spring Framework		6 hours
Spring Framework: Initializing a Spring application, Writing a Spring application, and Surveying the Spring landscape			
Module:7	Spring-Web Applications		7 hours
Developing Spring web applications -Displaying information, Processing form submission, Validating form input. Working with view controllers, Choosing a view template library, and Caching templates			
Module:8	Contemporary Issues		2 hours
Guest Lecture from Industry and R & D Organizations			
			Total Lecture hours: 45 hours
Text Book(s)			
1.	Herbert Schildt, "The Complete Reference-Java",2017, Eleventh Edition, Tata Mcgraw-Hill.		
Reference Books			
1.	Budi Kurniawan, "Servlet & JSP: A Tutorial, Brainy Software", 2015,Second Edition, Brainy Software.		
2.	Craig Walls, "Spring in Action", 2020, Fifth edition, Manning Publication.		
3.	Pankaj B. Brahmanekar, "Advanced JAVA Programming, 2019, Tech Neo Publications.		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC310P	Advanced Java Programming Lab	0	0	2	1
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To design and develop web applications and database connectivity using Servlets, JSP, and JDBC					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

2. To design and develop web applications using RMI
3. To design and develop web applications using Java Beans and Spring Framework.

Course Outcomes:

1. Provide a basic understanding of server-based application development
2. Design and develop server-side programming using Servlets and JSP, Client-server applications using RMI
3. Design and develop web applications using Java Beans and Spring Framework

List of Challenging Experiments (Indicative)

No of hours

1	Programs on handling request and responses in client-server communication using Java Servlets	6 hours
2	Programs on handling cookies and sessions in client-server communication using Java Servlets	2 hours
3	Programs on database connection using JDBC from Java Servlets in client-server communication	4 hours
4	Programs on handling request and responses in client-server communication using Java Server Pages (JSP)	4 hours
5	Programs on exception handling and session management in client-server communication using JSP	2 hours
6	Programs on database connection using JDBC from JSP in client-server communication	4 hours
7	Programs on JSP custom tags	2 hours
8	Programs on web application development using Java Beans	2 hours
9	Programs on web application development using Spring Framework	2 hours
10	Program to demonstrate the use of Hibernate and Spring integration	2 hours
Total Lecture hours:		30 hours

Text Book

1. Jim Keogh, "J2EE The Complete Reference", 2017, McGraw Hill Education (India).

Reference Books

1. Uttam Roy, ADVANCED JAVA PROGRAMMING, 2015, Oxford publication
2. Herbert Schildt, "Java The Complete Reference", 2021, Comprehensive Coverage of Java Language, Oracle Press, McGraw Hill Education.

Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar

Recommended by Board of Studies 01-11-2023

Approved by Academic Council No. 72 Date 13-12-2023

Course Code	Course Title	L	T	P	C
UCSC406L	Computer Graphics and Multimedia	3	0	0	3
Prerequisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To understand and design Graphics primitives					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

2. To emphasize the understanding of 2D,3D graphics operation and 3D projection, viewing mechanism		
3. To understand the basics of multimedia and compression techniques.		
Course Outcomes:		
1. Implement the graphics model and recognize the meaning of computer graphics terminologies and differentiate methods involved in developing graphics models		
2. Design and develop real work graphics applications using 2D, 3D primitives and transformations		
3. Implementing curves, projections and back-face detection on 3D rendering		
4. Analyze the standard compression techniques for Audio and Video.		
Module:1	Computer Graphics Hardware	4 hours
Video Display Devices - Raster-Scan Systems - Graphics Workstations and Viewing Systems - Input Devices - Hard-Copy Devices - Graphics Networks - Graphics on the Internet		
Module:2	Graphics Output Primitives	6hours
Coordinate Reference Frames - Specifying a Two-Dimensional World-Coordinate Reference Frame - OpenGL Point Functions - Line Functions 5 Curve Functions - Fill-Area Primitives - Polygon Fill Areas - Polygon Fill-Area Functions - Vertex Arrays - Pixel-Array Primitives		
Module:3	Two-Dimensional Geometric Transformations	6 hours
Basic Two-Dimensional Geometric Transformations - Matrix Representations and Homogeneous Coordinates - Inverse Transformations - Two-Dimensional Composite Transformations - Raster Methods for Geometric Transformations - Transformations between Two-Dimensional Coordinate Systems		
Module:4	Three-Dimensional Geometric Transformations	7 hours
Three-Dimensional Translation - Three-Dimensional Rotation - Three-Dimensional Scaling - Composite Three-Dimensional Transformations - Transformations between Three-Dimensional Coordinate Systems - Affine Transformations		
Module:5	Visible-Surface Detection Methods	7 hours
Classification of Visible-Surface Detection Algorithms - Back-Face Detection - Depth-Buffer Method - A-Buffer Method - Scan-Line Method - Depth-Sorting Method - BSP-Tree Method - Area-Subdivision Method - Octree Methods - Ray-Casting Method - Comparison of Visibility-Detection Methods - Curved Surfaces - Wire-Frame Visibility Methods		
Module:6	Multimedia Basics	6 hours
Introduction and definitions - Graphics and Image Data Representations- Multimedia Data Compression – Lossless Compression Algorithms-Lossy Compression Algorithms		
Module:7	Multimedia Compression	7 hours
Basic Video Compression Techniques- - Image Compression Standards - MPEG 1,2,4 Compression- H.264 Video Coding.		
Module:8	Contemporary Issues	2 hours
Guest Lecture from Industry and R & D Organizations		
		Total Lecture hours: 45 hours
Text Book(s)		
1.	Donald Hearn, Pauline Baker, " Computer Graphics with OpenGL - C Version",2014, Fourth Edition, Pearson Education	



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

2	Ze-Nian Li, Mark S. Drew and Jiangchuan Liu, "Fundamentals of Multimedia", 2021, Third Edition, Springer		
Reference Books			
1.	James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, "Computer Graphics-Principles and practice", 2007, Second Edition, Pearson Education		
2.	Ralf Steinmetz and Klara Nahrstedt, "Multimedia: Computing Communications & Application", 2009, Pearson Education		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by the Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023

Course Code	Course Title	L	T	P	C
UCSC406P	Computer Graphics and Multimedia Lab	0	0	2	1
Pre-requisite		Syllabus version			
		v.1.0			



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Objectives:			
<ol style="list-style-type: none"> To understand, analyze and design graphics objects To work on graphics packages both 2D and 3D 			
Course Outcomes:			
<ol style="list-style-type: none"> Use of computer programming in creation of graphics object Design of 2D&3D objects and curves. Implementation of filling, clipping and visualization. Design and animate objects using multimedia tools. 			
Indicative Experiments			Hours
1.	2D API usage: Learning of Graphics Programming Environment and usage of Graphics APIs. Modelling and visualization of real-world /artificial scene using 2D graphics primitives		2 Hours
2	2D Graphics primitive: Implementation of Circle Drawing algorithm Implementation of Line Drawing algorithm		4 Hours
3.	2D Transformations: Implement the 2-D transformations functions on 2-D graphic objects. Write a sample program to demonstrate the use of the various 2-D transformation		4 Hours
4.	Clipping and Filling: Implementation of Line clipping algorithms against the given rectangular window. Implementation of area and polygon filling		4 Hours
5.	Curves: Implementation of quadratic curves like Bezier and spline.		4 Hours
6.	Projections: Implementation of program to demonstrate the use of the 3D transformations and projections.		4 Hours
7.	Interactive Graphics Programming: Implementation of interactive graphics programming using mouse(like windows paint)		4 Hours
8.	Adobe Photoshop: Learn and Practice various tools, effects, layers and filters in Adobe Photoshop.		2 Hours
9.	Adobe Flash Professional: Animate the objects using motion tweening, shape tweening and guide layers. Implementations of layer by layer animation and frame animation. Design and animate a shining text effect in Flash using masking. Controlling of various scenes using buttons and action scripts.		2 Hours
Total Laboratory Hours			30 hours
Text Book(s)			
1	Donald Hearn, Pauline Baker," Computer Graphics with OpenGL - C Version",2014, Fourth Edition, Pearson Education		
2	Conrad Chavez, Andrew Faulkner," Adobe Photoshop Classroom in a Book", 2022,Adobe press		
Mode of assessment: CAT, Exercises and FAT			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC407L	System Programming	3	0	0	3
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

<ol style="list-style-type: none"> To understand, analyze and design various system software components. To understand the basic system programming concepts. To develop software systems that demonstrate the importance of technologies. 		
Course Outcomes:		
<ol style="list-style-type: none"> Convert high-level program to machine-level program. Understand the execution process of HLL programs. Distinguish the basic design of various system programming concepts like assembler, loader and linker. Illustrate the working principles of scanners and parsers in the compiler. Implement various system tools like macro processors and debuggers. 		
Module:1	Introduction to System Software and Language Processors	3 hours
Introduction – System Programming - views of System Software - Language Processing Activities, Program Execution		
Module:2	Machine Architectures	7 hours
Simplified Instructional Computers (SIC) – SIC Machine Architecture, SIC/XE Machine Architecture, SIC Programming Examples - Traditional Complex Instruction Set Computer (CISC) Machines – VAX Architecture, Pentium Pro Architecture; RISC Machines – Ultra SPARC Architecture, PowerPC Architecture, Cray T3E Architecture		
Module:3	Assembler	9 hours
Basic Assembler functions – Machine Dependent Assembler Features - Machine Independent Assembler Features – Assembler Design options – Implementation Examples		
Module:4	Loaders and Linkers	7 hours
Basic Loader functions – Machine Dependent Loader Features - Machine Independent Loader Features – Loader Design options – Implementation Examples		
Module:5	Macro Processors	7 hours
Basic Macro Processor functions - Machine Independent Macro Processor Features - Macro Processor Design options - Implementation Examples		
Module:6	Compilers	7 hours
Basic Compiler functions – Machine Dependent Compiler Features - Machine Independent Compiler Features – Compiler Design options – Implementation Examples		
Module:7	Interpreters & Debuggers	3 hours
Benefits of Interpretation, Overview of Interpretation, The Java Language Environment, Java Virtual Machine, Editors, Debugging Monitors, Classification of Debuggers		
Module:8	Contemporary Issues	2 hours
Guest Lecture from Industry and R & D Organizations		
		Total Lecture hours: 45 hours
Text Book		
1.	Leland L. Beck ,”System Software: An Introduction to Systems Programming”, 2020, Third Edition,Pearson.	
Reference Book(s)		
1.	Dhamdhare, “Systems Programming”,2019, McGraw-Hill.	
2.	R.K. Maurya, Anand A. Godbole, “System Programming and Compiler Construction”, 2019, Dreamtech Press.	
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar		



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Recommended by Board of Studies	01-11-2023		
Approved by Academic Council	No. 72	Date	13-12-2023

Course Code	Course Title	L	T	P	C
UCSC407P	Systems Programming Lab	0	0	2	1
Pre-requisite		Syllabus version			
		1.0			
Course Objectives:					
1. To study the architecture of a hypothetical machine, its assembly language, macro language					
2. To know the design and implementation of assemblers.					
3. To know the design and implementation of Linkers, Loaders, and Macro processors.					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Outcomes:			
<ol style="list-style-type: none"> 1. Have an understanding of foundation to design of assemblers. 2. Implement the understood design of macro processors concepts as programs. 3. Examine what happens during program compilation, linking, and loading 4. Understand the concepts and theory behind the implementation of high level programming languages. 			
Indicative Experiments			
1.	Implement a symbol table with functions to create, insert, modify, search, and display	2hours	
2.	Implement pass one of a two pass assembler symbol table preparation	2hours	
3.	Implement pass one of a two pass assembler intermediate code preparation	2hours	
4.	Implement pass two of a two pass assembler	2hours	
5.	Implement an absolute loader	2hours	
6.	Implement a relocating loader	2hours	
7.	Implement pass one of a direct-linking loader	2hours	
8.	Implement pass two of a direct-linking loader	2hours	
9.	Implement a two pass macro processor	2hours	
10.	Implement a single pass macro processor	2hours	
11.	Implement a simple text editor	2hours	
12.	Implementation of Lexical analyzer	2hours	
13.	Implementation of any YACC program	2hours	
14.	Implementation of one of top-down parser	2hours	
15.	Implementation of one of bottom-up parser	2hours	
Total Laboratory Hours			30 hours
Text Book			
1.	Leland L. Beck ,”System Software: An Introduction to Systems Programming”, 2020, Third Edition,Pearson.		
Reference Book(s)			
1.	Dhamdhere, “Systems Programming”,2019, McGraw-Hill Education		
2.	R.K. Maurya, Anand A. Godbole, “System Programming and Compiler Construction”, 2019, Dreamtech Press.		
Mode of assessment: CAT, Exercises and FAT			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023

Course Code	Course Title	L	T	P	C
UCSC408L	Robotics	3	1	0	4
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
<ol style="list-style-type: none"> 1. To elucidate the students on types of robots, components and working mechanism of manipulators. 2. To summarize and analyze the uses of sensors, actuators in robots 3. To familiarize the students with robot applications and future of robots. 					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Outcomes:		
<ol style="list-style-type: none"> 1. Understand the importance, role of microprocessors in robots, the positive and negative aspects of robots and applications of robots. 2. Classify the robots, components of manipulators, drive systems and work envelope 3. Explain the drive systems, grippers and gears in detail. 4. Analyze the role of sensors, control methods, actuators in robots. 5. Judge the uses of robot in present and their future world. 		
Module:1	Introduction	5 hours
Introduction - Definition - Robot History - Computer Programs - Languages - Microprocessors - Positive Aspects of Robots - Negative Aspects of Robots - Robots - Hard Automation - and Human Labor - Robots and Humans - Robots Versus Humans - Industrial Robot Applications		
Module:2	Robot types and Manipulators	7 hours
Types of Robots - Base - Arm - Wrist - Grippers - All Together It Becomes a Manipulator - Work Envelope - Articulation - Wrist Motion - Degrees of Freedom - Robot Motion Capabilities - Wrist Action - Work Envelopes - Moving the Manipulator - Drive Systems.		
Module:3	Drive systems, Grippers and Gears in Detail	7 hours
Drive systems in detail - Hydraulics - Pressure - Pumps - Pneumatics - Motors - End Effectors - Grippers - End-of-Arm Tooling - Positioning - Repeatability and Accuracy - Drives & Gears - Adjusting Gears - Harmonic Drives - Belts - Chains.		
Module:4	Sensors and Sensing	7 hours
Classes of Sensors - Noncontact Sensors - Self-Protection - Collision Avoidance - Proximity Sensors - Range Sensors - Tactile (Touch) Sensors - Strain Gauges - Pulsed Infrared Photoelectric Control - Temperature Sensing - Displacement Sensing - Speed Sensing - Torque Sensing - Vision Sensors		
Module:5	Control methods, Actuators and Programming a Robot	6 hours
Control Methods - Servo-Controlled Robots - Non-Servo-Controlled Robots - Electric Non-Servo-Controlled Robots - Pneumatic Non-Servo-Controlled Robots - Hydraulic Non-Servo-Controlled Robots. Actuators - Controllers - Programming a Robot - Teach Pendant - Lead-Through Programming - Computer Terminal Programming.		
Module:6	Uses of robots	6 hours
Uses for Robots - Loading and Unloading - Lane Loader - Flow-Line Transfer - Machine Loading - Materials Handling - Die Casting - Palletizing - Line Tracking - Process Flow - Fabricating - Assembling - Painting - Welding - Inspecting and Testing - The Future of Flexible Automation		
Module:7	Future and Advanced Systems	5 hours
The Future of Robots - Social Impact of Robots - New Uses and New Forms - Robots and Robotics - Today and Advanced Systems - Software for Robots		
Module:8	Contemporary Topics	2 hours
Guest Lecture from Industry and R & D Organizations		
		Total Lecture hours: 45 hours
		Total Tutorial hours: 15 hours
Text Book(s)		
1.	Mark R. Miller, Rex Miller, "Robots and Robotics (Principles, Systems, and Industrial Applications)", 2019, McGraw Hill	
Reference Books		
1.	John J. Craig, "Introduction to Robotics Mechanics and Control", 2022, Person Edition Limited	
2.	Saeed B. Nikku, "Introduction to Robotics Analysis, Control, Applications", 2020, John Wiley & Sons Ltd	
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar		
Recommended by Board of Studies		01-11-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Approved by Academic Council	No. 72	Date	13-12-2023
------------------------------	--------	------	------------

Course code	Course Title	L	T	P	C
UCSC409L	Cyber Physical Systems	3	1	0	4
Pre-requisite		Syllabus version			
		1.0			
Course Objectives					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

<ol style="list-style-type: none"> To introduce the concepts of Cyber-Physical Systems To obtain CPS fundamentals and principles knowledge as building blocks to promote further design and implementation of more complex real time systems. To understand the systems that bridge the cyber-world of computing and communications with the physical world as cyber-physical systems with Logical Correctness for Hybrid Systems and security of Cyber-Physical System 		
Course Outcomes:		
<ol style="list-style-type: none"> Understand the basics of Cyber Physical Systems(CPS) Identify the important system principles in various application domain Perceive the relationship between CPS and Wireless Sensor Network Develop several symbolic synthesis models and techniques for CPS Examine the software and platform issues in Feedback Control Systems with logical correctness, security and scheduling of CPS 		
Module:1	Introduction to Cyber-Physical System	7 hours
Introduction to Cyber-Physical System- Emergence of CPS - CPS Drivers - Application Domains of CPS - Theoretical Foundations: Basic principles of design and validation of CPS - Challenges in CPS		
Module:2	Cyber Physical System Application Domain	7 hours
Medical Cyber-Physical Systems: System Description and Operational Scenarios - Key Design Drivers and Quality Attributes - Quality Attributes and Challenges of the MCPS Domain - Energy Cyber-Physical Systems - System Description and Operational Scenarios - Key Design Drivers and Quality Attributes - Key Systems Principles		
Module:3	Cyber-Physical Systems Built on Wireless Sensor Networks	7 hours
System Description and Operational Scenarios - Medium Access Control - Routing - Node Localization - Clock Synchronization - Power Management - Key Design Drivers and Quality Attributes - Physically Aware - Real-Time Aware - Runtime Validation Aware - Security Aware - Practitioners' Implications		
Module:4	Symbolic Synthesis for Cyber-Physical Systems	6 hours
Introduction and Motivation - Basic Techniques - Solving the Synthesis Problem - Construction of Symbolic Models - Advanced Techniques - Construction of Symbolic Models - Continuous-Time Controllers		
Module:5	Software and Platform Issues in Feedback Control Systems	6 hours
Basic Techniques - Controller Timing - Control Design for Resource Efficiency - Reducing the Computation Time - Less Frequent Sampling - Event-Based Control - Controller Software Structures - Sharing of Computing Resources - Analysis and Simulation of Feedback Control Systems		
Module:6	Logical Correctness for Hybrid Systems	5 hours
Introduction and Motivation - Basic Techniques - Discrete Verification - Real-Time Verification - Hybrid Verification - Summary and Open Challenges		
Module:7	Security of Cyber-Physical Systems	5 hours
Cyber Security Requirements - Attack Model - Countermeasures - Advanced Techniques - System Theoretic Approaches - Synchronization in Distributed Cyber-Physical Systems - Challenges in Cyber-Physical Systems - A Complexity-Reducing Technique for Synchronization		
Module:8	Contemporary Issues	2 hours
Guest Lecture from Industry and R & D Organizations		
		Total Lecture Hours:
		45 hours
		Total Tutorial Hours:
		15 hours
Text Book(s)		
1. Raj Rajkumar, Dionisio de Niz and Mark Klein, "Cyber-Physical Systems", 2017 Addison-Wesley		
Reference Books		
1. Walid M. Taha Abd-Elhamid M. Taha Johan Thunberg, "Cyber- Physical Systems: A Model- Based Approach", 2021, Springer		



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

2.	Nathan Ida, "Sensors, Actuators, and Their Interfaces: A Multidisciplinary Introduction", 2020, Second Edition, IET		
3.	A. Platzer, "Logical Foundations of Cyber Physical Systems", 2017, Springer.		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council	No. 72	Date	13-12-2023

Course code	Course Title	L	T	P	C
UCSC410L	Augmented Reality and Virtual Reality	3	1	0	4
Pre-requisite		Syllabus version			
		v. 1.0			
Course Objectives :					
1. To understand the fundamental concepts of immersive technologies – Augmented Reality and Virtual Reality					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

2. To gain knowledge on the various types, techniques, and modeling of AR and VR
3. To understand the working mechanism of AR and VR with the hardware and software requirements and methodologies

Course Outcomes:

1. Apply the concepts of AR and VR to various applications
2. Evaluate the various methodologies, and tools suitable for the development of AR and VR
3. Apply AR and VR application development using Unity software
4. Develop AR and VR applications using SDK bundles and deploy them in the head mount devices

Module:1	Introduction to Virtual Reality	7 hours
-----------------	--	----------------

Introduction to virtual reality – history – design guidelines – How humans interact with computers – sensory design – sensory principle.

Module:2	Perceptual Models	7 hours
-----------------	--------------------------	----------------

Perceptual modalities – Space and Time – stability, attention, and action – design guidelines – adverse health effects - Content Creation – Interaction – VR components – present and future state of VR.

Module:3	Models and Mapping	6 hours
-----------------	---------------------------	----------------

Virtual reality for ART – 3D art optimization – hardware – SLAM – tracking – Mapping – Geometric modeling, kinematics modeling, physical modeling, behavior modeling - Platforms - 3D position tracking – navigation – position and motion tracking – data gloves, and gesture interface.

Module:4	Virtual Reality Devices	6 hours
-----------------	--------------------------------	----------------

Head mount devices - Types of VR devices – Oculus Quest - OpenGL, real-time rendering – haptics gesture interfaces - hand & pose recognition.

Module:5	Introduction to Augmented Reality	6 hours
-----------------	--	----------------

Overview of AR concepts – Taxonomy - Types of AR – Technology issue - game engine - modeling - tracking – calibration - computer vision for AR.

Module:6	Technologies & Tools for Augmented Reality	6 hours
-----------------	---	----------------

Working of AR – hardware components – software components – contents - interactions – mobile AR – user experiences and interface - Tools for AR/VR development – OpenCV - ARKit – ARCore – cross-platform AR and VR - Virtual Reality Toolkit (VRTK) – Wikitude.

Module:7	Development and applications of AR/VR	5 hours
-----------------	--	----------------

Develop and deploy AR applications (Vuforia) - Develop and deploy VR applications – Software development kit Applications – Scientific, industrial and government – commercial and enterprise – Education – Healthcare.

Module:8	Contemporary Issues	2 hours
-----------------	----------------------------	----------------

Guest Lecture from Industry and R & D Organizations

	Total Lecture hours:	45 hours
	Total Tutorial hours:	15 hours

Text Book(s)

1. Erin, Steve Lukas, Vasanth Mohan, Creating Augmented and Virtual Realities, Theory & Practice for Next Generation Spatial Computing,2019, O'reilly.
2. John Peddie, Augmented Reality, where we will live,2017 Springer.

Reference Books

1. Jens Grubert, Raphael Grasset, "Augmented Reality for Mobile application development",2013 O'reilly
2. Steve Aukstakalnis, "Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR", 2016,Addison-Wesley professional.



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

3	Jason Gerald, "The VR Book, Human-centered design for Virtual Reality", 2016, ACM.		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023

Course Code	Course Title	L	T	P	C
UCSC411L	Blockchain Technologies	3	1	0	4
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To understand fundamental components of Blockchain technology and examine decentralization using blockchain					
2. To examine the technical aspects of digital keys, mining, and crypto transaction in blockchain					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

3. To function the components of bitcoin and explore the real time blockchain applications			
Course Outcomes:			
<ol style="list-style-type: none"> 1. Identify the technology components of Blockchain and different approaches to developing decentralized applications 2. Understand the cryptography fundamentals 3. Inspect Bitcoin and its transaction life cycle 4. Comprehend the operational aspects of mining and mining algorithms 5. Examine the use of alternative coins and real time applications of blockchain 			
Module:1	Introduction to Blockchain Technology		6 hours
The growth of blockchain technology- Distributed systems- The history of blockchain-Generic elements of a blockchain-Benefits and limitations of blockchain-Tiers of blockchain technology-Features of a blockchain-Types of blockchain-Consensus			
Module:2	Decentralization		6 hours
Decentralization using blockchain-Methods of decentralization-Routes to decentralization-Blockchain and full ecosystem decentralization-Decentralized Organizations-Platforms for decentralization			
Module:3	Cryptography fundamentals		7 hours
Introduction-Cryptographic Primitives-Symmetric Cryptography-Asymmetric Cryptography-Public and private keys-Hash functions			
Module:4	Bitcoin Basics		7 hours
Bitcoin-Digital keys and addresses-Transactions-The transaction life cycle-The transaction data structure-Types of transactions-The structure of a block-The structure of a block header-The genesis block			
Module:5	Mining		6 hours
Tasks of the miners-Mining Rewards-Proof of Work (PoW)- The mining algorithm-The hash rate-Mining Systems-Mining pools			
Module:6	Alternative Coins and Smart Contracts		6 hours
Theoretical foundations-Alternatives to Proof of Work-Various stake types-Name coin-Litecoin - Primecoin-Smart Contracts- History- Smart contract templates - Smart contract programming architecture			
Module:7	Blockchain Applications		5 hours
Blockchain in Supply Chain - Blockchain in Government - Internet of Things -Blockchain in Financial Service- Payments and Secure Trading - Compliance and Mortgage- Medical Record Management System - Identity Management - Property Records- smart cities, E-Governance			
Module:8	Contemporary Issues		2 hours
Guest Lecture from Industry and R & D Organizations			
		Total Lecture hours:	45 hours
		Total Tutorial Hours:	15 hours
Text Book(s)			
1.	Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", 2018,Second Edition, Packt Publishing.		
Reference Books			
1.	Alexander Lipton ,Adrien Treccani ,"Blockchain and Distributed Ledgers Mathematics, Technology, and Economics" ,2021, world scientific publisher.		
2.	Arshdeep Bahga, Vijay Madiseti, "Blockchain Applications: A Hands On Approach",2017, VPT.		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course code	Course Title	L	T	P	C
UCSC412L	Malware Analysis	3	1	0	4
Pre-requisite		Syllabus version			
		V.1.0			
Course Objectives:					
<ol style="list-style-type: none">1. To understand and analyse malware using static and dynamic analysis2. To examine malware behavior3. To build and analyse malware networks and catch vulnerabilities by building your own malware network					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Outcomes:		
<ol style="list-style-type: none"> 1. Understand the cyber security challenges raised from malicious software attacks 2. Analyze the security risks, threats and potential vulnerabilities on enterprise networks environment 3. Apply the learned techniques to protect, reduce the security risks and avoid malicious software attacks on computer systems or networks 4. Carry out independent analysis of modern malware samples using behavioral, code analysis and memory forensic techniques 5. Research independently and use learned skills and tools to investigate malicious software attacks and implement or update a cyber protection plan 		
Module:1	Introduction of Malware	6 hours
The cyber kill chain, Definition of malware and its role in the kill chain - Different types of malware , goal of malware analysis -Types of malware analysis - Setting up a safe environment for malware analysis		
Module:2	Analyzing Malicious Windows Programs	6 hours
The Portable Executable file format, PE header and sections, Windows loader, Windows API, Import Address Table, Import functions, Export functions - System architecture, processes, threads, memory management, registry , PE files on disk and in memory.		
Module:3	Basic Static Analysis	6 hours
Basic static analysis- concepts and tools: hash functions, VirusTotal, strings, PEiD, PE Explorer, CFF Explorer, and Resource Hacker-Identifying file obfuscation techniques: packers and cryptors - Introduction to Yara.		
Module:4	Basic Dynamic and Network Analysis	7 hours
Basic dynamic analysis - concepts and tools for: Sys-internals tools, sandboxes - Persistence techniques -Network analysis, Faking a network for safe malware analysis - Introduction to Wire shark - Command and Control communication of malware.		
Module:5	Advanced Static Analysis	8 hours
Introduction to x86 architecture - Memory, instructions, opcodes, operands, registers, functions, stack - source code, compiled code - Advanced static analysis - Introduction to disassemblers and decompilers - Static code analysis with IDA/Ghidra - Obfuscation techniques		
Module:6	Advanced Dynamic Analysis	7 hours
Introduction to debuggers - Dynamic analysis with OllyDbg - Process injection techniques and hooking - User mode, kernel mode debugging - Ransomware analysis, Cryptographic algorithms used by ransomware, Cryptographic flaws in ransomware		
Module:7	Analysis of Malicious Documents and Malware Attacks	3 hours
File formats: OLE2, OOXML, RTF, PDF - Malicious macro - Document exploits – OLE tools, Threat Intelligence, IOCs, Security solutions		
Module:8	Contemporary Topics	2 hours
Guest Lecture from Industry and R & D Organizations		
		Total Lecture hours: 45 hours
		Total Tutorial hours: 15 hours
Text Book(s)		
1.	Alexey Klymenov, Amr Thabet , "Mastering Malware Analysis: The complete malware analyst's guide to combating malicious software, APT, cybercrime, and IoT attacks",2019, First Edition, Packt publishing	
Reference Books		
1.	Michael Sikorski, Andrew Honig , "Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software",2012, No Starch Press	



DISCIPLINE ELECTIVE COURSES

(Artificial Intelligence and Machine Learning)

Course Code	Course Title	L	T	P	C
UCSC311L	Artificial Intelligence	3	1	0	4
Pre-requisite		Syllabus version			
		1.0			
Course Objectives:					
1. To establish theoretical knowledge and understanding in the field of Artificial Intelligence and identify					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

- its possible applications
2. To familiarize oneself with AI techniques for problem-solving, planning and knowledge inference systems capability
 3. To develop and design AI techniques to make decisions in complex uncertain environments

Course Outcomes:

1. Understand the foundation and applications of Artificial Intelligence
2. Use state space search and heuristic techniques for solving search problems
3. Apply randomized search and emergent systems for making decisions on complex problems
4. Use classical CSP techniques for selecting suitable actions to achieve a specific goal
5. Demonstrate the implications of planning and logics in artificial intelligence

Module:1	Introduction	5 hours
-----------------	---------------------	----------------

Artificial Intelligence - Historical Backdrop - Mind and Body – AI in the Last Century - Applications of AI - The Turing Test – Intelligent Decision - The Bottom Line – Topics in AI

Module:2	State Space Search	6 hours
-----------------	---------------------------	----------------

Generate and Test- Simple Search – Depth First Search – Breadth First Search – Comparison of BFS and DFS – Quality of Solution – Depth Bounded DFS – Depth First Iterative Deepening - Case Study: Water Jug Problem

Module:3	Heuristic Search	7 hours
-----------------	-------------------------	----------------

Heuristic Functions – Best First Search – Hill Climbing – Local Maxima – Solution Space Search – Variable Neighborhood Descent – Beam Search – Tabu Search – Peak to Peak Methods - Case Study: Traveling Salesman Problem

Module:4	Randomized Search and Emergent Systems	7 hours
-----------------	---	----------------

Iterated Hill Climbing – Simulated Annealing – Genetic Algorithms – The Travelling Salesman Problem – Neural Network – Emergent Systems – Ant Colony Optimization - Case Study: Knapsack Problem

Module:5	Constraint Satisfaction Problems	5 hours
-----------------	---	----------------

N – Queens – Constraint Propagation – Scene Labelling – Higher Order Consistency – Directional Consistency – Algorithm Backtracking – Look-Ahead Strategies – Strategic Retreat - Case Study: Map Coloring Problem

Module:6	Logic and Inferences	6 hours
-----------------	-----------------------------	----------------

Formal Logic – Propositional Logic – Propositional Resolution – First Order Logic – Incompleteness - Forward Chaining – Resolution Refutation of FOL – Deductive Retrieval – Backward Chaining – Second Order Logic - Case Study: Machine Translations

Module:7	Planning	7 hours
-----------------	-----------------	----------------

The STRIPS Domain – Forward State Space Planning - Backward State Space Planning – Goal Stack Planning – Plan Space Planning – A Unified Framework for Planning - Case Study: Robotic Arm problem

Module:8	Contemporary Topics	2 hours
-----------------	----------------------------	----------------

Guest Lecture from Industry and R & D Organizations

	Total Lecture hours:	45 hours
	Tutorial Hours:	15 hours

Text Book(s)

- | | |
|----|--|
| 1. | Deepak Khemani, "A First Course in Artificial Intelligence", 2017, First Edition, McGraw Hill Education, India |
|----|--|

Reference Books

- | | |
|----|---|
| 1. | Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 2022, Fourth Edition, Pearson, India |
|----|---|

Mode of Evaluation: CAT, Written assignment, Quiz, FAT and Seminar

Recommended by Board of Studies	01-11-2023
---------------------------------	------------



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Approved by Academic Council	No. 72	Date	13-12-2023
------------------------------	--------	------	------------

Course Code	Course Title	L	T	P	C
UCSC312L	Machine Learning	3	0	0	3
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To understand the basic concepts of Machine Learning					
2. To understand and build the supervised and unsupervised learning models					
3. To learn and understand the concept of neural networks and deep learning					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Outcomes:			
1. Identify the basic concepts of Machine Learning and Training model			
2. Understand and distinguish between types of learning			
3. Identify and apply the appropriate machine learning techniques for classification			
4. Analyze the unsupervised learning techniques			
5. Analyze the concept of Neural Network			
Module:1	Introduction to Machine Learning	5 hours	
Fundamentals of Machine Learning – Applications -Types of Machine Learning – Challenges of Machine Learning – Testing and Validating			
Module:2	Training a ML Model	5 hours	
End-to-End Machine Learning Project – Working with Real Data – Get the Data – Explore and Visualize the Data – Prepare the Data for Machine Learning Algorithms			
Module:3	Classification and Regression	8 hours	
Support Vector Machine – Naive Bayes – Decision Tree – KNN algorithm - Regression – Linear Regression – Ridge Regression			
Module:4	Ensemble Approaches	5 hours	
Voting Classifiers – Bagging and Pasting – Random Forests – Boosting – Stacking			
Module:5	Dimensionality Reduction	5 hours	
Approaches for Deduction – Principal Component Analysis – Random Projection – Locally Linear Embedding			
Module:6	Unsupervised Learning	7 hours	
K-means clustering - Limits of K-means – Hierarchical clustering- expected maximization algorithm			
Module:7	Artificial Neural Network	8 hours	
Biological to Artificial Neurons – Logic Computations with Neurons – Perceptron - Multilayer Perceptron and Back propagation			
Module:8	Contemporary Issues	2 hours	
Guest Lecture from Industry and R & D Organizations			
Total Lecture hours:			45 hours
Text Book(s)			
1.	Aurelien Geron, “Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow”, 2019, Second Edition, O'Reilly Media, Inc.		
2.	Ethem Alpaydin, “Introduction to Machine Learning”, 2020, Fourth Edition, , MIT Press.		
Reference Books			
1.	Aurélien Géron, “Neural networks and deep learning “,2018, O'Reilly Media.		
Mode of Evaluation: CAT, Written assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023

Course Code	Course Title	L	T	P	C
UCSC312P	Machine Learning Lab	0	0	2	1
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To equip students with the knowledge about machine learning algorithms					
2. To provide experience in applying machine learning algorithms to practical problems.					
Course Outcomes:					
1. Use appropriate algorithms for problem solving					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

2. Understand complexity of Machine Learning algorithms and their limitations			
3. Capable of performing experiments in Machine Learning using real-world data.			
Indicative Experiments			Hours
1.	Python Libraries Implementation of python libraries such as NumPy, Math and SciPy. Develop a python program to create a NumPy array and apply the matrix operations Develop a python program to create pandas data frame from list of data. Develop a python program to analyze the dataset using pandas and matplotlib library Develop a program to compute Mean, Median, Mode, Variance and Standard Deviation using Datasets.		4 Hours
2	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file		2 Hours
3	Develop a python program to implement Simple linear regression and plot the graph		3 Hours
3.	Develop a python program to classify the English text using Naïve baye's theorem		3 Hours
4.	Develop a python program to implement single layer perceptron. Implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.		4 Hours
5.	Demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.		2 Hours
6.	Implement the basic Averaging method & Max Voting ensemble methods to focus on classification problem.		2 Hours
7.	Implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.		2 Hours
8.	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using the k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.		2 Hours
9.	Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.		2 Hours
10.	Mini project – develop a simple application using TensorFlow / keras		4 Hours
Total Laboratory Hours			30 hours
Book(s)			
1. Aurelien Geron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", 2019, Second Edition, O'Reilly Media, Inc.			
2. Ethem Alpaydin, "Introduction to Machine Learning", 2020, Fourth Edition, , MIT Press			
Mode of assessment: CAT, Exercises, FAT			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC313L	Image Processing	3	0	0	3
Pre-requisite		Syllabus version			
Course Objectives:					
1. To understand and analyze the fundamental principles of digital image processing.					
2. To apply image enhancement, and restoration techniques.					
3. To demonstrate the image segmentation and morphological operations					
Course Outcomes:					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Text Book(s)			
1. Rafael C Gonzalez, Richard E Woods, "Digital Image Processing", 2018, Fourth Edition - Wesley Publishing Company			
Reference Books			
1.	S Jayaraman, S Esakkirajan, T Veerakumar, "Digital Image Processing", 2019, MC Graw Hill Education Pvt. Ltd		
2.	Anil K Jain, "Fundamentals of Digital Image Processing", 2015, Prentice Hall of India		
3.	William K. Pratt, "Digital Image Processing", 2014, John Wiley & Sons		
Mode of Evaluation: CAT, Written assignment, Quiz, FAT and Seminar			
Recommended by the Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023
1. Interpret the fundamental concepts of a digital image processing system. 2. Analyze images in spatial and frequency domains using various transforms. 3. Evaluate the techniques for image enhancement and image restoration. 4. Apply thresholding and region-based image segmentation techniques 5. Demonstrate the geometrical structures of an image using morphological processing			
Module:1	Digital Image Fundamentals		5 Hours
Origins of digital image processing – Examples of Fields that use Digital Image Processing – Fundamental Steps in Digital Image Processing- Components of an Image Processing Systems			
Module:2	Sampling And Quantization		6 Hours
Image Sampling and Quantization, Representing Digital Images, Spatial and Intensity Resolution, and Image Interpolation- The basic relationship between pixels			
Module:3	Spatial domain image enhancement		6 Hours
Intensity Transformation Functions - Histogram Processing – Spatial Filtering, Spatial Correlation and Convolution- Smoothing and Sharpening of Spatial Filters			
Module:4	Frequency Domain Image Enhancement		7 Hours
Introduction to transforms, 2D Discrete Fourier Transform and its properties - Filtering in Frequency Domain - Image Smoothing - Image Sharpening			
Module:5	Image Restoration		7 Hours
Model of Image Degradation / Restoration - Noise models – Restoration in the Presence of Noise through Spatial Filtering: Mean Filter, Order Statistic Filter, Adaptive Filter - Periodic Noise Reduction by Frequency Domain Filtering			
Module:6	Image Segmentation		6 Hours
Point, Line and Edge Detections - Thresholding – Region Based Segmentation: Region Growing, Region Splitting and Merging			
Module 7	Morphological Processing		6 Hours
Morphological operations- Erosion, Dilation, Opening and Closing, Applications of morphological processing			
Module 8	Contemporary Topics		2 Hours
Guest Lecture from Industry and R & D Organizations			
Total Lecture hours:			45 Hours



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC313P	Image Processing Lab	0	0	2	1
Pre-requisite		Syllabus Version			



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

		1.0	
Course Objectives:			
1. To present a clear exposition of image smoothing and sharpening techniques			
2. To provide the knowledge of image restoration techniques and morphological operations			
Course Outcomes:			
1. Understand the fundamentals of digital image processing and image transform techniques			
2. Apply different Image Smoothing & Sharpening algorithms in spatial and frequency domains			
3. Analyze the threshold and edge based image segmentation and morphological processing			
Indicative Experiments			Hours
1.	Basic matrix operations on image		3 Hours
2.	Implementation of point process techniques		3 Hours
3.	Implementation of spatial domain smoothing and sharpening techniques		3 Hours
4.	Implementation of DFT and inverse DFT techniques		3 Hours
5.	Implementation of frequency domain smoothing and sharpening techniques		3 Hours
6.	Implementation of spatial domain restoration techniques		3 Hours
7.	Implementation of frequency domain restoration techniques		3 Hours
8.	Implementation of Image segmentation using point line and edge detection approach		3 Hours
9.	Implementation of threshold based segmentation		3 Hours
10.	Boundary extraction using morphological operations		3 Hours
Total Laboratory Hours			30 Hours
Text Book(s)			
1.	Rafael.C,Gonzalez, Richard E Woods, "Digital Image Processing",2018,Fourth Edition, Pearson.		
2.	S Jayaraman , S Esakkirajan, T Veerakumar, "Digital Image Processing" , 2019, MC Graw Hill Education		
Mode of assessment: CAT, Exercises, FAT			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023

Course Code	Course Title	L	T	P	C
UCSC314L	Deep Learning	3	0	0	3
Pre-requisite		Syllabus version			



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

		v.1.0
Course Objectives:		
<ol style="list-style-type: none"> 1. To learn the basics of deep learning and the learning strategies in deep neural networks 2. To acquire knowledge on the concepts of Convolutional Neural Networks and recurrent networks along with their applications 3. To apply Deep Learning techniques to solve various real-world problems 		
Course Outcomes:		
<ol style="list-style-type: none"> 1. Familiarize the basic concepts of learning algorithms and the significance of deep learning 2. Understand the process of regularization and optimization methods for deep neural networks 3. Construct the convolutional neural networks with appropriate building blocks 4. Recognize the architecture of recurrent neural networks for solving time series problems 5. Explore the concepts of modern practical deep networks to solve real-world problems 		
Module:1	Artificial Neural Network	7 hours
Basic concepts of Artificial Neurons,MP Neurons, Single and Multi-layer Perceptron, Perceptron learning algorithm, Feed-Forward Neural network - Types of Learning Algorithms: Supervised and Unsupervised algorithms, Significance of Deep Learning, Applications		
Module:2	Deep Feedforward Networks	7 hours
Gradient-Based Learning-Hidden Units-Architecture Design-Back-Propagation and Other Differentiation Algorithms		
Module:3	Regularization	4 hours
Parameter Norm Penalties: Parameter Regularization, L1 Regularization - Constrained Optimization using Norm Penalties - Early Stopping – Dropout		
Module:4	Convolutional Networks	7 hours
Convolution Operation - Pooling – Convolution and Pooling as an Infinitely Strong Prior - Variants of the Basic Convolution Function		
Module:5	Auto Encoders	4 hours
Undercomplete Autoencoders - Regularized Autoencoders - Stochastic Encoders and Decoders - Applications of Autoencoders		
Module:6	Sequence Models: Recurrent Nets	7 hours
Unfolding Computational Graphs - Recurrent Neural Networks – Deep Recurrent Networks – Recursive Neural Networks-Long Short-Term Memory and Other Gated RNNs		
Module:7	Practical Methodologies and Applications	7 hours
Performance Metrics-Default Baseline Models - Selecting Hyperparameters- Debugging Strategies-Large-Scale Deep Learning - Speech Recognition		
Module:8	Contemporary Issues	2 hours
Guest Lecture from Industry and R & D Organizations		
	Total Lecture hours:	45 hours
Text Book(s)		
1.	Ian Goodfellow, Yoshua Bengio and Aaron Courville, “Deep learning”, 2016, MIT Press	
Reference Books		
1.	Dipanjan Sarkar, Raghav Bali, Tamoghna Ghosh, Hands-On Transfer Learning with Python, 2018, First edition, Packt Publishing	
2.	John D. Kelleher, Deep Learning, 2019, First edition, The MIT Press	
3.	Charu C. Aggarwal, Neural Networks and Deep Learning: A Textbook, 2018, First Edition, Springer	
Mode of Evaluation: CAT, Written assignment, Quiz, FAT and Seminar		
Recommended by Board of Studies	01-11-2023	
Approved by Academic Council	No. 72	Date 13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC314P	Deep Learning Lab	0	0	2	1
Pre-requisite		Syllabus version			



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

		V.1.0	
Course Objectives:			
1. To understand the basics of learning strategies, optimization and regularization techniques in deep neural networks			
2. To apply Deep Learning techniques to solve various real-world problems			
Course Outcomes:			
1. Familiarize the basic concepts of learning algorithms and artificial neural networks			
2. Understand the process of regularization and optimization methods for deep neural networks			
3. Construct the convolutional neural networks and recurrent neural networks for solving real-world problems			
Indicative Experiments			Hours
1.	Implementation of Simple Neural Network		3 Hours
2.	XOR implementation using Neural Networks		3 Hours
3.	Implementation of neural networks with regularization and fine-tuning techniques		3 Hours
4.	Usage of Back Propagation neural network for classification problems		3 Hours
5.	Implementation of different auto-encoders		3 Hours
6.	Implementation of CNN for image-based datasets		3 Hours
7.	Implementation of CNN for other applications		3 Hours
8.	Implementation of a simple Recurrent Neural Network		3 Hours
9.	Implementation of a LSTM and BLSTM for a specific application		3 Hours
10.	Implementation of a GRU and BGRU for a specific application		3 Hours
Total Laboratory Hours			30 hours
Text Book(s)			
1.	Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep learning, 2016, MIT Press		
Reference Books			
1.	Dipanjan Sarkar, Raghav Bali, Tamoghna Ghosh, Hands-On Transfer Learning with Python, 2018, First edition, Packt Publishing		
2.	John D. Kelleher, Deep Learning, 2019, First edition, The MIT Press		
Mode of assessment: CAT, Exercises, FAT			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023

Course code	Course Title	L	T	P	C
UCSC315L	Human Computer Interaction	3	1	0	4
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

<ol style="list-style-type: none"> To introduce the concepts that are necessary to produce effective interface designs. To gain knowledge about development methodologies, evaluation techniques, task analysis, and prototyping. To understand the conceptual frameworks for cognition, communication and collaboration. 			
Course Outcome			
<ol style="list-style-type: none"> Understand human computer interaction principles, requirements and cognition frameworks Summarize the concepts of collaborative and interaction design process Understand the prototyping techniques and guidelines for the conceptual and physical design Analyze the evaluation paradigms and framework for coherence and contextual design process. Create the predictive models to design mobile communicators 			
Module:1	Introduction to Interaction		5 hours
Interaction design: Good and Poor design, Process of interaction design; Goals: Usability, and User experience goals; Heuristics and usability principles- Nielsen's Heuristics			
Module:2	Conceptualization and Cognition		6 hours
Conceptual models - Conceptual models based on activities - Conceptual models based on objects- Interface metaphors- Paradigms of interaction- Conceptual frameworks for cognition: Mental models, Information processing, External Cognition			
Module:3	Designing for collaboration and communication		6 hours
Social mechanisms used in communication and collaboration: Conversational mechanisms, Coordination mechanisms, Awareness mechanisms- Interaction design and lifecycle models			
Module:4	Identifying needs and establishing requirements		6 hours
Requirements, Data gathering, Data interpretation and analysis, Task description and analysis: Scenarios, Use cases, Hierarchical Task Analysis (HTA)			
Module:5	Design, prototyping and construction		7 hours
Low fidelity and high fidelity prototyping, compromises in prototyping, Conceptual design and Physical design- Guidelines for physical design - Shneiderman's eight golden rules of interface design			
Module:6	User-centered approaches, Evaluation Framework		7 hours
Introduction, Coherence and Contextual design, Participatory design: PICTIVE and CARD; Evaluation paradigms and Techniques, DECIDE: Framework for evaluation			
Module:7	Testing, modeling users, Design and Evaluation		6 hours
User testing, predictive models; Designing mobile communicators: Nokia's approach to developing a communicator, Philip's approach to designing a communicator for children			
Module:8	Contemporary Topics		2 hours
Guest Lecture from Industry and R & D Organizations			
			Total Lecture hours: 45 hours
			Total Tutorial hours: 15 hours
Text Book(s)			
1.	Helen Sharp, Jennifer Preece, Yvonne Rogers, "Interaction Design: Beyond Human-Computer Interaction", 2019, Fifth edition, Wiley.		
Reference Books			
1.	Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, "Designing the User Interface: Strategies for Effective Human-Computer Interaction", 2016 Sixth edition, Pearson.		
Mode of Evaluation: CAT, Written assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UBSC316L	Computer Vision	3	1	0	4
Pre-requisite		Syllabus version			
		v.1.0			



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Objectives			
1. To identify major image analysis approaches involved in computer vision			
2. To understand concepts of image formation, feature extraction and image analysis			
3. To emphasize both the theoretical and practical aspects of computing with images			
Course Outcome			
1. Understand key concepts related to Image formation and processing			
2. Comprehend techniques in Recognition, feature detection and matching			
3. Interpret significant methods in motion estimation			
4. Recognize basic skills to reconstruct 3D images			
5. Understand concepts in image-based rendering			
Module:1	Introduction and Image Formation		5 hours
Computer Vision – Geometric primitives and transformation – Photometric Image Formation – The digital camera			
Module:2	Image Processing		5 hours
Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Geometric transformations			
Module:3	Recognition		7 hours
Instance recognition-Image Classification - Object detection- Semantic segmentation – Video Understanding			
Module:4	Feature Detection and Matching		7 hours
Points and Patches - Edges and Contours - Lines and Vanishing Points -Segmentation			
Module:5	Motion Estimation		6 hours
Translational alignment - Parametric motion - Optical flow - Layered motion			
Module:6	3D Reconstruction		6 hours
Shape from X – 3D Scanning - Surface representations - Point-based representations- Volumetric representations - Model-based reconstruction			
Module:7	Image-based rendering		7 hours
View interpolation Layered depth images - Light fields and Lumi graphs - Environment mattes - Video-based rendering			
Module:8	Contemporary Topics		2 hours
Guest Lecture from Industry and R & D Organizations			
			Total Lecture hours:
			45 hours
			Total Tutorial hours:
			15 hours
Text Book(s)			
1.	R. Szeliki, “Computer Vision: Computer Vision: Algorithms and Applications”, 2021, Second edition, Springer-Verlag London Limited		
Reference Books			
1.	D. A. Forsyth, J. Ponce, “Computer Vision: A Modern Approach”, 2015, Second edition, Pearson Education		
2.	S. Khan, H. Rahmani, S. Shah and M. Bennamoun, “A Guide to Convolutional Neural Networks for Computer Vision”, 2018, First edition, Morgan & Claypool Publishers, Australia		
Mode of Evaluation: CAT, Written assignment, Quiz, FAT and Seminar			
Recommended by		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI



VIT[®]
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

DISCIPLINE ELECTIVE COURSES (Data Science)

Course Code	Course Title	L	T	P	C
UCSC312L	Machine Learning	3	0	0	3
Pre-requisite		Syllabus version			



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

v.1.0

Course Objectives:

1. To understand the basic concepts of Machine Learning
2. To understand and build the supervised and unsupervised learning models
3. To learn and understand the concept of neural networks and deep learning

Course Outcomes:

1. Identify the basic concepts of Machine Learning and Training model
2. Understand and distinguish between types of learning
3. Identify and apply the appropriate machine learning techniques for classification
4. Analyze the unsupervised learning techniques
5. Analyze the concept of Neural Network

Module:1 Introduction to Machine Learning 5 hours

Fundamentals of Machine Learning – Applications -Types of Machine Learning – Challenges of Machine Learning – Testing and Validating

Module:2 Training a ML Model 5 hours

End-to-End Machine Learning Project – Working with Real Data – Get the Data – Explore and Visualize the Data – Prepare the Data for Machine Learning Algorithms

Module:3 Classification and Regression 8 hours

Support Vector Machine – Naive Bayes – Decision Tree – KNN algorithm - Regression – Linear Regression – Ridge Regression

Module:4 Ensemble Approaches 5 hours

Voting Classifiers – Bagging and Pasting – Random Forests – Boosting – Stacking

Module:5 Dimensionality Reduction 5 hours

Approaches for Deduction – Principal Component Analysis – Random Projection – Locally Linear Embedding

Module:6 Unsupervised Learning 7 hours

K-means clustering - Limits of K-means – Hierarchical clustering- expected maximization algorithm

Module:7 Artificial Neural Network 8 hours

Biological to Artificial Neurons – Logic Computations with Neurons – Perceptron - Multilayer Perceptron and Back propagation

Module:8 Contemporary Issues 2 hours

Guest Lecture from Industry and R & D Organizations

Total Lecture hours: 45 hours

Text Book(s)

1. Aurelien Geron, “Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow”, 2019, Second Edition, O'Reilly Media Inc
2. Ethem Alpaydin, “Introduction to Machine Learning”, 2020, Fourth Edition, , MIT Press.

Reference Books

1. Aurélien Géron, “Neural networks and deep learning “,2018, O'Reilly Media.

Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar

Recommended by Board of Studies 01-11-2023

Approved by Academic Council No. 72 Date 13-12-2023

Course Code	Course Title	L	T	P	C
UCSC312P	Machine Learning Lab	0	0	2	1
Pre-requisite		Syllabus version			
		v.1.0			

Course Objectives:

1. To equip students with the knowledge about machine learning algorithms
2. To provide experience in applying machine learning algorithms to practical problems.



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Outcomes:			
1. Use appropriate algorithms for problem solving			
2. Understand complexity of Machine Learning algorithms and their limitations			
3. Capable of performing experiments in Machine Learning using real-world data			
Indicative Experiments			Hours
1.	Python Libraries Implementation of python libraries such as NumPy, Math and SciPy. Develop a python program to create a NumPy array and apply the matrix operations Develop a python program to create pandas data frame from list of data. Develop a python program to analyze the dataset using pandas and matplotlib library Develop a program to compute Mean, Median, Mode, Variance and Standard Deviation using Datasets.		4 Hours
2	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file		2 Hours
3	Develop a python program to implement Simple linear regression and plot the graph		3 Hours
3.	Develop a python program to classify the English text using Naïve baye's theorem		3 Hours
4.	Develop a python program to implement single layer perceptron. Implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.		4 Hours
5.	Demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.		2 Hours
6.	Implement the basic Averaging method & Max Voting ensemble methods to focus on classification problem.		2 Hours
7.	Implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.		2 Hours
8.	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using the k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.		2 Hours
9.	Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.		2 Hours
10.	Mini project – develop a simple application using TensorFlow / keras		4 Hours
Total Laboratory Hours			30 hours
Book(s)			
1. Aurelien Geron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", 2019, Second Edition, O'Reilly Media Inc			
2. Ethem Alpaydin, "Introduction to Machine Learning", 2020, Fourth Edition, MIT Press			
Mode of assessment: CAT, Exercises, FAT			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC317L	Big Data Technologies	3	0	0	3
Pre-Requisite		Syllabus version			
		1.0			
Course Objectives:					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

<ol style="list-style-type: none"> 1. To understand the basics of Big Data and its analytics methods 2. To provide an overview of Apache Hadoop and its Eco System 3. To analyze unstructured data using appropriate tools and technologies 		
Course Outcomes:		
<ol style="list-style-type: none"> 1. Identify big data systems and design for analysis 2. Understand the Hadoop Eco System and Mapreduce framework 3. Analyze different types of data stored in Hadoop for decision making 4. Apply Hadoop related tools and understand the YARN architecture 5. Create and Process data using Spark and NoSQL 		
Module:1	Introduction to Big Data Concepts	5 hours
Evolution of Big data – Structuring Big data, Elements of Big data, Different Types of Analytics – Exploring the use of Big Data		
Module:2	Understanding Hadoop Eco system	5 hours
Introduction to Hadoop, Terminologies; Hadoop Distributed File System - MapReduce, Hadoop YARN, Hbase, Hive - Pig and Pig Latin, Sqoop, ZooKeeper - Flume, Oozie		
Module:3	MapReduce Framework	6 hours
The MapReduce Framework - Techniques to Optimize MapReduce Jobs - Uses of MapReduce - Role of HBase in Big Data Processing - Exploring the Big Data Stack - Virtualization and Big Data - Virtualization Approaches		
Module:4	Hadoop Database	6 hours
RDBMS and Big Data - Non-Relational Database, Polyglot Persistence - Integrating Big Data with Traditional Data Warehouses - Big Data Analysis and Data Warehouse - Selecting the Suitable Hadoop Data Organization for Applications		
Module:5	Understanding Hadoop YARN	7 hours
Background of YARN, Advantages of YARN - YARN Architecture, Working of YARN - YARN Schedulers - Backward Compatibility with YARN - YARN Configurations, YARN Commands - Log Management in Hadoop 1 - Advantages of YARN		
Module:6	Hadoop Related tools	8 hours
Introducing Pig, Running Pig - Getting Started with Pig Latin - Working with Operators in Pig - Working with Functions in Pig - Using Oozie - Introducing Oozie - Oozie Coordinator, Oozie Bundle - Oozie Parameterization with EL - Oozie Job Execution Model - Accessing Oozie, Oozie SLA		
Module:7	No SQL Data Management	6 hours
Introduction to NoSQL, Aggregate Data Models - Key Value Data Model, Document Databases - Relationships, Graph Databases - Schema-Less Databases, Materialized Views - Distribution Models, Sharding - MapReduce Partitioning and Combining - Composing MapReduce Calculations		
Module:8	Contemporary Issues	2hours
Guest Lecture from Industry and R & D Organizations		
Total Lecture hours:		45 hours
Text Book(s)		
1.	DT Editorial Services, "Big Data (covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization) Black Book" 2017, Dreamtech Press.	
Reference Books		
1.	Raj Kamal, Preeti Saxena, "Big Data Analytics, Introduction to Hadoop, Spark, and Machine-Learning" , 2019, McGraw-Hill Education	
2.	Paul Zikopoulos, Chris Eaton, Dirk Deroos, Tom Deutsch, " Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data",2017, McGraw-Hill Education	
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar		



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Recommended by Board of Studies			
Approved by Academic Council		Date	

Course Code	Course Title	L	T	P	C
UCSC317P	Big Data Technologies Lab	0	0	2	1
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To analyze unstructured data using appropriate tools and technologies					
2. To develop R programs for data stored in HDFS					
Course Outcomes:					
1. Apply MapReduce based analysis					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

2. Create and Process data using Spark and NoSQL	
3. Develop R programs for analysis and visualization with data stored in HDFS	
Indicative Experiments	
	Hours
1. Use different HDFS commands	2 Hours
2. File R/W programs	2 Hours
3. Programs using MapReduce Paradigm (Word count, Matrix Multiplication).	6 Hours
4. Creating Hive database and applying queries	4 Hours
5. Creating Hbase database and applying queries	4 Hours
6. Writing SparkQL queries	4 Hours
7. Visualizing data using R with different types of graphs and charts	4 Hours
8. Importing data from csv, xls files and HDFS and analyzing	4 Hours
Total Laboratory Hours	
30 hours	
Text Book(s)	
1	DT Editorial Services, "Big Data (covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization) Black Book" 2017, Dreamtech Press.
Reference Book(s)	
1	Raj Kamal, Preeti Saxena, "Big Data Analytics, Introduction to Hadoop, Spark, and Machine-Learning", 2019, McGraw-Hill Education.
2	Paul Zikopoulos, Chris Eaton, Dirk Deroos, Tom Deutsch, " Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", 2017, McGraw-Hill Education
Mode of assessment: CAT, Exercises, FAT	
Recommended by Board of Studies	01-11-2023
Approved by Academic Council	No. 72 Date 13-12-2023

Course Code	Course Title	L	T	P	C
UCSC318L	Exploratory Data Analytics	3	0	0	3
Pre-requisite		Syllabus version			
		V.1.0			
Course Objectives:					
1. To explore the data using various tools					
2. To visualize and transform data					
3. To analyze and evaluate data using statistical methods					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Outcomes:			
1. Explore and analyze data using various tools			
2. Visualize and transform data using charts and frames			
3. Gain knowledge in correlation and time-series analysis			
4. Able to apply techniques for handling multi-dimensional data			
5. Analyze the suitable exploratory data analysis methods in machine learning applications			
Module: 1	Introduction to Data Analytics and Exploratory Data Analysis		4 hours
Understanding data science -The significance of EDA-Making sense of data-Comparing EDA with classical and Bayesian analysis-Software tools available for EDA			
Module: 2	Visual Aids for EDA		7 hours
Technical requirements - Bar charts - Scatter plot- Area plot and stacked plot - Pie chart - Table chart - Polar chart – Histogram - Lollipop chart			
Module: 3	Data Transformation		7 hours
Loading the dataset - Data transformation - Data analysis -Merging database-style dataframes - Transformation techniques			
Module: 4	Descriptive Statistics		7 hours
Technical requirements- Understanding statistics - Measures of central tendency - Measures of dispersion - Grouping Datasets			
Module: 5	Correlation Analysis and Time Series Analysis		6 hours
Types of analysis: Understanding univariate, bivariate, multivariate analysis - Understanding the time series dataset - TSA with Open Power System Data			
Module: 6	Hypothesis Testing and Regression		6 hours
Hypothesis testing principle - Types of Hypothesis testing - T-test - p-hacking - Understanding regression			
Module: 7	Model Development and Evaluation		6 hours
Types of machine learning - Understanding supervised learning - Understanding unsupervised learning - Understanding reinforcement learning - Unified machine learning workflow			
Module: 8	Contemporary Topics		2 hours
Guest Lecture from Industry and R & D Organizations			
			Total Lecture hours: 45 hours
Text Book(s)			
1.	Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysis with Python” First Edition, 2020, Packt Publishing.		
Reference Books			
1.	Claus Wilke, “Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures”, 2019, O’Reilly.		
2.	Craig K. Enders, “Applied Missing Data Analysis”, Second Edition, 2022, Guilford Press		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC318P	Exploratory Data Analytics Lab	0	0	2	1
Pre-requisite		Syllabus version			
		1.0			
Course Objectives:					
1. To emphasize the importance of programming in EDA					
2. To familiarize the student with Python programming for various tasks					
Course Outcomes:					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

1. Gain practical knowledge on various methods to handle missing data			
2. Identify the suitable plots for data and conclude the characteristics of the data			
3. Explore the importance of exploratory data analysis in machine learning practically			
Indicative Experiments			Hours
1.	Practical exercises on data transformation and pre-processing methods.		2 Hours
2.	Practical exercises on missing data methods, imputation methods, multiple imputation		2 Hours
3	Practical exercises on displaying plots of categorical data.		2 Hours
4	Practical exercises on displaying plots of numerical data.		2 Hours
5	Practical exercises on displaying plots of frequency distribution.		2 Hours
6	Practical exercises on displaying plots of bivariate numerical data.		2 Hours
7.	Practical exercises on uniform distribution, normal distribution, binomial distribution		2 Hours
8.	Practical exercises on a measure of central tendency: mean, median, mode, standard deviation.		2 Hours
9	Practical exercises on univariate, bivariate, and multivariate analysis		2 Hours
10	Practical exercises on measure dispersion.		2 Hours
11	Practical exercises on correlation analysis		2 Hours
.			
12	Practical exercises on time series analysis		2 Hours
.			
13	Practical exercises on plotting of clusters using k-means		2 Hours
.			
14	Practical exercises on word cloud		2 Hours
15	Practical exercises on regression		2 Hours
.			
Total Laboratory Hours			30 hours
Text Book(s)			
1.	Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", 2020, First Edition, Packt Publishing		
Reference Books			
1.	Claus Wilke, "Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures", 2019, O'Reilly		
2	Danyel Fisher and Miriah Meyer "Making Data Visual: A Practical Guide to Using Visualization for Insight", 2018, O'Reilly		
Mode of assessment: CAT, Exercises, FAT			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023

Course code	Course Title	L	T	P	C
UCSC319L	Data Visualization	3	1	0	4
Pre-requisite		Syllabus version			
		1.0			
Course Objectives :					
1. To understand the various types of data, and apply and evaluate the principles of data visualization					
2. Acquire skills to apply a structured approach and visualization techniques to create visualizations					



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

for a problem effectively and its associated dataset		
3. To create interactive visualization for better insight using various visualization tools		
Course Outcomes:		
<ol style="list-style-type: none"> 1. Identify the different data, and visualization types to bring out the insight 2. Relate the visualization to the problem based on the dataset to analyze and bring valuable insight from a large dataset 3. Design visualization dashboards and reports to support decision-making on large-scale data 4. Demonstrate the analysis of the large dataset using various visualization techniques and tools 5. Handle data and data visualizations in a manner that demonstrates an understanding of ethical considerations surrounding data 		
Module:1	Introduction to Data Visualization	6 hours
Data Visualization and its Importance – Overview of data visualization - From Graphics to Visualization- Graphics-Rendering Basics- Rendering the Height Plot- Texture Mapping- Transparency and Blending- Viewing		
Module:2	Data Representation and Visualization Pipeline	7 hours
Continuous Data - Discrete Datasets - Cell Types - Grid Types - Attributes - Advanced Data Representation - Conceptual Perspective - Implementation Perspective - Algorithm Classification		
Module:3	Scalar and vector Visualization	6 hours
Color Mapping - Designing Effective Colormaps – Contouring - Height Plots - Divergence and Vorticity - Vector Glyphs - Vector Color Coding - Displacement Plots - Stream Objects - Texture-Based Vector Visualization		
Module:4	Tensor Visualization	7 hours
Principal Component Analysis - Visualizing Components - Visualizing Scalar and vector PCA Information - Tensor Glyphs - Fiber Tracking - Fiber Rendering – Hyperstreamlines		
Module:5	Domain-Modeling Techniques	6 hours
Cutting – Selection - Grid Construction from Scattered Points - Grid-Processing Techniques		
Module:6	Image and Volume Visualization	6 hours
Image Data Representation - Image Processing and Visualization - Basic Imaging Algorithms - Shape Representation and Analysis - Volume Visualization Basics - Image Order Techniques - Object Order Techniques - Volume Rendering vs. Geometric Rendering		
Module:7	Information Visualization and Software	5 hours
Infovis vs. Scivis - Table Visualization - Visualization of Relations - Multivariate Data Visualization - Text Visualization - Imaging Software - Grid Processing Software - Information Visualization Software		
Module:8	Contemporary Issues	2 hours
Guest Lecture from Industry and R&D Organizations		
		Total Lecture hours: 45 hours
		Total Tutorial hours: 15 hours
Text Book(s)		
1.	Tamara Munzer, “Visualization Analysis and Design”, First edition, 2015, CRC Press.	
Reference Books		
1.	Ossama Embarak, “Data Analysis and Visualization Using Python Analyze Data to Create Visualizations for BI Systems”, 2018, APRESS.	
2.	Michael Fry, Jeffrey Ohlmann, Jeffrey Camm, James Cochran, “Data Visualization: Exploring and Explaining with Data”, 2021, South-Western College Publishing.	
3.	Avril Coghlan, “A little book of R for multivariate analysis”, First edition, 2013, Welcome Trust Sanger Institute	
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar		
Recommended by Board of Studies		01-11-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Approved by Academic Council	No. 72	Date	13-12-2023
------------------------------	--------	------	------------



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC320L	NoSQL Databases	3	0	0	3
Pre-requisite		Syllabus version			
		1.0			
Course Objectives:					
1. To explore the basics of NoSQL databases 2. To describe the main types of NoSQL databases and their architectures 3. To facilitate the students to choose correct type of NoSQL depends on the application requirements					
Course Outcomes:					
1. Explore distributed data processing and distributed databases 2. Understand the detailed architecture of NoSQL and its major types 3. Employ Key Data store and document data store in real time applications 4. Apply Columnar Data store as a backend for suitable applications 5. Explore Neo4J for graphical applications					
Module:1	Introduction to NoSQL Concepts	5 hours			
The Value of Relational Databases - Impedance Mismatch - Application and Integration Databases - Attack of the Clusters - The Emergence of NoSQL					
Module:2	Aggregate and Distribution Models	7 hours			
Aggregates -Key-Value and Document Data Models - Column-Family Stores – Relationships - Graph Databases - Schemaless Databases - Materialized Views - Modeling for Data Access - Single Server – Sharding – Master Slave Replication - Peer-to-Peer Replication - Combining Sharding and Replication					
Module:3	Consistency and Version Stamps	6 hours			
Update – Read – Relaxing Consistency - Relaxing Durability – Quorums - Business and System Transactions - Version Stamps on Multiple Nodes – Mapreduce					
Module:4	Key-Value and Document Databases	6 hours			
Key-Value Data Store - Features - Suitable Use Cases- - Document Database: Features - Suitable Use Cases					
Module:5	Column-Family Stores and Graph Databases	6 hours			
Column-Family Data Store: Features-Suitable Use Cases - Graph Database- Features-Suitable Use Cases					
Module:6	Schema Migrations and Polyglot Persistence	7 hours			
Schema Changes -Schema Changes in RDBMS - Schema Changes in a NoSQL Data Store - Disparate Data Storage Needs - Polyglot Data Store Usage - Service Usage over Direct Data Store Usage - Expanding for Better Functionality - Choosing the Right Technology- Enterprise Concerns with Polyglot Persistence- Deployment Complexity					
Module:7	Beyond NoSQL	6 hours			
File Systems - Event Sourcing - Memory Image - Version Control - XML Databases - Object Databases-visualize relation -Choosing Your Database - arangodb					
Module:8	Contemporary Topics	2 hours			
Guest Lecture from Industry and R & D Organizations					
Total Lecture hours:					45 hours
Text Book(s)					
1.	Pramod J. Sadalage and Martin Fowler, “NoSQL Distilled: A Brief Guide to the				



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

	Emerging World of Polyglot Persistence", 2019, Addison Wesley		
Reference Books			
1.	Jeff Carpenter, Eben Hewitt , "Cassandra: The Definitive Guide", 2020,Third Edition, O'Reilly Media, Inc		
2	Daniel G. McCreary and Ann M. Kelly, "Making Sense of NoSQL", 2013, Manning publisher		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC320P	NoSQL Databases Lab	0	0	2	1
Pre-requisite		Syllabus version			
		1.0			
Course Objectives:					
1. To explore the basics of NoSQL databases and the difference between the NoSQL database and Traditional relational DBMS. 2. To describe the main types of NoSQL databases and their architectures. 3. To facilitate the students to choose the correct type of NoSQL based on the application requirements					
Course Outcomes:					
1. Able to design appropriate data store using MongoDB and perform CRUD operations and queries 2. Apply Cassandra Datastore for real-time applications to do analysis using CRUD and query operations. 3. Exposure to Neo4J and ability to solve graphical processing applications					
Indicative Experiments					Hours
1.	Redis Commands				2 Hours
2.	Simulation of session variables and values using Redis Commands				2 Hours
3.	MongoDB CRUD operations for simple and collection data types				2 Hours
4.	Mongo DB indexing and queries				3 Hours
5.	MongoDB with Java or Python				3 Hours
6.	Cassandra CRUD operations for all data types				3 Hours
7.	Cassandra indexing, queries				3 Hours
8.	Cassandra with java or Python				3 Hours
9.	Neo4J Node and relationship creations				3 Hours
10	Queries with Neo4J				2 Hours
11	Queries with Neo4j				2 Hours
12	Neo4j with Java or Python				2 Hours
Total Laboratory Hours					30 hours
Text Book(s)					
1.	Pramod J. Sadalage and Martin Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", 2019, Addison Wesley				
Reference Books					
1.	Kristina Chodorow, "Mongo DB the Definitive Guide", 2013, O'Reilly Media.				
2.	Jeff Carpenter, Eben Hewitt, "Cassandra: The Definitive Guide", Third Edition, 2020, O'Reilly Media, Inc.				
Mode of assessment: CAT, Exercises, FAT					
Recommended by Board of Studies		01-11-2023			
Approved by Academic Council		No. 72	Date	13-12-2023	



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Course Code	Course Title	L	T	P	C
UCSC321L	Social Network Analytics	3	1	0	4
Pre-requisite		Syllabus version			
		v.1.0			
Course Objectives:					
1. To understand the insights and components of Social Network 2. To analyze network measures and link predictions 3. To apply the concept of community structure, detection, and prediction in social networks					
Course Outcomes:					
1. Understand the social network analysis and its applications 2. Analyze the importance of nodes in a network and find the dependencies among the nodes using views of network models 3. Evaluate a social network using different measures and metrics 4. Analyze the different link analysis algorithms and link prediction methods in social network applications 5. Develop social network applications for different types of communities					
Module:1	Introduction to Social Network Analysis	4 hours			
Social Network Analysis - Need for Social Networks - Applications of Social Network Analysis – Healthcare – Social Media & E-Commerce – Web and Cyberspace – Police & Military – Scientific Research & Academic Collaboration – Graphical Representation					
Module:2	Networks, View, and its Applications	5 hours			
Networks – Types of Networks – Link-centric view - Combining Node-centric and Link-centric view – Local view – Temporal View – Generalized Views – Popular Real World Network - Three Levels of Social Network Analysis - Historical Development - From Sociology to Sociometry - Applications of Graph Theory to Social Structures - Social Network as Complex Network - Role of Computers in Influencing Social Network Analysis - Graph Visualization Tools					
Module:3	Network Measures	6 hours			
Network Measures - Network Basics - Degree and Degree Distributions – Paths - Clustering Coefficient - Connected Components - Node Centrality – Assortativity - Transitivity and Reciprocity – Similarity – Degeneracy					
Module:4	Network Growth Models	7 hours			
Properties of Real-World - High Average Local Clustering Coefficient -Small-world Property - Scale-free Property Networks – Random Network Model - Degree Distribution of Random Network - Binomial to Poisson Distribution - Evolution of a Random Network - Average Path Length - Clustering Coefficient - Random Network vs. Real-world Network – Ring Lattice Network Model – Watts Stragatz Model – Preferential Attachment model – Price’s Model					
Module:5	Link Analysis	7 hours			
Applications of Link Analysis - Signed Networks - Strong and Weak Ties - Link Analysis Algorithms – PageRank - Personalised PageRank - DivRank - SimRank - PathSIM					
Module:6	Link Prediction	8 hours			
Link Prediction – Applications of Link Prediction – Temporal Changes In a network - Evaluating Link Prediction Methods - Heuristic - Probabilistic - Supervised Random Walk - Information-theoretic Model – Latest trends					
Module:7	Community Structure in Networks	6 hours			



VIT[®]

Vellore Institute of Technology
 (Deemed to be University under section 3 of UGC Act, 1956)
 CHENNAI

Applications of Community Detection - Types of Communities - Community Detection Methods - Disjoint Community Detection - Overlapping Community Detection - Local Community Detection - Community Detection vs Community Search - Evaluation of Community Detection Methods			
Module:8	Contemporary Topics		2 hours
Guest Lecture from Industry and R & D Organizations			
		Total Lecture Hours:	45 Hours
		Total Tutorial Hours	15 Hours
Text Book(s)			
1.	Tanmoy Chakraborty, "Social Network Analysis", 2021, Wiley Publication.		
Reference Books			
1.	Jalal Kawash, "Online Social Media Analysis and Visualization", 2015, Lecture Notes in Social Networks,		
2	Emmanuel Lazega, Tom A.B Snijders, Nuffield College, "Multilevel Network Analysis for the Social Sciences, Theory, Methods and Applications", 2016, Springer.		
3	Song Yang, Franziska B Keller, Lu Zheng, "Social Network Analysis: Methods and Examples", 2016, SAGE Publications, Inc,		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date 13-12-2023



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI