B.Sc -Computer Science Syllabus under CBCS Pattern with effect from 2023-2024 Onwards

PERIYAR UNIVERSITY
PERIYAR PALKALAI NAGAR
SALEM-636011

B.Sc. Computer Science (Artificial Intelligence and Data Science)

Syllabus

OBE REGULATIONS AND SYLLABUS
(SEMESTER PATTERN)
(For Candidates admitted in the Colleges affiliated to Periyar University from 2023 - 2024 onwards

Programme Educational Objectives (PEOs)	
The B.Sc. Artificial Intelligence and Data Science program describe accomplishments that graduates are expected to attain within five to seven years after graduation	
PEO1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PEO2	Identity, formulate, review research literature and analyze complex engineering problems reaching substantiated con clusions using principles of mathematics, natural sciences.
PEO3	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health, safety, and the cultural, societal, and environmental considerations.

Programme Specific Out comes (PSOs)	
After the successful completion of B.Sc. Artificial Intelligence and Data Science program the students are expected to	
PSO1	Graduates should be able to evolve AI based efficient domain specific processes for effective decision making in several domains such as business and governance domains for Artificial Intelligence and Data Science
PSO2	Applythetechnicalandcriticalthinkingskillsinthedisciplineofartificial Intelligence and Data Science to find solutions for complex problems.
PSO3	Develop and Create, select, apply the theoretical knowledge of AI and Data Analytics along with practical industrial tools and techniques to manage and solve wicked societal problems
PSO4	Demonstrate the ability to create innovative solutions from idea to product, applying scientific methods and tools
PSO5	Provide innovative ideas to instigate new business ventures in the hospitality industry

Programme Outcomes (POs)	
On successful completion of the B.Sc. Artificial Intelligence and Data Science	
PO1	Exhibit good **domain knowledge** and completes the assigned tasks Effectively and efficiently in par with the expected quality standards.
PO2	Apply**analyticalandcriticalthinking**toidentify,formulate,analyzeandsolve complex problems in order to reach authenticated conclusions
PO3	**Designanddevelopresearchbasedsolutions**forcomplexproblemswithspecifiedneedsthr oughappropriateconsiderationforthepublichealth,safety,cultural,societal And environmental concerns.
PO4	Establishtheabilityto**Listen,read,proficientlycommunicateandarticulate Complex ideas** with respect to the needs and abilities of diverse audiences.
PO5	**Deliverinnovativeideastoinstigatenewbusinessventures**andpossessthe Qualities of a good entrepreneur.
PO6	Acquire the qualities of a **good leader and engage in efficient decision making.**
PO7	Graduateswillbeabletoundertakeanyresponsibilityasan**individual/memberof Multidisciplinary teams and have an understanding of team leadership**
PO8	Function as s**ocially responsible individual** with ethical values and accountable to Ethically validate any actions or decisions before proceeding and actively contribute to the societal concerns.
PO9	Identify and **address own educational needs i**n a changing world in ways sufficient to maintain the competence and to allow them to contribute to the advancement of knowledge
PO10	**Demonstrateknowledgeandunderstandingofmanagementprinciplesa**ndapply These to one own work to manage projects and in multidisciplinary environment.

*Forthestudentsadmittedfromtheacademicyear**2023-2024**andonwards*)

Scheme of Examination

Part	Title of the Course	Subject Code	Hours /Week	Examination				Credits
				Duration In Hours	Maximum Marks			
					CIA	CEE	Total	
	Semester I							
I	Language-I	23UFTA01	6	3	25	75	100	3
II	Communicative English-I	23UFEN01	6	3	25	75	100	3
III	Core1:Fundamentals of Computer Programming	23UAD01	4	3	25	75	100	5
III	Core2:DataStructures		4	3	25	75	100	5
III	CoreLab1: Computer Programming Lab	23UADP01	3	3	40	60	100	2
III	Allied1:	23UMAA01	5	3	25	75	100	4
IV	Value Education	23UVE01	2	2	25	75	100	2
IV	Professional English-I	23UPENO1	4	4	25	75	100	4
	*****Add-on Courses – Naan Mudhalvan Scheme: IT Courses –Infosys Springboard**							
	Total		34		275	325	600	28
	Semester II							
I	Language–II	23UFTA02	6	3	25	75	100	3
II	Communicative English–II	23UFEN02	6	3	25	75	100	3
II	Core3:Introduction to Python Programming	23UAD03	5	3	25	75	100	4
III	CoreLab2:Python Programming Lab	23UADP02	3	3	25	75	50	2
III	CoreLab3:InternetBasicsLab	23UADP02	3	3	25	75	50	2
III	Allied2:	23UMAA02	5	3	25	75	100	4
III	Allied-Practical	23UMAAP01	2	2	40	60	100	2
IV	Environmental Studies	23UES01	1	-	25	75	100	-
III	NMSDC-I Language Proficiency For Employability Effective English		2	-	-	-	-	2
IV	Professional English-II	23UPENO2	4	4	25	75	100	4
	*****Add-on Courses – Naan Mudhalvan Scheme: IT Courses –Infosys Springboard**							
	Total		34	24	215	585	800	26
	Semester III							
I	Language–III	23UFTA03	6	3	25	75	100	3
II	Foundation English – III	23UFENO3	6	3	25	75	100	3

II	Core4:InternetProgramming	23UAD04	4	3	25	75	100	4
III	Core5: Foundation of Artificial Intelligence	23UAD05	3	3	25	75	100	4
III	CoreLab4:InternetProgramming Lab	23UADP04	2	3	40	60	100	2
III	Allied3:	23USTA02	5	3	25	75	100	4
III	SkillbasedSubject1:Data Analytics	23UADSS01	2	3	25	75	100	3
IV	NMEC-1	23UTANO1	2	3	25	75	100	2
	Total		30		305	370	675	27
	Semester IV							
I	Language–IV	23UFTA04	6	3	25	75	100	3
II	Foundation English - IV	23UFEN04	6	3	25	75	100	3
III	Core7:Cognitive Science and Analysis	23UAD06	4	3	25	75	100	4
III	Core8: Fundamentals of Data Science	23UAD08	6	3	25	75	100	4
III	CoreLab 5:Database Lab	23UADPO5	2	3	25	75	50	2
III	Allied4:	23USTA04	5	3	25	75	100	4
III	Allied-Practical	23USTAP04	2	2	40	60	100	2
III	NMEC-II		2	3	25	75	100	2
IV	NMSDC-II Office fundamentals		2					2
IV	Add-on-course: Internship							
	Total		30		205	220	425	28
	Semester V							
III	Core8: Ethics of Artificial Intelligence	23UAD08	6	3	25	75	100	4
III	Core9:Database Design and Management	23UAD07	6	3	25	75	100	4
III	CoreLab6:Data Science Lab	23UCADP06	3	3	40	60	100	3
III	Elective–I: Big Data Analytics / Cyber Security/ Deep Learning	23UADE01	6	3	25	75	100	4
III	Skill based Subject 2Lab : Capstone Project Work Phase II	23UADSSP02	3	3	40	60	75	3
	Total		**30**		**205**	**220**	**425**	**22**
	Semester VI							
III	Core10:Robotic Process Automation	23UAD10	6	3	25	75	100	4
III	Core11:Project Work Lab	23UAD11	5	-	40	60	100	4
III	Core Practical –VII Programming in UI Path Automation Lab	23UADPO7	4	3	40	60	100	2

II I	Elective – II : Ethical Hacking/Digital Forensics Science / Natural Language Processing	23UADE02	5	3	25	75	100	4
II I	Elective–III: Internet of Things/ Data Visualization / Social Network Analysis	23UADE03	5	3	25	75	100	4
II I	SkillBasedSubject3: Machine Learning	23UADSS03	3	3	25	25	50	2
V	Extension Activities**	23UEX01	-	-		-		1
	***Add-on Courses: Naan Mudhalvan Scheme: Life Skills Emerging Technology For Employablitity-II	NMSDC-III	2					2
	Total		**30**		**325**	**275**	**600**	**23**
	Grand Total				**1660**	1840	**3500**	**151**

*No Continuous Internal Assessment(CIA).Only University Examinations.

**No University Examinations. Only Continuous Internal Assessment(CIA). Certificate Mandatory (No CIA and CEE) - Add-On Courses: Naan Mudhalvan Scheme : www.naanmudhalvan.tn.gov.in

S. No	Semester	Name of the course	Offered by	Link
1	I	English	Cambridge	www.naanmudhalvan.tn.gov.in
2	II	Business English	STEP	www.naanmudhalvan.tn.gov.in
3	III	IT Courses	Infosys springboard	https://infosysspringboard.ausnz.onwingspan.com/
4	IV	Entrepreneurship Skills	TANSIM	www.naanmudhalvan.tn.gov.in
5	V	IT Courses	Infosys - springboard	https://infosysspringboard.ausnz.onwingspan.com/
6	VI	Life Skills	Mahindra Pride	www.naanmudhalvan.tn.gov.in


First
Semester

Course Code		Fundamentals of Computer Programming	L	P	C
Core/Elective/Supportive		Core:1	4	0	5
Pre- requisite		• Basic knowledge of C concepts and C++ Programming • Basic knowledge in Procedure Oriented Programming concepts	Syllabus version	2023-24 Onwards	

Course Objectives

The main objectives of this course are to:

1. To impart knowledge about Computer fundamentals
2. To understand the concepts and techniques in C Programming
3. To equip and indulge themselves in problem solving using C
4. TointroduceheconceptsofObjectOrientedProgrammingParadigm inC++

Course Outcomes

1	Learn about the Computer fundamentals and the Problem solving and understand the basic concepts of C and C++ programming	K1
2	Demonstrate the various basic programming constructs like decision making statements. Looping statements and functions	K2
3	Analyze the object oriented concepts like overloading, inheritance ,polymorphism, Virtual functions ,constructors and destructors	K3
4	Comparethevariousfilestreamclasses;filetypes,usageoftemplatesandexception Handling mechanisms, pros and cons of procedure oriented language with the concepts of programming language	K4
5	Developprogramsincorporatingtheprogrammingconstructsofobjectoriented Programming concepts	K5,K6

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

Unit I	Introduction to C	12 Hours

Overview of C - Introduction - Character set - C tokens - keyword & Identifiers - Constants - Variables - Data types - Declaration of variables - Assigning values to variables - Defining Symbolic Constants - Arithmetic, Relational, Logical, Assignment, Conditional, Bitwise, Special, Increment and Decrement operators - Arithmetic Expressions - Evaluation of expression - precedence of arithmetic operators - Type conversion in expression – operator precedence & as sociativity - Mathematical functions - Reading & Writing a character - Formatted input and output.

Unit II	Decision Making , Looping and Arrays	15 Hours

Decision Making and Branching: Introduction – if, if….else, nesting of if …else statements- else if ladder – The switch statement, The ?: Operator – The go to Statement. Decision Making and Looping: Introduction- The while statement- the do statement – the for statement-jumps in loops. Arrays – Character Arrays and Strings

Unit III	C++	15 Hours

IntroductiontoC++-keyconceptsofObject-OrientedProgramming–Advantages–ObjectOrientedLanguages–I/O in C++- C++Declarations. Functions in C++-inline functions– Function Overloading. ClassesandObjects:DeclaringObjects–DefiningMemberFunctions–StaticMembervariablesandfunctions–arrayofobjects–friendfunctions–Overloadingmemberfunctions–Bitfieldsandclasses –Constructor and destructor with static members.

Unit IV	Inheritance	15 Hours

Operator Overloading: Overloading unary, binary operators – Overloading Friend functions – type conversion – Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchal, Hybrid ,Multipath inheritance –Virtual base Classes–Abstract Classes.

Unit V	Pointers & Files	15 Hours
Pointers–Declaration–PointertoClass,Object–thispointer–PointerstoderivedclassesandBaseclasses–Arrays–Characteristics–arrayofclasses. Files–File stream classes–file modes–Sequential Read/Write operations–Binary and ASCII Files –Random Access Operation–Templates–Exception Handling– Miscellaneous functions.		
Unit VI	**Contemporary Issues**	**3 Hours**
Problem Solving through C Programming – Online Coding		
	Total Lecture Hours	**60 Hours**

Text Book(s)

1. E Balagurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill, Second Reprint 2008
2. Ashok N Kamthane ,Object-Oriented Programming with Ansi and Turbo C++,Pearson Education,2003.

Reference Books

1. Ashok N Kamthane: Programming with ANSI and Turbo C, Pearson, 2002.
2. E. Balagurusamy, Object-Oriented Programming with C++,TMH,1998
3. Maria Litvin &Gray Litvin, C++foryou,Vikaspublication,2002.
4. JohnRHubbard, Programming with C, 2ndEdition,TMH publication,2002

Related Online Contents (MOOC,SWAYAM,NPTEL,Websitesetc)

1. **https://onlinecourses.swayam2.ac.in/aic20_sp06/preview**
2. **https://onlinecourses.swayam2.ac.in/arp19_ap79/preview**

Course Designed by :Dr.B.ARIVAZHAGAN, Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	M	L	L	L	L	L	L	L	L
CO5	S	M	L	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Computer Programming Lab	L	T	P	C
Core/Elective/Supportive		Core Lab :1	-	-	3	2
Pre- requisite		• Basic knowledge of Procedure Oriented Programming concepts • Basic knowledge in C Programming	Syllabus version		2023-24 Onwards	

Course Objectives

- TointroduceheconceptsofObject-OrientedProgrammingParadigmandprogrammingconstructsofC++

Course Outcomes

1	Apply the various basic programming constructs like decision making statements. Looping statements ,functions, concepts like overloading, inheritance ,polymorphism ,virtual functions , constructors and destructors	**K1,K3**
2	IllustratetheconceptofVirtualClasses,inlinefunctionsandfriendfunctions	**K2,K4**
3	Comparethevariousfilestreamclasses;filetypes,usageoftemplatesandexception Handling mechanisms.	**K5**
4	Comparetheprosandconsofprocedureorientedlanguagewiththeconceptsofobject Oriented language	**K5**

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

1. Write a C program to find the sum, average, standard deviation for a given set of numbers.
2. Write a C program to generate n prime numbers.
3. Write a C program to generate Fibonacci series.
4. Write a C program to sort the given set of numbers in ascending order.
5. Write a C program to count the number of Vowels in the given sentence.
6. Write a C++ Program to create class, which consists of EMPLOYEE Detail like E_ Number, E_ Name,
Department, Basic, Salary, Grade. Write a member function to get and display them.
7. WriteaC++ProgramtocreateaclassSHAPEwhichconsistsoftwovirtualfunctions
8. WriteaC++Programusingfunctionoverloadingtoreadtwomatricesofdifferent DataTypes
Such as integers and floating point numbers.
9. Write a C++ Program to create a File and to display the contents of that file with line numbers.
10. Write a C++ Program to merge two files into a single file.

Total Lecture Hours **36 hours**

Text Book(s)

1. E Bala gurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill, Second Reprint 2008
2. Ashok N Kamthane, Object-Oriented Programming with Ansi And Turbo C++, Pearson Education, 2003.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. Introduction to Programming in C – NPTEL
2. Problem solving through Programming in C - SWAYAM
3. C for Everyone : Programming Fundamentals – Course

Course Designed by : Dr. B.ARIVAZHAGAN, Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	L	L	L	L	L	L	L
CO2	S	S	M	L	L	L	L	L	L	L
CO3	S	S	M	L	L	L	L	L	L	L
CO4	S	S	M	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Data Structures	L	P	C
Core/Elective/Supportive		Core:2	4	0	5
Pre- requisite		Basic understanding of Data storage, retrieval and algorithms.	Syllabus version		2022-23 Onwards

Course Objectives

To understand the concepts of ADTs

1. To design linear data structures – lists, stacks, and queues
2. To understand sorting, searching and hashing algorithms
3. To apply Tree and Graph structures

Course Outcomes

1	Understand the concept of abstract data types	K1
2	Analyze linear data structures, such as lists, queues, and stacks, according to the needs of different applications	K2
3	Demonstrate the concept of trees and its applications	K3
4	Design, implement and analyze efficient tree structures to meet requirements such as searching, indexing, and sorting	K4
5	Enhance the knowledge to solve problems as graph problems and implement efficient graph algorithms to solve them	K5,K6

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

Unit I	Abstract Data Types	12 Hours

Abstract Data Types (ADTs) – ADTs and classes – introduction to OOP – classes in Python – inheritance – namespaces – shallow and deep copying. Introduction to analysis of algorithms – asymptotic notations – recursion – analyzing recursive algorithms.

Unit II	Linear Structures	15 Hours

List ADT – array-based implementations – linked list implementations – singly linked lists – circularly linked lists – doubly linked lists – applications of lists – Stack ADT – Queue ADT – double ended queues

Unit III	Sorting and Searching	15 Hours

Bubble sort – selection sort – insertion sort – merge sort – quick sort – linear search – binary search – hashing – hash functions – collision handling – load factors, rehashing, and efficiency.

Unit IV	Tree Structures	15 Hours

Tree ADT – Binary Tree ADT – tree traversals – binary search trees – AVL trees – heaps – multi-way search trees.

Unit V	Graph Structures	15 Hours

Graph ADT – representations of graph – graph traversals – DAG – topological ordering – shortest paths – minimum spanning trees.

Unit VI	Contemporary Issues	3 Hours

Expert lectures, online seminars - webinars

	Total Lecture Hours	60 Hours

Text Book(s)

1. Ellis Horowitz, Sartaj Shani, Data Structures, Galgotia Publication.
2. Ellis Horowitz, Sartaj Shani, Sanguthevar Rajasekaran, Computer Algorithms, Galgotia Publication.
3. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures & Algorithms in Python", John Wiley & Sons Inc., 2013
4. Lee, Kent D., Hubbard, Steve, "Data Structures and Algorithms with Python" Springer Edition 2015.
5. Aho, Hopcroft, and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.

Reference Books

1. Jean-Paul, Tremblay & Paul G .Sorenson , An Introduction to Data structures with Applications Tata McGraw Hill Company 2008, 2ndEdition.

2. Samanta.D , Classic Data Structure Prentice Hall of India Pvt Ltd 2007, 9th Edition
3. Seymour Lipschutz, Data Structures McGraw Hill Publications, 2014, 1st Edition
4. Rance D. Necaise, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", Second Edition, McGraw Hill, 2002.
6. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education, 2014

Related Online Contents (MOOC ,SWAYAM ,NPTEL ,Websites etc)

Course Designed by : Dr. B.ARIVAZHAGAN, Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	**S**	S	S	M	M	M	S	M	M	M
CO2	**S**	S	S	M	M	M	M	M	M	M
CO3	**S**	S	S	M	S	M	M	M	S	S
CO4	**S**	S	S	M	S	S	S	S	M	M

*S-Strong; M-Medium; L-Low

Course Code		Linear Algebra and Neural Networks	L	T	P	C
Core/Elective/Supportive		Allied:1	5	1	--	4
Pre- requisite		Basic knowledge in Mathematics	Syllabus version		2023-24 Onwards	

Course Objectives

1. To introduce the computational techniques and algebraic skills essential for the study of systems of linear equations, matrix algebra, and vector spaces
2. To introduce the concepts of neural networks and fuzzy systems
3. To explain the basic mathematical elements of the theory of fuzzy sets.

Course Outcomes

1	Explain the concept/theory in linear algebra, to develop dynamic and graphical views to the related issues of the chosen topics as outlined in course content and to formally prove theorems.	**K1**
2	Recognize the basic applications of the chosen topics and their importance in the modern science.	**K2**
3	Develop simple mathematical models and apply basic linear algebra techniques learned from the chosen topics to solve simple problems	**K3**
4	Report and communicate effectively with others and present mathematical results in a logical and coherent fashion	**K4**
5	Analyze the applications of fuzzy logic and neural network for various applications.	**K5**

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

Unit I	Matrix	15

Introduction-Determination-Inverse of a Matrix-Rank of a Matrix-Eigen Value Problem-Transpose-Properties of Transpose- Solving Simultaneous linear equations by matrix method.

Unit II	System of Simultaneous Linear Algebraic Equation	15

Gauss Elimination Method-Gauss Jordan Method-Simple Problems-Gauss Seidel Method-Simple Problems.

Unit III	Numerical Differentiation& Integration	15

Numerical Differentiation: Newton's Forward Difference-Newton's Backward Difference Formula. **Numerical Integration**: Trapezoidal Rule-Simpson's Rule.

Unit IV	Graph Theory	15

Graph Theory: Basic Terminology-Paths, Cycle & Connectivity-Sub graphs and Types of Graphs-Representation of Graphs in Computer Memory. **Trees**: Properties of Trees and Binary Trees-Traversing Binary Trees and Computer Representation of General Trees

Unit V	Fundamentals of Neural Networks	15

Basic concepts of neural networks – Human brain- Model of an Artificial neuron- Neural network architecture: Single layer Feed forward network - Multilayer Feed forward network – Recurrent neural network – Characteristics of neural networks – Learning Methods- Taxonomy of neural network Architecture-History of neural network research

Total Lecture Hours **75**

Text Book(s)

1. Navanitham , P.A., "Business Mathematics & Statistics", Jai Publishers, Trichy (Unit I)
2. Venkataraman M. K., "Numerical Methods in Science & Engineering", National Publishing Company, Chennai. (Unit II & III)
3. Sharma J.K., "Discrete Mathematics ",Second Edition, MacMillan Publishers India Limited, Chennai, 2005 (Unit IV)

4. Rajasekaran S. and Vijayalakshmi Pai G.A., "Neural Networks, Fuzzy Logic, and Genetic Algorithms : Synthesis And Applications" Prentice Hall of India (Unit V)

Reference Book(s)

1. Fuzzy logic & Neural Networks/ Chennakesava R. Alavala/ New Age International, 2008
2. Neural Networks for control, Millon W. T, Sutton R.S and Werbos P. J, MIT Press 1992
3. Fuzzy sets Fuzzy logic, Klir, G. J anfd Yuan B.B Prentice Hall oif India Pvt. Ltd.,, New Delhi
4. Introduction to Fuzzy control, Dirankov D. Hellendoorn H, Reinfrank M., Narosa Publications House, New Delhi 1996

Related Online Contents (MOOC ,SWAYAM ,NPTEL ,Websites etc)		

Course Designed by : Dr. C. RADHIKA, Assistant Professor & Head, Dept. of Mathematics, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	S	M	L	L	L	L	L	L	L
CO5	S	S	S	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Second Semester

Course Code		Introduction to Python Programming	L	T	P	C
Core/Elective/Supportive		Core:3	4	0	-	4
Pre- requisite		• Basic knowledge of Python Programming. • Knowledge in Object Oriented Programming Concepts.	Syllabus version		2023-24 Onwards	

Course Objectives

1. To know the basics of algorithmic problem solving with read and write simple Python programs.
2. To develop Python programs with conditionals and loops.
3. To define Python functions and call them.
4. To use Python data structures - lists, tuples , dictionaries and fix input/output with files in Python.

Expected Course Outcomes

1	Develop algorithmic solutions to simple computational problems	**K1**
2	Read, write, execute by hand simple Python programs. Structure simple Python programs for solving problems.	**K2**
3	Decompose a Python program into functions.	**K3**
4	Represent compound data using Python lists, tuples, dictionaries. Read and write data from/to files in Python Programs	**K3**
5	Judge the pros and cons of Python	**K4**

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

Unit I	**Algorithmic Problem Solving**	**16**

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

Unit II	**Data, Expressions, Statements**	**15**

Python interpreter and interactive mode, values and types: int, float, boolean, string and list; variables, expressions, statements, tuple assignment, precedence of operators, comments, modules and functions, function definition and use, flow of execution, parameters and arguments.

Unit III	**Control Flow, Functions**	**14**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else). Iteration: state, while, for, break, continue, pass. Fruitful functions: return values, parameters, local and global scope, function composition, recursion. Strings: string slices, immutability, string functions and methods, string module, Lists as arrays.

Unit IV	**Lists, Tuples, Dictionaries**	**13**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters. Tuples: tuple assignment, tuple as return value, Dictionaries: operations and methods, advanced list processing - list comprehension.

Unit V	**Files, Modules, Packages**	**17**

Files and exception: text files, reading and writing files, format operator, command line arguments, errors and exceptions, handling exceptions, modules, packages.

Total Lecture Hours	**75**

Text Book(s)
1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016. 2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
Reference Book(s)
1. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press, 2013 2. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016. 3. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd.,, 2015. 4. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012. 5. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013. 6. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.
Related Online Contents (MOOC ,SWAYAM ,NPTEL ,Websites etc)
1 http://greenteapress.com/wp/think-python/
Course Designed by :Mr. G. D. PRAVEEN KUMAR ,Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	M	M	L	L	L	L	L	L	L
CO5	S	S	S	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Programming Lab-Problem Solving in Python Programming	L	T	P	C
Core/Elective/Supportive		CoreLab:2	-	-	3	2
Pre- requisite		• Basic knowledge of Programming Constructs • Knowledge on Object Oriented Programming Concepts	Syllabus version		2023-24 Onwards	

Course Objectives

1. To write, test, and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. Use functions for structuring Python programs.
4. Represent compound data using Python lists, tuples and dictionaries.
5. Read and write data from/to files in Python.

Course Outcomes

1	Write, test, and debug simple Python programs. Read and write data from/to files in Python	**K2**
2	Implement Python programs with conditionals and loops.	**K3**
3	Develop Python programs step-wise by defining functions and calling them.	**K4**
4	Use Python lists, tuples, dictionaries for representing compound data.	**K5**

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

PROGRAM1	**6**
Compute the GCD of two numbers	
PROGRAM2	**6**
Find the square root of a number (Newton's method)	
PROGRAM3	**6**
Exponentiation (power of a number)	
PROGRAM4	**6**
Find the maximum of a list of numbers	
PROGRAM5	**6**
Linear search and Binary search	
PROGRAM6	**6**
Selection sort, Insertion sort	
PROGRAM7	**6**
Merge sort	
PROGRAM8	**6**
First n prime numbers	
PROGRAM9	**6**
Multiply matrices	
PROGRAM10	**6**
Programs that take command line arguments (word count)	
Total Lecture Hours	**60Hours**

Text Book(s)

1	Mark Summerfield. ―Programming in Python 3: A Complete introduction to the Python Language, Addison-Wesley Professional, 2009.

Reference Book(s)

1	Martin C. Brown, ―PYTHON: The Complete Reference‖, McGraw-Hill, 2001

Course Designed by :Mr. G. D. PRAVEEN KUMAR ,Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode	

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	L	L	L	L	L	L	L
CO2	S	S	S	L	L	L	L	L	L	L
CO3	S	S	S	L	L	L	L	L	L	L
CO4	M	M	S	S	M	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Internet Basics Laboratory	L	T	P	C
Core/Elective/Supportive		CoreLab:3	-	0	3	2
Pre-requisite		• Basic knowledge in Computers	Syllabus		2023-24 Onwards	

Course Objectives

1. Introduce the fundamentals of Internet and the Web functions.
2. Impart knowledge and essential skills necessary to use the internet and its various components.
3. Find ,evaluate ,and use online information resources.
4. Use Google Apps for education effectively.

Expected Course Outcomes

1	Apply the pre defined procedures to create Gmail account ,check and receive messages	K3
2	Apply the pre defined procedures to perform various basic operations on internet	K3
3	Utilize various Google applications like docs, Google classroom ,Google drive, Google Forms ,Google meet and slides	K3

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

PROGRAM-1	**3**
Create an email account in Gmail. Using the account created compose a mail to invite other college students for your college fest, enclose the invitation as attachment and send the mail to at least 10recipients.Use CC and BCC options accordingly	
PROGRAM-2	**3**
Open your inbox in the Gmail account created, check the mail received from your peer from other college inviting you for his college fest, and download the invitation. Reply to the mail with a thank you note for the invite and forward the mail to other friends	
PROGRAM-3	**3**
Assumethatyouarestudyinginfinalyearofyourgraduationandareeagerlylookingforajob.Visit Any job port a land upload your resume.	
PROGRAM-4	**3**
Create a label and upload bulk contacts using import option in Google Contacts	
PROGRAM-5	**3**
Create one-pages to try in your mother tongue by using voice recognition facility of Google Docs	
PROGRAM-6	**3**
CreateyourownGoogleclassroomandinviteallyourfriendsthroughemailid.Poststudymaterialin GoogleclassroomusingGoogledrive.Createaseparatefolderforeverysubjectanduploadallunitwise E-Content Materials.	
PROGRAM-7	**3**
CreateandshareafolderinGoogleDriveusing_sharealink‘optionandsetthepermissiontoaccess That folder by your friends only.	
PROGRAM-8	**3**
Create a meet using Google Calendar and record the meet using Google Meet.	
PROGRAM-9	**3**
Create a registration form for your Department Seminar or Conference using Google Forms.	
PROGRAM-10	**3**
Createaquestionpaperwithmultiplechoicetypesofquestionsforasubjectofyourchoice,using Google Forms.	
Total Lecture Hours	**30Hours**
Text Book(s)	

1	IanLamont,GoogleDrive&Docsin30Minutes, 2nd Edition.
Reference Book(s)	
1	Sherry Kinkoph Gunter ,My Google Apps, 2014.
Course Designed by :	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	L	L	L	L	L	L	L	L
CO2	S	M	L	L	L	L	L	L	L	L
CO3	S	S	M	L	L	L	L	L	L	L
CO4	S	S	M	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Optimization Techniques	L	T	P	C
Core/Elective/Supportive		Allied:2	5	0	0	4
Pre- requisite		Basic Knowledge in Optimization	Syllabus version		2023-24 Onwards	

Course Objectives

The objective of this course is to enable the student to

1. Formulate and solve linear programming problems (LPP)
2. Evaluate Integer Programming Problems, Transportation and Assignment Problems.
3. Obtain solution to network problems using CPM and PERT techniques.
4. Able to optimize the function subject to the constraints.
5. Identify and solve problems under game theory.

Course Outcomes

1	Demonstrate and Formulate and solve linear programming problems (LPP)	**K1**
2	Evaluate Integer Transportation and Assignment Problems	**K2**
3	Obtain solution to network problems using CPM and PERT techniques	**K3**
4	Apply the strategies of game theory and to make better decisions while solving problems	**K4**
5	Identify and solve problems under replacement models	**K5**

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

Unit I	Introduction To Operation Research	15

Introduction of Operations Research - Linear programming- Mathematical Formulation- Graphical Method to solve LPP-Simplex Method.

Unit II	Transportation and Assignment Problems	15

Transportation problems: Introduction- Finding Initial Basic Feasible solutions- moving Towards optimality (non- degenerate only) – Maximization in transportation problem-Unbalanced transportation problem.

Assignment problem: Introduction –Hungarian Assignment method – Maximization in Assignment problem – Unbalanced Assignment problem- Travelling Salesman Problem.

Unit III	Project Scheduling Hours	15

Project network -Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM. (Simple Problems Only).

Unit IV	Game Theory	15

Game theory: Concept of Pure and Mixed strategies – solving 2 x 2 matrices with and without saddle point. Graphical solution - mx2 and 2xn games- Solving games by Dominance Property.

UNIT V	Replacement Theory	15

Theory of Replacement – Introduction - Replacement models –Replacement of items that deteriorates gradually (value of money does not change with time)

	Total Lecture Hours	75Hours

Text Book(s)

1. P. K. Gupta, Man Mohan, Kanti Swarup: "Operations Research", Sultan Chand, 2008.

Reference Book(s)

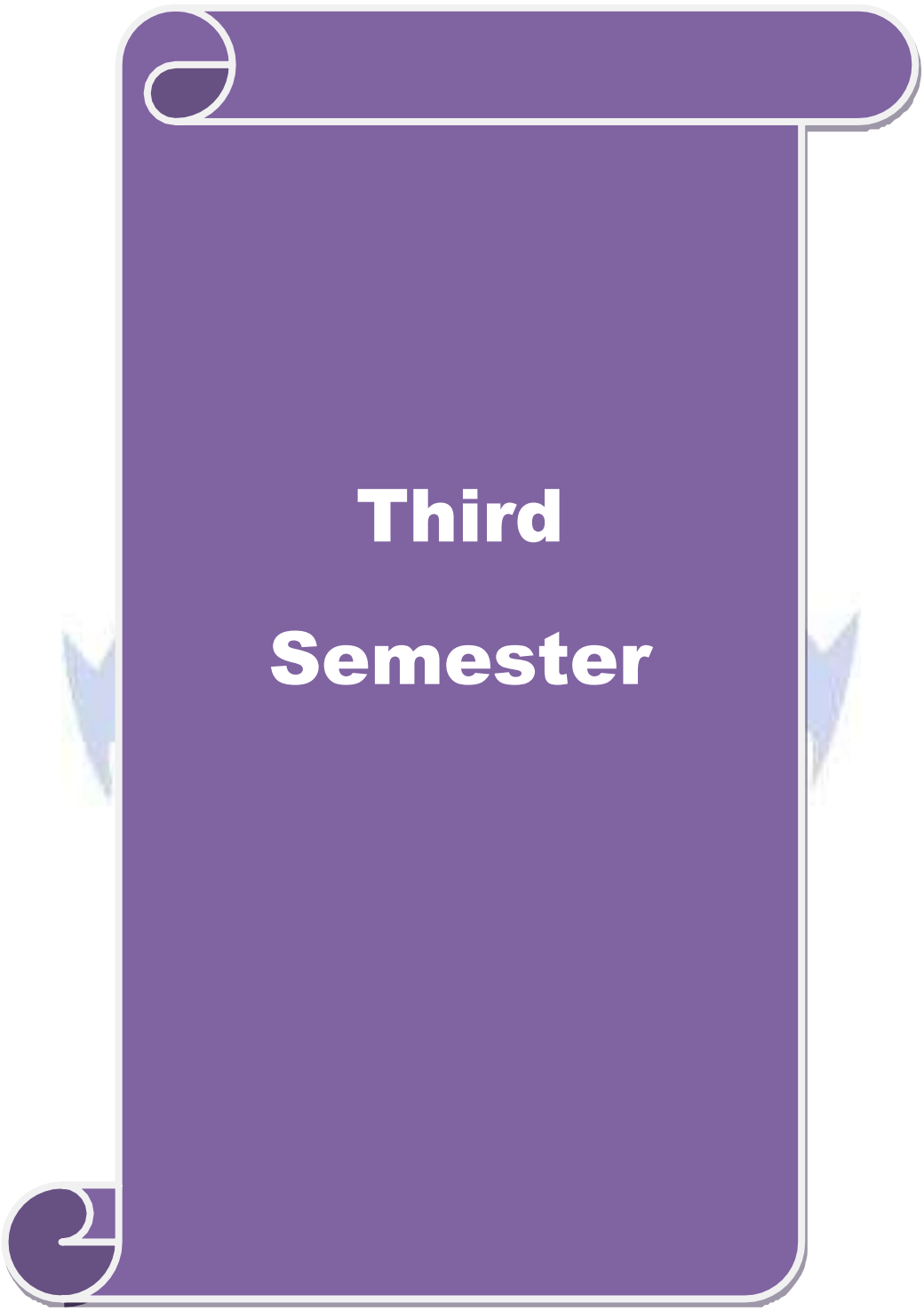
1. Sundaresan V, Ganapathy K.S, Ganesan K, Resource Management Technique- Lakshmi Publications, 2003.
2. J. K. Sharma: Operations Research Theory & Applications, Macmillan India Limited,

Fifth edition.2013.

Course Designed by : Ms. V.AMUDHAMALAR, Assistant Professor, Dept. of Mathematics, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	M	M	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low


Third
Semester

Course Code		Internet Programming	L	T	P	C
Core/Elective/Supportive		Core:4	4	0	0	4
Pre- requisite		• Knowledge in Basics of Object Oriented Programming	Syllabus version		2023-24 Onwards	

Course Objectives

1. TointroducetheconceptsofObjectOrientedProgrammingParadigmandtheprogrammingconstructsof JAVA

Course Outcomes

1	Recite the history of JAVA and its evolution	K1
2	Explainthevariousprogramminglanguageconstructs,objectorientedconceptslike overloading, inheritance,polymorphism,Interfaces,threads,exceptionhandlingandpackages	K2
3	Illustrate the concepts of Applets, files and the concept of stream classes.	K3
4	Outlinethebenefitsandapplicationsofobjectsorientedprogrammingconceptsand Defend how JAVA differs from other programming languages	K3
5	Judge the pros and cons of other object oriented language with the concepts of JAVA	K4

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

Unit I	Introduction	18

Java Features – comparison of Java with C and C++ - Java and Internet – Java Environment – Java Program structure – Java Tokens – Implementing a Java Program – Java Virtual Machine – Constants – Variables – Data Types – Scope of Variables – Type casting – Operators and expressions – Decision Making, Branching and Looping

Unit II	Classes and Arrays	18

Defining a class – Constructors – Methods – overloading – static Members – Nesting of Methods – Overriding methods – Final Classes – Abstract Class – Visibility control – Arrays – creating an array – Two Dimensional arrays – Strings – String Arrays – String Methods – String Buffer Class – Vectors – Wrapper Classes.

Unit III	Inheritance, Interfaces and Packages	17

Defining a subclass – Subclass constructor – Multilevel inheritance – Hierarchical Inheritance – Defining Interfaces – Extending Interfaces – Implementing Interfaces – Java APF Packages – creating a package – Accessing and Using a package – Adding a class to a package – Hiding Classes

Unit IV	Multithreading Exception Handling	19

Extending the Thread class – Thread Life cycle – Thread Exception – Thread priority – Synchronization – Runnable Interface – Exceptions – Throwing own Exceptions – Concepts of streams – stream classes – Byte Stream Classes – Character stream Classes – Using Streams – Using file Class –Other Stream Classes.

Unit V	Applet Programming	18

Difference between Application and Applets – Applet Life cycle – creating an Executable Applet – Designing a Web Page – Adding Applet to HTML File – Passing Parameters to Applets

Total Lecture Hours	90Hours

Text Book(s)	
1	E. Balagurusamy, “Programming with Java – A primer”, Second Edition, Tata McGraw Hill Publishing Company, Delhi, 2002.
Reference Book(s)	
1	Herbert Schildt, “The complete Reference – Java 2”, Fifth Edition, Tata McGraw Hill Publishing Company, Delhi, 2002.
2	The Complete Reference Java 2 - Patrick Naughton & Hebert Schildt, 3rd Edition, TMH
3	Programming with Java – John R. Hubbard, 2nd Edition, TMH.
Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)	
1. https://onlinecourses.swayam2.ac.in/aic20_sp06/preview 2. https://onlinecourses.swayam2.ac.in/arp19_ap79/preview	
Course Designed by :Dr. K .S. MOHANASATHIYA ,Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	M	L	L	L	L	L	L	L
CO4	S	M	M	L	L	L	L	L	L	L
CO5	S	S	M	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Internet Programming Lab	L	T	P	C
Core/Elective/Supportive		Core Lab :4	0	0	2	2
Pre- requisite		• Basic knowledge of Programming • Knowledge on Object Oriented Programming Concepts	Syllabus version		2023-24 Onwards	

Course Objectives

To introduce the concepts of Object Oriented Programming Paradigm and the Programming constructs of JAVA

Course Outcomes

1	ApplythevariousbasicprogrammingconstructsofJAVAlikedecisionmakingstatements.Loopingstatements,overloading,inheritance,polymorphism,constructors And destructors	K3
2	Illustrate the concepts of the reading and multi-threading	K4
3	Design programs using various file stream classes ;file types ,and frames	K4

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

PROGRAM-1		**3**
Write a Java Applications to extract a portion of a character string and print the extracted string.		
PROGRAM-2		**3**
Write a Java Program to implement the concept of multiple inheritance using Interfaces.		
PROGRAM-3		**3**
Write a Java Program to create an Exception called payout-of-bound sand throw the exception		
PROGRAM-4		**3**
Write a Java Program to implement the concept of multi the reading with the use of any three multiplication tables and assign three different priorities to them.		
PROGRAM-5		**3**
Write a Java Program to draw several shapes in the created windows		
PROGRAM-6		**3**
Write a Java Program to demonstrate the Multiple Selection List-box.		
PROGRAM-7		**3**
Write a Java Program to create a frame with three text fields for name ,age and qualification and a text Field for multiple line for address		
PROGRAM-8		**3**
Write a Java Program to create Menu Bars and pull down menus.		
PROGRAM-9		**3**
Write a Java Program to create frames which respond to the mouse clicks.		
PROGRAM-10		**3**
Write a Java Program to draw circle ,square ,ellipse and rectangle at the mouse click positions.		
	Total Hours	**30 Hours**

Text Book(s)

1	Programming with Java–A Primer-E. Balagurusamy,3rd Edition, TMH.

Reference Book(s)

2	The Complete ReferenceJava2-PatrickNaughton&Hebert Schildt,3rd Edition, TMH

Course Designed by : Dr. K.S.MOHANASATHIYA, Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	L	L	L	L	L	L
CO2	S	S	S	L	L	L	L	L	L	L
CO3	S	S	S	L	L	L	L	L	L	L
CO4	S	S	S	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Foundation of Artificial Intelligence	L	T	P	C
Core/Elective/Supportive		Core:5	3	0	0	4
Pre- requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

The objective of this course is to enable the students to

1. Understand the basic concepts of intelligent agents
2. Develop general-purpose problem solving agents, logical reasoning agents and agents that reason under uncertainty.
3. Employ AI techniques to solve some of today's real world problems.

Course Outcomes

1	Understand autonomous agents that make effective decisions in fully informed, partially observable and adversarial settings	**K1**
2	Choose appropriate algorithms for solving given AI problems	**K2**
3	Design and implement logical reasoning agents	**K6**
4	Demonstrate agents that can reason under uncertainty	**K2**
5	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.	**K4**

K1–Remember K2 –Understand K3–ApplyK4-AnalyzeK5–EvaluateK6-Create

Unit I	**Intelligent Agents**	**18**

Introduction to AI –Agents and Environments –Concept of rationality –Nature of environments –Structure of agents Problem solving agents –search algorithms –uninformed search strategies

Unit II	**Problem Solving**	**18**

Heuristic search strategies –heuristic functions. Local search and optimization problems –local search in continuous space –search with non-deterministic actions –search in partially observable environments –online search agents and unknown environments.

Unit III	**Game Playing and CSP**	**18**

Game theory –optimal decisions in games –alpha-beta search –monte-carlo tree search –stochastic games –partially observable games. Constraint satisfaction problems –constraint propagation –backtracking search for CSP –local search for CSP –structure of CSP.

Unit IV	**Logical Agents**	**18**

Knowledge-based agents –propositional logic –propositional theorem proving –propositional model checking –agents based on propositional logic. First-order logic –syntax and semantics –knowledge representation and engineering –inferences in first-order logic –forward chaining –backward chaining –resolution.

Unit V	**Knowledge Representation and Planning**	**18**

Ontological engineering –categories and objects –events –mental objects and modal logic –reasoning systems for categories –reasoning with default information. Classical planning –algorithms for classical planning –heuristics for planning –hierarchical planning –non-deterministic domains –time, schedule, and resources –analysis.

Total Lecture Hours	**90 Hours**

Text Book(s)
1. Stuart Russel and Peter Norvig, “Artificial Intelligence: A Modern Approach”, Fourth Edition, Pearson Education, 2020. 2. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007 3. Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2008
Reference Book(s)
1. Patrick H. Winston, "Artificial Intelligence", Third edition, Pearson Edition, 2006 2. Deepak Khemani, “Artificial Intelligence”, Tata McGraw Hill Education, 2013 (http://nptel.ac.in/) 3. Artificial Intelligence by Example: Develop machine intelligence from scratch using real artificial intelligence use cases -by Dennis Rothman, 2018
Course Designed by : Dr. K.S.MOHANASATHIYA, Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	S	M	L	L	L	L	L	L	L
CO5	S	S	S	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Operating System Design	L	T	P	C
Core/Elective/Supportive		Allied:3	5	0	0	4
Pre- requisite		Students Should have the basic knowledge in computer.	Syllabus version		2023-24 Onwards	

Course Objectives

1. To understand the structure and functions of OS
2. To learn about Processes, Threads and Scheduling algorithms
3. To understand the principles of concurrency and Deadlocks
4. To learn various memory management schemes
5. To study I/O management and File systems.

Course Outcomes

1	Outline the basic services and functionalities of operating systems	K1
2	Analyze various scheduling algorithms and understand the different deadlock, prevention and avoidance schemes	K2, K3
3	Illustrate the different memory management schemes	K4
4	Outline the functionality of file systems	K5
5	Compare and contrast Linux, Windows and mobile operating systems	K6

K1–Remember K2 –Understand K3–ApplyK4-AnalyzeK5–EvaluateK6-Create

Unit I	Introduction to Operating Systems	18

Computer System Overview: Basic elements – Instruction execution – Interrupts – Memory hierarchy – Cache memory – Direct memory access – Multiprocessor and multi core organization

Unit II	Operating Systems Overview	18

Operating System Overview: Objectives and functions – Evolution of operating system, Computer system organization, Operating System Structure and Operations: System calls – System programs, Operating-System Design and Implementation, Operating-System Debugging.

Unit III	Process Management	19

Processes: Process concept – Process scheduling – Operations on processes – Interprocess communication. Threads: Overview – Multithreading models – Thread issues. CPU Scheduling: FCFS, SJF, Priority, Round robin scheduling. Process synchronization – Critical section problem – Mutex locks – Semaphores, Deadlocks – Avoidance – Prevention – Detection and Recovery.

Unit IV	Memory Management	17

Main Memory: Contiguous memory allocation – Segmentation – Paging. Virtual Memory: Demand paging – Page replacement algorithms – Allocation of Frames – Thrashing.

Unit V	Storage Management	18

Mass Storage Structure: Overview – Disk scheduling and management. File System Storage: File concepts – Directory and disk structure – Sharing and protection. File System Implementation: File system structure – Directory structure – Allocation methods – Free space management.

Total Lecture Hours	90Hours

Text Book(s)

1. Abraham Silbers chatz, Peter Baer Galvin, Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc, 2012.

2. Neil Smyth, "I Phone I OS 4 Development Essentials – X code", 4th Edition, Payload media,2011.

Reference Book(s)

1. Ramez Elmasri, A Gil Carrick, David Levine, "Operating Systems A Spiral Approach", Tata McGraw Hill Edition, 2010.

2. Achyut S Godbole, Atul Kahate, “Operating Systems”, McGraw Hill Education, 2016.
3. Andrew S Tanenbaum, “Modern Operating Systems”, 2nd Edition, Pearson Education, 2004.
4. Harvey M Deitel, “Operating Systems”, 3rd Edition, Pearson Education, 2004.
5. Daniel P Bovet, Marco Cesati, “Understanding the Linux Kernel”, 3rd edition, O‘Reilly,2005

	Related Online Contents (MOOC,SWAYAM, NPTEL, Web site setc)	
1		
2		

Course Designed by : Dr. K.S.MOHANASATHIYA, Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	M	M	S	M	M	M	M	L
CO2	S	S	S	S	S	M	M	M	S	L
CO3	S	M	M	M	S	M	S	S	S	L
CO4	S	S	S	M	S	S	S	M	M	M
CO5	S	S	S	M	S	S	S	M	M	M

*S-Strong; M-Medium; L-Low

Course Code		Data Analytics	L	T	P	C
Core/Elective/Supportive		Skill based Subject :1	2	0	0	3
Pre- requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

1. To study the basic inferential statistics and sampling distribution.
2. To understand the concept of estimation of parameters using fundamental tests and testing of hypotheses.
3. To understand the techniques of analysis of variance.
4. To gain knowledge in predictive analytics techniques.
5. To perform a case study with any available sample data sets.

Expected Course Outcomes

1	Understand and critically apply the concepts and methods of analytics	**K2**
2	Analyze the concept of sampling	**K4**
3	Demonstrate the skills to perform various tests in the given data	**K5**
4	Apply the knowledge to derive hypotheses for given data	**K3**
5	Perform statistical analytics on a data set	**K6**

K1–Remember K2 –Understand K3–ApplyK4-AnalyzeK5–EvaluateK6-Create

UNIT I	Introduction	16

Introduction Data Analytics – Data Analysis Vs Data Analytics – Data Analytics – Types - Data Analytics – Framework – Data Analytics – Tool - R language - Understanding R -features - Installing R and R Studio – Packages and Library.

UNITII	Importing and Exporting Files	15

Importing and Exporting Files: CSV File – JSON File – txt File –Excel File – Xml File - Command Line Vs. Scripts. - Data Pre-Processing – Missing Value – Omitting Null Values – Data Transformation – Data Selection – Data Integration.

UNITIII	Data Manipulation	16

Command Line Vs. Scripts Data Manipulation: Slicing - Subscripts and Indices – Data Subset – Dplyr Package: Select Function - Filter Function - Mutate Function - Arrange Function.

UNITIV	Data Summarization	14

Data Summarization & Visualization - Mean – Median – Mode - Variablity Measures - Variance – Range - IQR – Standard Deviation – Sum of Squares –Identifying Outliers using IQR.

UNITV	Case Studies	14

Data Analytics Case Studies – Marketing – Logistic Management – Insurance – Behavioral Analytics – Data Analytics on Diamond Dataset.

TotalLectureHours	75Hours

Text Book(s)

1. V. Bhuvaneswari, "Data Analytics with R Step by Step", Scitech Publisher, ISBN – 978-81-929131-2-4, Edition 2016.
2. Roger D.Peng, "R Programming for Data Science", Lean Publishing, 2014.
3. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packt Publishing, ISBN- 978-1-78216-328-2, 2013.
4. Sholom Weiss, et.al, "The Text Mining Handbook: Advanced Approaches in Analysing Unstructured Data", Springer, Paperback 2010.
5. Emmanuel Paradis, "R for Beginners", 2005.

Reference Book(s)

1. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.
2. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.
3. David Spiegelhalter, "The Art of Statistics: Learning from Data", Pelican Books, 2020.
4. Peter Bruce, Andrew Bruce, and Peter Gedek, "Practical Statistics for Data Scientists", Second Edition, O'Reilly Publishers, 2020.
5. Charles R. Severance, "Python for Everybody: Exploring Data in Python 3", Shroff Publishers, 2017.
6. Bradley Efron and Trevor Hastie, "Computer Age Statistical Inference", Cambridge University Press, 2016.

	Related Online Contents (MOOC,SWAYAM,NPTEL,Websitesetc)	
1		
2		

Course Designed by :Dr. K.S.MOHANASATHIYA, Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	M	L	L	L	L	L	L	L	L
CO3	S	M	M	L	L	L	L	L	L	L
CO4	S	S	S	L	L	L	L	L	L	L
CO5	S	S	S	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Fourth Semester

Course Code		Database Design and Management	L	T	P	C
Core/Elective/Supportive		Core:7	3	0	0	4
Pre- requisite		None	Syllabus version		2022-23 Onwards	

Course Objectives

1. To introduce database development life cycle and conceptual modelling
2. To learn SQL for data definition, manipulation and querying a database
3. To learn relational database design using conceptual mapping and normalization
4. To learn transaction concepts and serialize bility of schedules
5. To learn data model and querying in object-relational and No-SQL databases

Expected Course Outcomes

1	Understand the database development life cycle and apply conceptual modeling	K2
2	Apply SQL and programming in SQL to create, manipulate and query the database	K2
3	Apply the conceptual-to-relational mapping and normalization to design relational database	K3
4	Determine the serializability of any non-serial schedule using concurrency techniques	K3

K1–Remember K2 –Understand K3–ApplyK4-AnalyzeK5–EvaluateK6-Create

Unit I	**Conceptual Data Modeling**	**18**

Database environment –Database system development lifecycle –Requirements collection – Database design --Entity-Relationship model –Enhanced-ER model –UML class diagrams.

Unit II	**Relational Model and SQL**	**15**

Relational model concepts --Integrity constraints --SQL Data manipulation –SQL Data definition –Views --SQL programming.

Unit III	**Relational Database Design and Normalization**	**18**

ER and EER-to-Relational mapping –Update anomalies –Functional dependencies-Inference rules –Minimal cover –Properties of relational decomposition –Normalization upto BCNF.

Unit IV	**Transaction Management**	**18**

Transaction concepts –properties –Schedules –Serializability –Concurrency Control –Two-phase locking techniques.

Unit V	**Object Relational and No-SQL Databases**	**18**

Mapping EER to ODB schema –Object identifier –reference types –row types –UDTs –Subtypes and super types –user-defined routines –Collection types –Object Query Language.

Unit VI	**Contemporary Issues**	**3**

Expert lectures, online seminars - webinars

Total Lecture Hours	**90Hours**

Text Book(s)

1. Thomas M. Connolly, Carolyn E. Begg, Database Systems –A Practical Approach to Design, Implementation and Management, Sixth Edition, Global Edition, Pearson Education, 2015.
2. Ramez Elmasri, Shamkant B. Navathe, Fundamental of Database Systems, 7th Edition, Pearson, 2017.

Reference Book(s)

1. Toby Teorey, Sam Lightstone, Tom Nadeau, H. V. Jagadish, "DATABASE MODELING AND DESIGN -Logical Design", Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. Carlos Coronel, Steven Morris, and Peter Rob, Database Systems: Design, Implementation, and Management, Ninth Edition, Cengage learning, 2012
3. Abraham Silberschatz, Henry F Korth, S Sudharshan, "Database System Concepts", 6th

Edition, Tata Mc Graw Hill, 2011.

4. Hector Garcia-Molina, Jeffrey D Ullman, Jennifer Widom, "Database Systems:The Complete Book", 2nd edition, Pearson.

5. S Sumathi, S Esakkirajan, " Fundamentals of Relational Database Management Systems ", (Studies in Computational Intelligence), Springer-Verlag, 2007.

6. Raghu Ramakrishnan, "Database Management Systems", 4th Edition, Tata Mc Graw Hill, 2010.

Related Online Contents (MOOC,SWAYAM,NPTEL,Websitesetc)		
1	https://www.tutorialspoint.com/oracle_sql/index.html	

Course Designed by : Dr. M.VIJAYAKUMAR, Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	S	M	M	M	M	L
CO2	S	S	S	M	S	M	M	M	M	L
CO3	S	S	S	S	S	S	S	S	M	M
CO4	S	S	S	S	S	M	S	S	M	L

*S-Strong; M-Medium; L-Low

Course Code		Database Programming Lab	L	T	P	C
Core/Elective/Supportive		Core Lab :5	0	0	2	2
Pre- requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

1. To understand the database development life cycle
2. To learn database design using conceptual modelling, Normalization
3. To implement database using Data definition, Querying using SQL manipulation and SQL programming
4. To implement database applications using IDE/RAD tools
5. To learn querying Object-relational databases

Expected Course Outcomes

1	Understand the database development life cycle	**K2**
2	Design relational database using conceptual-to-relational mapping, Normalization	**K3**
3	Apply SQL for creation, manipulation and retrieval of data	**K4**
4	Develop a database applications for real-time problems	**K6**

K1–Remember K2 –Understand K3–ApplyK4-AnalyzeK5–EvaluateK6-Create

List of Programs

1. Database Development Life cycle: Problem definition and Requirement analysis Scope and Constraints
2. Database design using Conceptual modeling (ER-EER) –top-down approach .Mapping conceptual to relational database and validate using Normalization
3. Implement the database using SQL Data definition with constraints, Views
4. Query the database using SQL Manipulation
5. Querying/Managing the database using SQL Programming -Stored Procedures/Functions -Constraints and security using Triggers
6. Database design using Normalization –bottom-up approach
7. Develop database applications.
8. Create a table for Employee details with Employee Number as primary key and following fields:

Name, Designation, Gender, Age, Date of Joining and Salary. Insert at least ten rows and perform various queries using any one Comparison, Logical, Set, Sorting and Grouping operators.

9. Write a PL/SQL to update the rate field by 20% more than the current rate in inventory table which has the following fields: Prono, ProName and Rate. After updating the table a new field (Alter) called for Number of item and place for values for the new field without using PL/SQL block.
10. Querying the Object-relational database using Objet Query language.

Total Lecture Hours **30Hours**

Text Book(s)

1	E-Book : Bill Pribyl, Steven Feuerstein, “Oracle PL/SQL Programming”, O’Reilly Media, Inc., 6th Edition, February 2014.

Reference Book(s)

Related Online Contents (MOOC, SWAYAM, NPTEL, Web sites etc)		
1		
2		

Course Designed by : Dr. M.VIJAYAKUMAR, Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	M	L	S	M	M	L
CO3	S	S	S	L	M	M	S	M	S	L
CO3	S	S	S	M	S	M	S	S	S	M
CO4	S	S	S	M	S	M	S	S	M	M
CO5	S	S	S	S	S	S	S	S	S	M

*S-Strong; M-Medium; L-Low

Course Code		Data and Information Security	L	T	P	C
Core/Elective/Supportive		Allied:4	5	0	0	4
Pre- requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

1. To understand the basics of number theory and security
2. To understand and analyze the principles of different encryption techniques
3. To understand the security threats and attacks
4. To understand and evaluate the need for different security aspects in real time applications
5. To learn the different applications of information security

Expected Course Outcomes

1	Understand the fundamentals of security and the significance of number theory in computer security.	**K2**
2	Learn the public key cryptographic standards and authentication scheme	**K3**
3	Apply the Security Frameworks for Real Time Applications	**K5**
4	Develop appropriate security algorithms understanding the possible threats	**K4**

K1–Remember K2 –Understand K3–ApplyK4-AnalyzeK5–EvaluateK6-Create

Unit I	Fundamentals of Security	18

Computer Security Concepts - Threats, Attacks and Assets – Security Functional Requirements – Fundamental Security Design Principles – Attack Surfaces and Attack Trees. Computer Security Strategy– Number Theory: Prime Numbers and Factorization, Modular Arithmetic, GCD and Euclidean Algorithm, Chinese Remainder Theorem.

Unit II	Encryption Techniques and Key Management	18

Symmetric Encryption Principles – Data Encryption Standard – Advanced Encryption Standard – Stream Ciphers and RC4 - Cipher Block Modes Operation – Digital Signatures - Key Distributions - Public Key Cryptosystem: RSA, Elliptic Curve Cryptography - Key Exchange Algorithms: Diffie Hellmen and ELGamal Key Exchange.

Unit III	Authentication, Integrity and Access Control	17

Authentication: Security Hash Function – HMAC – Electronic User Authentication Principles, Password Based Authentication, Token Based and Remote Authentication; Internet Authentication Applications: Kerberos X.509 – Public Key Infrastructure.

Unit IV	Access Control	18

Access Control: Access Control Principles - Subjects, Objects and Access Rights - Discretionary Access Control - Example: UNIX File Access Control – Role Based Access Control - Attribute-Based Access Control - Identity, Credential and Access Management - Trust Frameworks.

Unit V	Security	19

System Security: Firewall, Viruses, Worms, Ransomeware, Keylogger, Greyware, IDS, DDoS Network Security: SSL – TLs – HTTPS –IP Security; OS Security-Application Security - Linux/Unix Security - Windows Security - Virtualization Security- Wireless Security.

Unit VI	Contemporary Issues	3
Expert lectures, online seminars - webinars		
	TotalLectureHours	**90Hours**

Text Book(s)

1. William Stallings, "Cryptography and Network Security Principles and Practice", Fifth Edition, 2011, Pearson Education International
2. William Stallings and Lawrie Brown, "Computer Security Principles and Practice", Third Edition,2015, Pearson Education International

Reference Book(s)

1. Tim Mather, Subra Kumaraswamy and Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", 2009, Oreilly
2. Mikhail Gloukhovtsev, "IoT Security: Challenges, Solutions & Future Prospects", 2018, Knowledge Sharing Article, Dell Inc.
3. Pradip KumarDas, Hrudaya Kumar Tripathy, Shafiz Affendi Mohd yusuf, Privacy and Security Issues in Big Data, An Analytical View on Business Intelligence. Springer 2021.

Related Online Contents (MOOC, SWAYAM, NPTEL, Web sites etc)

1		
2		

Course Designed by : Dr. M.VIJAYAKUMAR, Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	S	M	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low


Fifth
Semester

Course Code		Cognitive Science and Analytics	L	T	P	C
Core/Elective/Supportive		Core:6	4	0	0	4
Pre- requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

1. To explain cognitive computing and design principles.
2. To distinguish between NLP and cognitive computing.
3. To apply advanced analytics to cognitive computing.
4. To discuss application of cognitive computing in business.
5. To illustrate various applications of cognitive computing.

Course Outcomes

1	Apply cognitive computing and design principles.	**K3**
2	Understand the concept NLP and cognitive computing.	**K2**
3	Analyze advanced analytics to cognitive computing.	**K4**
4	Discuss application of cognitive computing in business.	**K5**

K1–Remember K2 –Understand K3–ApplyK4-AnalyzeK5–EvaluateK6-Create

Unit I	Foundation	17

Foundation of Cognitive Computing: cognitive computing as a new generation, the uses of cognitive systems, system cognitive, gaining insights from data, Artificial Intelligence as the foundation of cognitive computing, understanding cognition.

Unit II	Design Principles	16

Design Principles for Cognitive Systems: Components of a cognitive system, building the corpus, bringing data into cognitive system, machine learning, hypotheses generation and scoring, presentation and visualization services.

Unit III	NLP in Cognitive System	18

Natural Language Processing in support of a Cognitive System: Role of NLP in a cognitive system, semantic web, Applying Natural language technologies to Business problems.

Unit IV	Big Data Vs Cognitive Computing	18

Relationship between Big Data and Cognitive Computing: Dealing with human-generated data, defining big data, architectural foundation, analytical data warehouses, Hadoop, data in motion and streaming data, integration of big data with traditional data.

Unit V	Cognitive Computing in Business	18

Business Implications of Cognitive Computing: Preparing for change, advantages of new disruptive models, knowledge meaning to business, difference with a cognitive systems approach, meshing data together differently, using business knowledge to plan for the future.

Unit VI	Contemporary Issues	3

Expert lectures, online seminars - webinars

Total Lecture Hours	90Hours

Text Book(s)

1. Judith H Hurwitz, Marcia Kaufman, Adrian Bowles, "Cognitive computing and Big Data Analytics" Wiley, 2015.
2. Vijay Raghvan, Venu Govindaraju, C.R. Rao, Cognitive Computing: Theory and Applications", by Elsevier publications, North Holland Publication, 1st Edition, 2016.
3. Bernadette Sharp (Author), Florence Sedes (Author), Wieslaw Lubaszewski (Author), Cognitive Approach to Natural Language Processing Hardcover, First Edition May 2017.

Reference Book(s)

1. Arun Kumar Sangaiah, Arunkumar Thangavelu, et al., Cognitive Computing for Big Data Systems Over IoT: Frameworks, Tools and Applications: Lecture Notes on Data Engineering and Communications Technologies 1st edition 2018
2. Min Chen and Kai Hwang, Big-Data Analytics for Cloud, IoT and Cognitive Computing Wiley Publication, 1st Edition, 2017.
3. Mallick, Pradeep Kumar, Borah, Samarjeet," Emerging Trends and Applications in Cognitive Computing", IGI Global Publishers, 2019.

	Related Online Contents (MOOC, SWAYAM, NPTEL,Websitesetc)	
1		
2		

Course Designedby :Dr. S.PRASATH,Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	S	M	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Ethics of Artificial Intelligence	L	T	P	C
Core/Elective/Supportive		Core:8	6	0	0	4
Pre- requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

1. To understand the need for ensuring ethics in AI
2. To understand ethical issues with the development of AI agents
3. To apply the ethical considerations in different AI applications
4. To evaluate the relation of ethics with nature
5. To overcome the risk for Human rights and other fundamental values.

Course Outcomes

1	Understand the ethical issues in the development of AI agents	**K2**
2	Learn the ethical considerations of AI with perspectives on ethical values	**K1**
3	Apply the ethical policies in AI based applications and Robot development	**K3**
4	To implement the AI concepts to societal problems by adapting the legal concepts by securing fundamental rights.	**K4**
5	Overcome the evil genesis in the concepts of AI	**K5**

K1–Remember K2 –Understand K3–ApplyK4-AnalyzeK5–EvaluateK6-Create

Unit I	**Ethics of AI**	**18**
Role of Artificial Intelligence in Human Life, Understanding Ethics, Why Ethics in AI? Ethical Considerations of AI, Current Initiatives in AI and Ethics, Ethical Issues with our relationship with artificial Entities.		
Unit II	**Framework and Models**	**19**
AI Governance by Human-right centered design, Normative models, Role of professional norms, Teaching Machines to be Moral.		
Unit III	**Concepts and Issues**	**19**
Accountability in Computer Systems, Transparency, Responsibility and AI. Race and Gender, AI as a moral right-holder.		
Unit IV	**Perspectives and Approaches**	**17**
Perspectives on Ethics of AI, Integrating ethical values and economic value, Automating origination, AI a Binary approach, Machine learning values, Artificial Moral Agents.		
Unit V	**Cases and Application**	**17**
Ethics of Artificial Intelligence in Transport, Ethical AI in Military, Biomedical research, Patient Care, Public Health, Robot Teaching, Pedagogy, Policy, Smart City Ethics.		
Unit VI	**Contemporary Issues**	**3**
	TotalLectureHours	**90 Hours**

Text book(s)

1. Paula Boddington, "Towards a Code of Ethics for Artificial Intelligence", Springer, 2017
2. Markus D. Dubber, Frank Pasquale, Sunit Das, "The Oxford Handbook of Ethics of AI", Oxford University Press Edited book, 2020
3. S. Matthew Liao, "Ethics of Artificial Intelligence", Oxford University Press Edited Book, 2020

Reference Book(s)

1. N. Bostrom and E. Yudkowsky. "The ethics of artificial intelligence". In W. M. Ramsey and K. Frankish, editors, The Cambridge Handbook of Artificial Intelligence, pages 316–334. Cambridge University Press, Cambridge, 2014.
2. Wallach, W., & Allen, C, "Moral machines: ceaching robots right from wrong", Oxford University Press, 2008.

Related Online Contents (MOOC,SWAYAM,NPTEL, Websites etc)

1		
2		

Course Designed by : Dr. K.R.ANANTH, Associate Professor & Head, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	S	M	L	L	L	L	L	L	L
CO5	S	S	S	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Fundamentals of Data Science	L	T	P	C
Core/Elective/Supportive		Core:9	6	0	0	4
Pre- requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

1. To acquire skills in data preparatory and preprocessing steps
2. To understand the mathematical skills in statistics
3. To learn the tools and packages in Python for data science
4. To gain understanding in classification and Regression Model
5. To acquire knowledge in data interpretation and visualization techniques

Course Outcomes

1	Apply the skills of data inspecting and cleansing	**K2**
2	Determine the relationship between data dependencies using statistics	**K2**
3	Understand the can handle data using primary tools used for data science	**K2**
4	Represent the useful information using mathematical skills	**K2**
5	Apply the knowledge for data describing and visualization using tools	**K3**

K1–Remember K2 –Understand K3–ApplyK4-AnalyzeK5–EvaluateK6-Create

Unit I	Introduction	18

Need for data science –benefits and uses –facets of data –data science process –setting the research goal –retrieving data –cleansing, integrating and transforming data –exploratory data analysis –build the models –presenting and building applications.

Unit II	Frequency Data Distributions	19

Frequency distributions –Outliers –relative frequency distributions –cumulative frequency distributions –frequency distributions for nominal data –interpreting distributions –graphs –averages –mode –median –mean –averages for qualitative and ranked data.

Unit III	Normal Data Distributions	19

Normal distributions –z scores –normal curve problems –finding proportions –finding scores –more about z scores –correlation –scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient.

Unit IV	Python for Data Handling	17

Basics of Numpy arrays, aggregations, computations on arrays, comparisons, structured arrays, Data manipulation, data indexing and selection, operating on data, missing data, hierarchical indexing, combining datasets –aggregation and grouping, pivot tables.

Unit V	Python for Data Visualization	17

Visualization with matplotlib, line plots, scatter plots, visualizing errors, density and contour plots, histograms, binnings, and density, three dimensional plotting, geographic data.

Unit VI	Contemporary Issues	3
	TotalLectureHours	**90 Hours**

Text Book(s)

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016.
2. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017.
3. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016.

Reference Book(s)

1. Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green Tea Press, 2014.

	Related Online Contents (MOOC,SWAYAM,NPTEL, Web sites etc)	
1		

Course Designed by : Dr. K.R.ANANTH, Associate Professor & Head, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	S	M	L	L	L	L	L	L	L
CO5	S	S	S	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Data Science Lab	L	T	P	C
Core/elective/Supportive		Core Lab :6	0	0	3	4
Pre- requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

1. Understand the Programming Language.
2. To prepare data for data analysis through understanding its distribution.
3. Exposure on data processing using excel
4. To acquire knowledge in plotting using visualization tools.
5. To understand and implement classification and regression model.

Course Outcomes

1	Understand the basic concepts and techniques of Machine Learning.	K2
2	Explaintheregressionmethods,classificationmethods,clusteringmethods.	K1
3	Apply the inference and learning algorithms for the hidden Mark model.	K3
4	Demonstrate Dimensionality reduction Techniques	K4
5	AppreciatetheunderlyingmathematicalrelationshipswithinandacrossMachine Learning algorithms and the para digms of supervise dandun-supervised learning.	K5

K1–Remember K2 –Understand K3–ApplyK4-AnalyzeK5–EvaluateK6-Create

List of Programs

1. Study of Basic function in Excel
2. Working with Range Names and Tables
3. Cleaning Data with Text Functions
4. Cleaning Data containing Data Values
5. Working with VLOOKUP functions and Pivot Table.
6. Demonstration of Data Visualization in Excel.
7. Importing Data from External Source Using Excel
8. Creating a data model
9. Create a dashboard for a given requirement
10. Implement a data analytics for the real time data set

Total Lecture Hours **90Hours**

Textbook(s)

Reference Book(s)

Related Online Contents (MOOC,SWAYAM,NPTEL,Websitesetc)

Course Designed by : Dr. K.R.ANANTH, Associate Professor & Head, School of Computer Science,VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	L	L	L	L	L	L	L	L
CO2	S	M	M	L	L	L	L	L	L	L
CO3	S	M	M	L	L	L	L	L	L	L
CO4	S	S	S	L	L	L	L	L	L	L
CO5	S	S	S	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Big Data Analytics	L	T	P	C
Core/elective/Supportive		Elective: I	6	0	0	4
Pre-requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

1. To understand about big data.
2. To learn and use NoSQL big data management.
3. To work with map reduce applications
4. To understand the usage of Hadoop related tools for Big Data Analytics

Course Outcomes

1	Understand and critically apply the concepts and methods of big data analytics	**K2**
2	Analyze about the various methodologies.	**K4**
3	Apply modeling uncertainty and statistical inference	**K3**
4	Evaluate the performance of analytical frameworks	**K5**

K1–Remember K2 –Understand K3–ApplyK4-AnalyzeK5–EvaluateK6-Create

Unit I	Introduction	18

Introduction – Data – Information – Data Terminologies – Database – Data Mining – Data Warehouse – Data Evolution Roadmap – Big Data – Definition – Type of Data – Numeric – Categorical – Graphical – High Dimensional Data .

Unit II	Data Classification	18

Data Classification – Hot Data – Cold Data – Warm Data – Thick Data – Thin Data - Classification of digital Data: Structured, Semi-Structured and Un-Structured- Data Sources - Time Series – Transactional Data – Biological Data – Spatial Data – Social Network Data

Unit III	Big Data	17

Big Data: Digital Data-an Imprint: Evolution of Big Data – What is Big Data – Sources of Big Data. Characteristics of Big Data 6Vs – Big Data Myths - Data Discovery-Traditional Approach.

Unit IV	Big Data Technology	17

Big Data Technology: Big Data Technology Process – Big Data Exploration - Data Augmentation – Operational Analysis – 360 View of Customers – Security and Intelligence.

Unit V	Use Cases	17

Big Data Use Cases –- Big Data Roles Data Scientist , Data Architect, Data Analyst – Skills – Case Study : Big Data – Customer Insights – Behavioural Analysis – Big Data Industry Applications - Marketing – Retails – Insurance – Risk and Security – Health care.

Unit VI	Contemporary Issues	3

Total Lecture Hours	90Hours
Course Designed by :	

Text Book(s)

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
3. V. Bhuvaneswari, T. Devi, “Big Data Analytics: Scitech Publisher , 2018
4. Han Hu, Yonggang Wen, Tat-Seng, Chua, Xuelong Li,“Toward Scalable Systems for Big Data Analytics: A Technology Tutorial”, IEEE, 2014.

Reference Book(s)
1. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012. 2. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011. 3. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010. 4. Alan Gates, "Programming Pig", O'Reilley, 2011.

Related Online Contents(MOOC,SWAYAM,NPTEL, Web sites etc)		
1		
2		

Course Designed by : Dr. K.SELVANAYAKI, Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	M	L	L	L	L	L	L	L	L
CO3	S	M	M	L	L	L	L	L	L	L
CO4	S	S	S	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Cyber Security	L	T	P	C
Core/Elective/Supportive		Elective: I	6	0	0	4
Pre- requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

1.To understand the fundamental functioning of Cyber security
2. To understand the different protective mechanism in varied Cyber space

Course Outcomes

1	Understand the basics of Cyber security	K2
2	Apply the appropriate security over internet and mobile devices	K3
3	Understand the legal frame work of Cyber securityand different security threats	K3
4	Analyze and adopt the required firewall and security	K4
5	Examine the method and procedure for cryptography and apply it	K5

K1–Remember K2 –Understand K3–ApplyK4-AnalyzeK5–EvaluateK6-Create

Unit I	**Introduction**	**17**

History of Internet – Overview of Cyber Security – The Security Environment – Threats: Cyber Crime, Warfare, terrorism and Espionage. Vulnerabilities: vulnerabilities in software, System administration, Network Architectures, Open Access Data, Weak Authentication.

Unit II	**Cyber space**	**17**

Cyber space – web browsing and browser security – Email security, firewall in browsers, security certificate – basic security for HTTP applications and services. Password security – guidelines to choose a password – two steps authentication – WiFi security. Securing social media – social media secure networking – smart phone security – Android, IoS

Unit III	**Cyber Intrusion**	**18**

Cyber Intrusion, Abuse of Privileges, Unauthorized Access, Malware infection, Intrusion detection and Prevention Techniques: Network based and host based, Anti-Malware software. Cyber Security Regulations – Government and Private organizations in Cyberspace – Cyber Security Standards – National Cyber Security Policy

Unit IV	**Cryptography Basics**	**18**

Introduction to Cryptography, Classifications of Cryptography: Symmetric key and Asymmetric key Cryptography, Applications of Cryptography. Firewalls- Types of Firewalls, VPN Security Security Protocols: - Application Layer security - PGP and S/MIME, ransport Layer security – SSL and TLS, Network Layer Security -IPSec.

Unit V	**Introduction to Cyber Forensics**	**18**

Introduction to Cyber Forensics, Preliminary Investigations procedure and methods, Conducting disk-based analysis, Tracing Internet access, Tracing memory.

Unit VI	**Contemporary Issues**	**3**
	Total Lecture Hours	**90 Hours**

Text Book(s)

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", 4th Edition, Vikas Publishing House, 2011.
2. Atul Kahate, "Cryptography and Network Security", McGraw Hill, 2013.

Reference Book(s)

1. William Stallings, "Cryptography and Network Security Principles and Practices",7th Edition, Pearson, 2017.
2. Man Young Rhee, "Internet Security: Cryptographic Principles", Wiley Publications, 2003.

3. Nelson, Phillips, Enfinger, Steuart, "Computer Forensics and Investigations", Cengage Learning, India Edition, 2008.		
	Related Online Contents (MOOC,SWAYAM,NPTEL,Websites etc)	
1		
2		
Course Designed by : Dr. K.SELVANAYAKI, Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO2	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO3	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO4	**S**	**M**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO5	**S**	**S**	**S**	**L**	**L**	**L**	**L**	**L**	**L**	**L**

*S-Strong; M-Medium; L-Low

Course Code		Deep Learning	L	T	P	C
Core/elective/Supportive		Elective - I	6	0	0	4
Pre- requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

1. To understand the basics of deep neural networks
2. To understand CNN of architectures of deep neural networks
3. To understand the concepts of Artificial Neural Networks
4. To learn the basics of Data science in Deep learning
5. To learn about applications of deep learning in AI and Data Science

Course Outcomes

1	Understand the basic concepts and techniques of Deep Learning.	**K2**
2	Analyze deep learning algorithms for data science	**K4**
3	Apply the deep learning architectures	**K3**
4	Create deep learning algorithms for variety applications	**K6**

K1–Remember K2 –Understand K3– ApplyK4-AnalyzeK5–EvaluateK6-Create

Unit I	Basics of Deep Learning	18

Linear Algebra: Scalars -- Vectors -- Matrices and tensors. Probability Distributions -- Gradient-based Optimization.

Unit II	Deep Learning Models	18

Tensorflow–Variables–Operations–Placeholders–Sessions–SharingVariables–Graphs–Visualization.

Unit III	Convolutional Neural Networks	17

Convolution Operation -- Sparse Interactions -- Parameter Sharing -- Equivariance -- Pooling -- Convolution Variants: Strided -- Tiled -- Transposed and dilated convolutions.

Unit IV	Deep Learning Algorithms for AI	17

Artificial Neural Networks – Linear Associative Networks – Perceptron -The Backpropagation Algorithm - Hopfield Nets - Boltzmann Machines.

Unit V	Applications of Deep Learning	17

Detection in chest X-ray images -object detection and classification -RGB and depth image fusion - NLP tasks - dimensionality estimation - time series forecasting.

Unit VI	Contemporary Issues	3
	Total Lecture Hours	**90 Hours**

Text Book(s)

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, ``Deep Learning", MIT Press, 2016
2. Stone, James. (2019). Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning, Sebtel Press, United States, 2019
3. Vance, William , Data Science: A Comprehensive Beginners Guide to Learn the Realms of Data Science (Hardcover - 2020), Joiningthedotstv Limited

Reference Book(s)

1. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), Deep Learning Applications, Volume 3,Springer Publications 2022
2. Charu C. Aggarwal, Neural Networks and Deep Learning: A Textbook, Springer International Punlishing, 2018.

RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)

1	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview	
2	https://onlinecourses.swayam2.ac.in/arp19_ap79/preview	

Course Designed by : Dr. K.SELVANAYAKI, Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO2	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO3	**S**	**M**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO4	**S**	**S**	**S**	**L**	**L**	**L**	**L**	**L**	**L**	**L**

*S-Strong; M-Medium; L-Low

Course Code		Capstone Project Work Phase II	L	T	P	C
Core/elective/Supportive		Skill Based Subject Lab:3	0	0	6	2
Pre- requisite		• Students should have completed Capstone Project Work Phase –I • Strong coding skills in any one programming paper	Syllabus version		2023-24 Onwards	

Course Objectives

- To understand and select the task based on the ricers kills.
- To get the knowledge about analytical skill for solving the selected task.
- To get confidence for implementing that ask and solving the real time problems.

Expected Course Outcomes

On the successful completion of the course, student will be able to:

1	Select appropriate input, output, form and table design	**K3**
2	Designcodetomeettheinputrequirementsandtoachievetherequiredoutput	**K6**
3	Composea project report in corporating the features of the project	**K6**

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

Aim of the project work

1. The aim of the project work is to acquire practical knowledge on the implementation of the programming concepts studied.

2. Each student should carry out individually one project work and it may be a work using the software packages that they have learned or the implementation of concepts from the papers studied or implementation of any innovative idea focusing on application oriented concepts.

3. The project work should be compulsorily done in the college only under the supervision of the depart ment staff concerned.

Viva Voce

1. Viva-Voce will be conducted at the end of the year by both Internal (Respective Guides) and External Examiners, after duly verifying the Annexure Report available in the College, for total of 75 marks at the last day of the practical session.

2. Outof75marks, 45 marks for project report and 30 Marks for Viva Voce.

Project Work Format

PROJECTWORK

TITLE OF THE DISSERTATION

Bona fide Work Done

by STUDENT

NAMEREG.NO.

Dissertation submitted in partial fulfillment of the requirements for the award of

<Name of the Degree>

College Logo

Signature of the Guide

Signature of the HOD

Submitted for the Viva-Voce Examination on held on _____

Internal Examiner External Examiner

Month– Year

CONTENTS

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	L	L	L	L	L
CO2	S	S	S	S	S	M	M	L	L	L
CO3	S	S	S	S	S	M	M	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Capstone Project Work	L	T	P	C
Core/Elective/Supportive		Skill Based Subject 2 Lab	0	0	3	3
Pre- requisite		• Students should have a good understanding of software engineering • Student should possess strongan alytical skills • Strong coding skills in any one programming	Syllabus version		2023-24 Onwards	

Course Objectives

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

Expected Course Outcomes

On the successful completion of the course, student will be able to:

1	Illustrate are al world problem and identify the list of project requirements	**K3**
2	Judge the features of the project including forms, databases and reports	**K5**
2	Designcodetomeettheinputrequirementsandtoachievetherequiredoutput	**K6**
3	Composed project report incorporating the features of the project	**K6**

K1–Remember K2 –Understand K3–ApplyK4-AnalyzeK5–EvaluateK6-Create

Aim of the project work

1. The aim of the project work is to acquire practical knowledge on the implementation of the programming concepts studied.

2. Each student should carry out individually one project work and it may be a work using the Software packages that they have learned or the implementation of concepts from the papers studied or implementation of any innovative idea focusing on application oriented concepts.

3.The project work should be compulsorily done in the college only under the supervision of the Department staff concerned.

Viva Voce

1. Viva-Voce will be conducted at the end of the year by both Internal (Respective Guides) and External Examiners, after duly verifying the Annexure Report available in the College, for at total of 75 marks at the last day of the practical session.

2. Outof75marks, 45 marks for project report and 30 Marks for Viva Voce.

Project Work Format

PROJECT WORK

TITLE OF THE DISSERTATION

Bonafide Work Done by

STUDENT

NAMEREG.NO.

Dissertate on submitted in partial full fillment of the requirements for the award
of
<Name of the Degree>
Of Bharathiar University,Coimbatore-46.

College Logo

Signature of the Guide Signature of the HOD
Submitted for the Viva-Voce Examination held on _____

Internal Examiner External Examiner

Month– Year

CONTENTS

3.2 Input Design

3.3 Output Design

3.4 Database Design

3.5 System Development

3.5.1 Description of Modules(Detailed explanation about the project work)

4SoftwareTestingandImplementationC

onclusion

Bibliography

Appendices

A. Dataflow Diagram

B. Table Structure

C. Sample Coding

D. Sample Input

E. Sample Output

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	L	L	L	L	L
CO2	S	S	S	S	S	L	L	L	L	L
CO3	S	S	S	S	S	M	M	L	L	L
CO4	S	S	S	S	S	M	M	L	L	L

*S-Strong; M-Medium; L-Low


Sixth
Semester

Course Code		Robotic Process Automation	L	T	P	C
Core/Elective/Supportive		Core:10	6	0	0	4
Pre-requisite		None	Syllabus		2023-24 Onwards	

Course Objectives

- To introduce the fundamental concept sand techniques of natural language processing(NLP)

Expected Course Outcomes

1	Understandthefundamentalconceptsandtechniquesofnaturallanguageprocessing (NLP)	K2
2	Understanding of the models and algorithms in the field of NLP.	K2
3	Demonstrate the computational proper ties of natural languages and the commonly used algorithms for processing linguistic in formation.	K2
4	Understanding semantic sand pragmatics of languages for processing	K2

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

Unit I	**Robotic Process Automation (RPA)**	**18**

Robotic Process Automation (RPA):Fundamentals of RPA – Programming basics from RPA perspective – Applying RPA – RPA development methodology – Architecture of RPA – RPA and emerging ecosystem.

Unit II	**Automation and RPA**	**18**

Basics of RPA - RPA Benefits - Processes that can be automated – Types of Robots. Automation and RPA Concepts: Business models for implementing RPA – Centre of Excellence - Types and their applications – Building an RPA team - Approach for implementing RPA initiatives.

Unit III	**Understanding the Automation Cycle**	**18**

Automation stages and the role of a Business Manager - Guidelines for tracking the implementation success – Metrics /Parameters to be considered for gauging success- Choosing the right licensing option.

Unit IV	**Ui Path Studio**	**17**

Introduction - Automation debugging – Automation library – Activities Packages – Basic automation tasks - Text and image automation.Setting up the UiPath environment –- Introduction to UiPath - The User Interface - Keyboard Shortcuts

Unit V	**Data persistence in RPA**	**16**

Tables in RPA - Data Manipulation in excel - Extracting Data from PDF – Using anchors in PDF.

Unit VI	**Contemporary Issues**	**3**
	Total Lecture Hours	**75Hours**

Text Book(s)

1. Robotic Process Automation using UiPath StudioX: A Citizen Developer's Guide to HyperautomationPaperback June 2021by Adeel Javed, Anum Sundrani, Nadia Malik, Sidney Madison Prescott.
2. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool – UiPath Paperback March 2018by Alok Mani Tripathi

Reference URL (s)

1. https://www.uipath.com/landing/academic-studio-download
2. https://www.uipath.com/rpa/robotic-process-automation

3. https://www.uipath.com/rpa/academy

	Related Online Contents (MOOC,SWAYAM,NPTEL,Web sites etc)	
1		
2		

Course Designed by : Dr. S.PRASATH, Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO2	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO3	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO4	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**

*S-Strong; M-Medium; L-Low

Course Code		Programming in UI Path Automation Lab	L	T	P	C
Core/elective/Supportive		Core Lab :7	0	0	4	2
Pre-requisite		Basics in Flowchart, Algorithm	Syllabus		2023-24 Onwards	

Course Objectives

- To get a knowledge in dissecting the myths from the facts and realize the true benefits of RPA

Course Outcomes

1	Understand business functionalities in Robotics Process Automation	K2
2	Implement RPA functions across the Organizations to boost revenues	K3
3	Demonstrate the basics of robotic process automation using UI Path.	K2
4	Manage RPA solutions to ensure lasting results	K2

K1–Remember K2 –Understand K3–ApplyK4-AnalyzeK5–EvaluateK6-Create

LISTOFPROGRAMS

1. Robotic Process Automation – Introduction, Working
2. UiPath – Basics, Installation and Understanding User Interface Components
3. Keyboard Shortcuts & Customization.
4. Visual workflow automation straightforward and intuitive
5. UiPath is providing automated workflow design, Which can be used without programming knowledge
6. Recording are important functionality of UiPath studio, enables us to capture user's action on the screen and translate them into sequences.
7. Excel Automation
8. Email Automation

TotalLectureHours	30Hours

Text Book(s)

Reference Book(s)

	Related Online Contents (MOOC,SWAYAM,NPTEL, Web sites etc)	
1		
2		

Course Designed by : Dr. S.PRASATH, Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	L	L	L	L	L	L	L
CO2	S	M	M	L	L	L	L	L	L	L
CO3	S	S	M	L	L	L	L	L	L	L
CO4	S	S	S	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Project Work Lab	L	T	P	C
Core/Elective/Supportive		Core-11	0	0	6	4
Pre- requisite		Students should have the strong knowledge inane one of the programming languages in this course.	Syllabus version		2023-24 Onwards	

Course Objectives

- To understand and select the task based on the ire core skills.
- To get the knowledge about analytical skill for solving the selected task.
- To get confidence for implementing the task and solving the real time problems.
- Express technical and behavioral ideas and though thin oral settings.
- Prepare and conduct oral presentations

Course Outcomes

On the successful completion of the course, student will be able to :

1	Formulate a real world problem and develop its requirements develop design solution Foresee to requirements	**K3**
2	Testandvalidatetheconformanceofthedevelopedprototypeagainsttheoriginal requirements of the problem	**K5**
3	Workasaresponsiblememberandpossiblyaleaderofateamindevelopingsoftware solutions	**K3**
4	Expresstechnicalideas,strategiesandmethodologiesinwrittenform.Self-learnnewtools,algorithmsandtechniquesthatcontributetothesoftwaresolutionof the project	**K1-K4**
5	Generate ergative solutions, compare them and select the optimum one	**K6**

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

Aim of the project work

1. The aim of the project work is to acquire practical knowledge on the implementation of the programming concepts studied.

2. Each student should carry out individually one project work and it may be a work using this of ware packages that they have learned or the implementation of concepts from the papers studied or implementation of any innovative idea focusing on application oriented concepts.

3. The project work should be compulsorily done in the college only under the supervision of the department staff concerned.

Viva Voce

1. Viva-Voce will be conducted at the end of the year by both Internal (Respective Guides) and External Examiners, after duly verifying the Annexure Report available in the College, for a total of200marks at the last day of the practical session.

2. Outof200 marks,160 marks for project report and40 marks for Viva Voce.

Project Work Format

PROJECTWORK

TITLEOFTHEDISSERTATION

Bona fide Work Done

by STUDENT NAME

REG.NO.

Dissertation submitted in partial fulfillment of the requirements for the award of
<Name of the Degree>

College Logo

Signature of the Guide Signature of the HOD

Submitted for the Viva-Voce Examination held on _____

Internal Examiner External Examiner

Month– Year

CONTENTS

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	L	L	L	L	L
CO2	S	S	S	S	M	L	L	L	L	L
CO3	S	S	S	S	M	M	M	L	L	L
CO4	S	S	S	S	M	M	M	L	L	L
CO5	S	S	S	S	M	M	M	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Ethical Hacking	L	T	P	C
Core/Elective/Supportive		Elective: II	5	0	0	4
Pre- requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

- To introduce the concepts of security and carious kinds of attacks
- To explain about system hacking and penetration testing

Expected Course Outcomes

1	Explain the importance of security and various types of attacks	**K2**
2	Understand the concepts of scanning and system hacking	**K2**
3	Explain about penetration testing and its methodology	**K2**
4	Identify the various programming languages used by security professional	**K4**

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

UNIT I	**Introduction To Hacking**	**15**

Introduction to Hacking – Importance of Security – Elements of Security – Phases of an Attack – Types of Hacker Attacks – Hacktivism – Vulnerability Research – Introduction to Foot printing – InformationGatheringMethodology–FootprintingTools–DNSInformation Tools-Meta Search Engines.

UNIT II	**Scanning And Enumeration**	**15**

Introduction to Scanning – Objectives – Scanning Methodology – Tools – Introduction To Enumeration–Enumeration Techniques and Procedure.

UNIT III	**System Hacking**	**15**

Introduction–CrackingPasswords–PasswordCrackingWebsites–PasswordGuessing–Password Cracking Tools–Password Cracking Countermeasures- Key loggers and Spyware.

UNIT IV	**Programming For Security Professionals**	**15**

HTML–Perl–Windows OS Vulnerabilities–Tools for Identifying Vulnerabilities Countermeasures

UNIT V	**Penetration Testing**	**15**

Introduction–SecurityAssessments–TypesofPenetrationTesting-PhasesofPenetration Testing– Tools–Choosing Different Types of Pen-Test Tools.

Total Lecture Hours	**75Hours**

Text Book(s)

1	EC-Council, ‑Ethical Hacking and Countermeasures: Attack Phases‖, CengageLearning,2010.
2	Jon Erickson,‑Hacking,2nd Edition: The Art of Exploitation‖,No Starch Press Inc., 2008.
3	Michael T. Simpson, Kent Backman, James E. Corley,‑Hands-On Ethical Hacking andNetworkDefense‖,CengageLearning,2013.

Reference Book(s)

1	Patrick Engebretson,‑The Basics of Hacking and Penetration Testing –Ethical Hacking and Penetration Testing MadeEasy‖,SecondEdition,Elsevier,2013.
2	Rafay Boloch, ‑Ethical Hacking and Penetration Testing Guide‖, CRC Press,2014

	Related Online Contents (MOOC,SWAYAM,NPTEL,Web sites etc)	
1	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview	
2	https://onlinecourses.swayam2.ac.in/arp19_ap79/preview	
Course Designed by :		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	M	L	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Digital Forensics	L	T	P	C
Core/elective/Supportive		Core:6	5	0	0	4
Pre-requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

1. To introduce the principle and concepts of digital forensic
2. Todetailaboutthevariousinvestigationprocedureslikedataacquisition and evidence gathering

Course Outcomes

1	Explain the principles of network ,mobile and cyber forensic science	K2
2	Illustrate the cyber-crime investigation procedures	K2
3	Apply the cyber-crime techniques to data acquisition and evidence collection	K3
4	Analyzing the digital evidences and arriving gat conclusions	K4
5	Examine the Volatile and Non-volatile Digital Evidence	K4

K1–Remember K2 –UnderstandK3–apply K4-AnalyzeK5–evaluateK6-Create

Unit I	Basics of Digital Forensics	15

Digital Forensics-Introduction, Objective and Methodology, Rules of Digital Forensics, Good Forensic Practices, Principles of Digital Evidence. Overview of types of Computer Forensics–Network Forensics, Mobile Forensics,SocialMediaForensicsandE-mailForensics.Servicesofferedby Digital Forensics.

Unit II	Cybercrime Investigation	15

Introduction to Cyber Crime Investigation, Procedure for Search and seizure of digital evidences in cyber- crime incident-Forensics Investigation Process- quisition, Duplication & Preservation of evidences, Examination and Analysis of evidences, Storing of Evidences, Documentation and Reporting, Maintaining the Chain of Custody.

Unit III	Data Acquisition and Evidence Gathering	15

Data Acquisition of live system, Shutdown Systems and Remote systems, servers. E-mail Investigations, Password Cracking. Seizing and preserving mobile devices. Data Acquisition and Evidence Gathering from Social Media. Challenges and issues in cyber-crime investigation.

Unit IV	Analysis of Digital Evidences	15

Search and Seizure of Volatile and Non-volatile Digital Evidence, Imaging and Hashing of Digital Evidences, Introduction to Deleted File Recovery, Stegano graphy and Steganalysis, Data Recovery Tools and Procedures, Duplication and Preservation of Digital Evidences, Recover Internet Usage Data, Recover Swap files/Temporary Files/Cache Files. Importance of Log Analysis in forensic analysis.

Unit V	Windows and Linux Forensics	15

Windows Systems Artifacts: File Systems, Registry, Event logs, Shortcut files, Executables. Alternate Data Streams (ADS), Hidden files, Slack Space, Disk Encryption, Windows registry, startup tasks, jump lists, Volume Shadow. Forensic Analysis of the Registry–Use of registry view ers,Reg edit. Extracting USB related artifacts and examination of protected storages.

Total Lecture Hours	75 Hours

Text Book(s)

1	Nina Godbole and SunitBelapore; "Cyber Security: Understanding CyberCrimes, ComputerForensicsandLegal Perspectives", WileyPublications,2011.
2	BillNelson,AmeliaPhillipsandChristopherSteuart;"GuidetoComputerForensics andInvestigations"– 3rd Edition, Cengage, 2010BBS.
3	ShonHarris; "All inOne CISSPGuide,ExamGuideSixthEdition",McGrawHill,2013.

Reference Book(s)		
1	LNJNNationalInstituteofCriminologyandForensicScience,"AForensicGuideforCrimeInvestigators–StandardOperatingProcedures",LNJNNICFS, 2016.	
2	PeterHipson;"MasteringWindowsXPRegistry",Sybex,2002.	
3	HarlanCarvey;"WindowsForensicAnalysisToolkit",Syngress,2012.	
4	AnthonyReyes,JackWiles;"TheBestDamnCybercrimeandDigitalForensicBook",Syngress,USA, 2007.	
5	Cory Altheideand Halan Carvey; "Digital Forensics with Open Source Tools",Syngress Publication.	
	Related Online Contents (MOOC,SWAYAM,NPTEL,Web sites etc)	
1	**https://onlinecourses.swayam2.ac.in/aic20_sp06/preview**	
2	**https://onlinecourses.swayam2.ac.in/arp19_ap79/preview**	
Course Designed by:		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	S	M	L	L	L	L	L	L	L
CO5	S	S	S	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Natural Language Processing	L	T	P	C
Core/elective/Supportive		Elective-II	5	0	0	4
Pre-requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

- To introduce the fundamental concept sand techniques of natural language processing(NLP)

Expected Course Outcomes

1	Understandthefundamentalconceptsandtechniquesofnaturallanguageprocessing (NLP)	K2
2	Understanding of the models and algorithm sin the field of NLP.	K2
3	Demonstrate the computational properties of natural languages and the commonly used Algorithms for proc assign linguistic information.	K2
4	Understanding semantic sand pragmatics of languages for processing	K2

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

UNIT I	Introduction to NLP	15

Introduction :application of NLP technique sand key issues-MT grammercheckers-dictation–document generation- NL interfaces- Natural language processing key issues- the different analysislevelusedforNLP:morpho-lexical-syntactic-semantic-pragmatic-markup(TEI,UNICODE)-finite state automata- Recursive and augmented transition networks-open problems

UNIT II	Lexical Level	15

Lexicallevel:errortolerantlexicalprocessing(spellingerrorcorrection)-ransducersforthedesignofmorphologicanalyzersfeatures-towardssyntax: part-of- speech tagging (BRILL,HMM)-efficient representations for linguisticre sources (lexica,grammars,….) trie sand Finite state automata.

UNIT III	Syntactic Level	15

Syntacticlevel:grammars(eg.formal/Chomskyhierarchy,DCSGs,systematiccase,unification,stochastic)-parsing(top-down,bottomup,char(earlyalgorithm),CYKalgorithm)-automatedestimationofprobabilisticmodelparameters(inside-outsidealgorithm)-dataorientedparsing-grammarformalismsandtreebanks-efficientpatsingforcontext-freegrammars(CFGs)-statistcial Parsing and probabilistic CFGs(PCFGs)-lexicilized PCFGse.

UNIT IV	Semantic Level	15

Semanticlevel:logicalforms-ambiguityresolution-semanticnetworkandparsers-procedural semantics-montaguesemantics-vectorspaceapproaches-distributionalsemantics-lexicalsemanticsandword sense disambiguation-compositional semantic semantic rolela belingandsematic parsing

UNIT V	Pragmatic LEvel	15

Pragmaticlevel:knowledgerepresentation-reasoning-plan/goalrecognition–speechacts/intentions – belief models- discourse- reference. Natural language generation: content determination – sent en ceplanning- surfa cerealization, subjectivity and sentiment analysis.

Total Lecture Hours	75Hours

Text Book(s)

1	DanielJandJamesH.Martin,‖speechandlanguageprocessing‖anintroductiontonatural languageprocessing,computationallinguistcs&speechrecognition‖prenticehall,2009.

Reference Book(s)

1	LanHWrittenandElbef,MarkA.Hall,‖datamining:practicalmachinelearningtoolsand techiniques‖,MorganKaufmann,2013	
	Related Online Contents (MOOC,SWAYAM,NPTEL,Web sites etc)	
1	**https://onlinecourses.swayam2.ac.in/aic20_sp06/preview**	
2	**https://onlinecourses.swayam2.ac.in/arp19_ap79/preview**	
Course Designed by :		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO2	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO3	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO4	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**

*S-Strong; M-Medium; L-Low

Course Code		Internet of Things (IoT)	L	T	P	C
Core/Elective/Supportive		Elective : III	5	0	0	4
Pre- requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

- To explain about the definition and usage of Internet of things
- To explain the key component sof IoT system

Expected Course Outcomes

1	Explain the definition and usage of the term –Internet of Thing s‖in different contexts	K2
2	Understand the key components that make up an IoT system	K2
3	DifferentiatebetweenthelevelsoftheIoTstackandbefamiliarwiththekey Technologie sand protocols employed teach layer of the stack	K3
4	Applytheknowledgeandskillsacquiredduringthecoursetobuildandtesta complete,workingIoTsysteminvolvingprototyping,programminganddataanalysis	K3
5	DiscoverwheretheIoTconceptfitswithinthebroaderICTindustryandpossible futuretrends	K4

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

Unit I	**Introduction to IoT**	**15**

Introduction–DefinitionandCharacteristicsofIoT,PhysicalDesignofIoT;ThingsinIOT,Logical DesignofIoT;IoTFunctionalBlocks,IoTCommunicationAPIs,IoTEnablingTechnologies;WSN,CloudCo mputing, Big Data Analysis, Communication Protocols, Embedded Systems

Unit II	**IoT Hardware**	**12**

IoTHardware,DevicesandPlatforms– BasicsofArduinoHardware,TheArduinoIDE,BasicArduinoProgramming,BasicsofRaspberrypi;Introduc tiontoRaspberrypi,Programmingwith Raspberrypi, IoTPlatforms,IoT Sensors and actuators

Unit III	**IoT Protocols**	**15**

IoTProtocols– IoTDatalinkProtocols,NetworkLayerRoutingProtocols,NetworkLayerEncapsulationProtocols,SessionLa yerProtocols,IoTSecurityProtocols,ServiceDiscovery Protocols,InfrastructureProtocols.

UnitIV	**IoT Programming**	**15**

IoT Programming – Arduino Programming: Serial Communications – Getting Input from Sensors,Visual,PhysicalandAudioOutputs,RemotelyControllingExternalDevices,WirelessCommunicat ion,

UnitV	**DomainSpecificIoT**	**15**

Domain Specific IoT – Home automation, smart cities, Smart Environment, IoT in Energy, Logistics, Agriculture, industry and Health & Life style sensors, Case Studies: ACase Study of Internet ofThings Using WirelessSensor Networks and Smart Phone

UnitVI	**Contemporary Issues**	**3**
	Total Lecture Hours	**75Hours**

Text Book(s)		
1	VijayMadisetti andArshdeepBahga,–Internet ofThings(AHands-on-Approach)‖, 1st Edition,VPT, 2014.	
Reference Book(s)		
1	Margolis, Michael. –ArduinoCooKbook: Receipestobegin, Expand and Enhance Your Projects‖.O'ReillyMediaInc.2011.	
2	Monk,Simon.RaspberryPiCookbook:SoftwareandhardwareproblemsandSolutions. O'ReillyMedia,Inc.2016.	
	Related Online Contents(MOOC,SWAYAM,NPTEL, Web sites etc)	
1	**https://onlinecourses.swayam2.ac.in/aic20_sp06/preview**	
2	**https://onlinecourses.swayam2.ac.in/arp19_ap79/preview**	
Course Designed by :		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	M	M	L	L	L	L	L	L	L
CO5	S	S	S	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Data Visualization	L	T	P	C
Core/Elective/Supportive		Elective: III	5	0	0	4
Pre- requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

- To introduce the concept of Data Visualization
- To explain the various techniquesin Data Visualization

Expected Course Outcomes

1	Understand the basics of data visualization	K2
2	Understand the importance fdatavisualization and the design and use of many visual components	K2
3	Explain the process of data visualization	K2
4	Explain the basics of interactive data visualization techniques visualization-based issues.	K2
5	Understand the concept of various types of visulaization	K2

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

Unit I	Introduction	15

Introduction-contextofdatavisualization-definitionmethodology,visualizationdesignobjectives.Key factors-purpose, visualization function and tone, visualization design options- data representation, data presenation, seven stages of data visualization, widgets, data visualization tools.

Unit II	Visualizing data methods	15

Visualizingdatamethods-mapping,timeseries-connectionsandcorrelations-scatterplotmaps-trees, Hierachiesan drecursion- networks naadgraphs, infographics

Unit III	Visualizing data process	15

Visualizing data process- acquiring data, where to find data, tools of acquiring data from the internet, locating file for use with processing, loading text data, dealing with files and folders, lisiting files in a folder, asynchronous image downloads, advanced web techniques, using a database, dealing with large number offiles.

Unit IV	Interactive data visualization	12

Interactive data visualization-drawing with data, scales-axes-updates, transaction and mode-interactivity-layouts-geomapping-exportingframework-T3lstabio

Unit V	Security data visualization	15

Securitydatavisualization-portscanvisualization-vulnerabilityassessmentandexploitation-firewall logvisualization-instructiondetectionlogvisualization-attackinganddefendingvisualizationsystems-creatingsecurityvisualization system

Unit VI	Contemporary Issues	3
	Total Lecture Hours	75 Hours

Text Book(s)

1	ScottMurray,"interactivedatavisualizationfortheweb",O"Reillymedia,inc,2013.

Reference Book(s)

1	Benfry,"visualizingdata",O"Reillymedia,inc,2007
2	Greg conti," security data visualization:","graphical techniques for network analysis", Nostarchpress inc,2007

Course Designedby :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO2	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO3	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO4	**S**	**M**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO5	**S**	**S**	**S**	**L**	**L**	**L**	**L**	**L**	**L**	**L**

*S-Strong; M-Medium; L-Low

Course Code		Social Network Analysis	L	T	P	C
Core/Elective/Supportive		Elective: III	5	0	0	4
Pre- requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

- To explain the methodologies used in social network analysis

Expected Course Outcomes

1	Understand abroad range of network concept sand theories.	K2
2	Appreciate how network analysis can contributed increasing knowledge about diverse Aspects of society.	K2
3	Usearelationalapproachtoanswerquestionsofinteresttothem(i.e.beabletoapply 'network thinking').	K3
4	Analyze social net work data using various software packages.	K3
5	Present results from social net work analysis, both orallyandin writing.	K5

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

Unit I	Clustering and Classification	15

Supervised Learning–Decision tree- Naïve Bayesian Text Classification-Support Vector Machines - Ensemble of Classifiers – Unsupervised Learning – K-means Clustering – Hierarchical Clustering – Partially Supervised Learning–Markov Models –Probability-Based Clustering–Vector Space Model

Unit II	Social Media Mining	12

DataMiningEssentials–DataMiningAlgorithms-WebContentMining–LatentsemanticIndexing– AutomaticTopicExtraction–OpinionMiningandSentimentAnalysis–DocumentSentimentClassification

Unit III	Extraction and Mining Communities in Web Social Networks	15

Extracting evolution of Web Community from a Series of Web Archive – Detecting Communities in Social Networks – Definition of Community – Evaluating Communities – Methods for CommunityDetection&Mining–ApplicationsofCommunityMiningAlgorithms– ToolsforDetectingCommunities–SocialNetworkInfrastructureandCommunities– DecentralizedOnlineSocial Networks–Multi-RelationalCharacterizationofDynamicSocialNetworkCommunities

Unit IV	Human behavioranalysis and privacy issues	15

Understanding and Predicting Human Behavior for Social Communities – Use Data Management,InferenceandDistribution–EnablingNewHumanExperiences–RealityMining– ContextAwareness – Privacy in Online Social Networks – Trust in Online Environment – Trust Models BasedonSubjectiveLogic–TrustNetworkAnalysis–TrustTransitivityAnalysis– CombiningTrustand Reputation–TrustDerivationBasedonTrustComparisons–AttackSpectrumandCountermeasures.

Unit V	Visualization And Applications Of Social Networks	15

Visualizing Online Social Networks – Visualizing Social Networks with Matrix-Based Representations – Node-LinkDiagrams–HybridRepresentations–Applications–CovertNetworks– CommunityWelfare– Collaboration Networks–Co-Citation Networks.

Unit VI	Contemporary Issues	3
	Total Lecture Hours	90 Hours

	Text Book(s)	
1	PeterMika, ‐Social networks and the SemanticWeb‖, Springer, 2007.	
2	BorkoFurht,—HandbookofSocialNetworkTechnologiesandApplications‖,Springer,2010.	
	Reference Book(s)	
1	BingLiu,‐Web Data Mining: ExploringHyperlinks, Contents, and UsageData (DataCentric SystemsandApplications)‖,Springer;SecondEdition,2011.	
2	RezaZafarani,MohammadAliAbbasi,HuanLiu,‖SocialMediaMining‖,Cambridge UniversityPress, 2014.	
3	GuandongXu,YanchunZhangandLinLi,—WebMiningandSocialNetworkingTechniques andapplications‖,Springer,2011	
4	DionGohandSchubertFoo,‐Socialinformationretrieval systems:emerging technologiesand Applicationsforsearching theWebeffectively‖,IdeaGroup,2007.	
	Related Online Contents (MOOC,SWAYAM,NPTEL, Web sites etc)	
1	**https://onlinecourses.swayam2.ac.in/aic20_sp06/preview**	
2	**https://onlinecourses.swayam2.ac.in/arp19_ap79/preview**	
CourseDesignedby :		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO2	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO3	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO4	**S**	**M**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO5	**S**	**S**	**S**	**L**	**L**	**L**	**L**	**L**	**L**	**L**

*S-Strong; M-Medium; L-Low

Course Code		Machine Learning	L	T	P	C
Core/elective/Supportive		SkillBasedSubject:3	3	0	0	2
Pre- requisite		None	Syllabus version		2023-24 Onwards	

Course Objectives

1. To understand the basics of Machine Learning (ML)
2. To understand the methods of Machine Learning
3. To know about the implementation aspects of machine learning
4. To understand the concepts of Data Analytics and Machine Learning
5. To understand and implement use cases of ML

Course Outcomes

1	Understand the basics of ML	**K2**
2	Demonstrate various ML techniques using standard packages	**K3**
3	Explore knowledge on Machine learning and Data Analytics	**K6**
4	Apply ML to various real time applications	**K4**

K1–Remember K2 –Understand K3–ApplyK4-AnalyzeK5–EvaluateK6-Create

Unit I	**Machine Learning Basics**	**12**

Introduction to Machine Learning (ML) - Essential concepts of ML – Types of learning – Machine learning methods based on Time – Dimensionality – Linearity and Non linearity – Early trends in Machine learning – Data Understanding Representation and visualization.

Unit II	**Machine Learning Methods**	**11**

Linear methods – Regression -Classification –Perceptron and Neural networks – Decision trees – Support vector machines – Probabilistic models —Unsupervised learning – Factorization.

Unit III	**Machine Learning in Practice**	**11**

Ranking – Recommendation System - Designing and Tuning model pipelines- Performance measurement – Azure Machine Learning – Open-source Machine Learning libraries.

Unit IV	**Machine Learning and Data Analytics**	**12**

Machine Learning for Predictive Data Analytics – Data to Insights to Decisions – Data Exploration – Information based Learning – Similarity based learning – Probability based learning – Error based learning – Evaluation – The art of Machine learning to Predictive Data Analytics.

Unit V	**Applications of Machine Learning**	**11**

Image Recognition – Speech Recognition – Email spam and Malware Filtering – Online fraud detection – Medical Diagnosis.

Unit VI	**Contemporary Issues**	**3**
	Total Lecture Hours	**60Hours**

Text Book(s)

1. Ameet V Joshi, Machine Learning and Artificial Intelligence, Springer Publications, 2020
2. John D. Kelleher, Brain Mac Namee, Aoife D' Arcy, Fundamentals of Machine learning for Predictive Data Analytics, Algorithms, Worked Examples and case studies, MIT press,2015

Reference Book(s)

1. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer Publications, 2011
2. Stuart Jonathan Russell, Peter Norvig, John Canny, Artificial Intelligence: A Modern Approach, Prentice Hall, 2020
3. Machine Learning Dummies, John Paul Muller, Luca Massaron, Wiley Publications, 2021

Related Online Contents(MOOC,SWAYAM,NPTEL,Web sites etc)		
Course Designed by : Dr. S.PRASATH, Assistant Professor, School of Computer Science, VET Institute of Arts and Science (Co-Education) College, Erode		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	M	L	L	L	L	L	L	L	L

*S-Strong;M-Medium; L-Low

Annexure

B.Sc. Artificial Intelligence and Data Science

Syllabus
(With effect from 2022-23)

Program Code: