

B.Sc.ArtificialIntelligenceandMac hineLearning

Syllabus

AFFILIATEDCOLLEGES

ProgramCode:***

2022–2025 Batch



BHARATHIARUNIVERSITY

(A State University, Accredited with “A” Grade by
NAAC, Ranked 13th among Indian Universities by MHRD-
NIRF,

World Ranking: Times-801-1000, Shanghai-901-1000, URAP-982)

Coimbatore-641046 TamilNadu, India

Programme Educational Objectives (PEOs)	
The B.Sc. Artificial Intelligence and Machine Learning program describe accomplishments that graduates are expected to attain within five to seven years after graduation	
PEO1	Expertized with the principles of Artificial Intelligence and problem solving, inference, perception, knowledge representation, and learning
PEO2	Exhibit high standards with regard to application of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models
PEO3	Investigate with a machine learning model for simulation and analysis and explore the scope, potential, limitations, and implications of intelligent systems.



Programme Specific Outcomes (PSOs)	
After the successful completion of B.Sc. Artificial Intelligence and Machine Learning program the students are expected to	
PSO1	Exhibit good domain knowledge and complete the assigned responsibilities effectively and efficiently in par with the expected quality standards for Artificial Intelligence and Machine Learning professional
PSO2	Apply the technical and critical thinking skills in the discipline of artificial intelligence and machine learning to find solutions for complex problems.
PSO3	Design and develop research-based solutions for complex problems in artificial intelligence and machine learning industry through appropriate consideration for the public health, safety, cultural, societal, and environmental concerns.
PSO4	Establish the ability to Listen, read, proficiently communicate and articulate complex ideas with respect to the needs and abilities of diverse audiences.
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 Machine Learning	
PO1	Exhibit good domain knowledge and complete the assigned responsibilities effectively and efficiently in par with the expected quality standards.
PO2	Apply analytical and critical thinking to identify, formulate, analyze, and solve complex problems in order to reach authenticated conclusions
PO3	Design and develop research based solutions for complex problems with specified needs through appropriate consideration for the public health, safety, cultural, societal, and environmental concerns.
PO4	Establish the ability to Listen, read, proficiently communicate and articulate complex ideas with respect to the needs and abilities of diverse audiences.
PO5	Deliver innovative ideas to instigate new business ventures and possess the qualities of a good entrepreneur
PO6	Acquire the qualities of a good leader and engage in efficient decision making.
PO7	Graduates will be able to undertake any responsibility as an individual/member of multidisciplinary teams and have an understanding of team leadership
PO8	Function as socially 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 in a changing world in ways sufficient to maintain the competence and to allow them to contribute to the advancement of knowledge
PO10	Demonstrate knowledge and understanding of management principles and apply these to one own work to manage projects and in multidisciplinary environment.

BHARATHIARUNIVERSITY::COIMBATORE641046

B.Sc.ArtificialIntelligenceandMachineLearning(CBCSPATTERN)
(Forthestudentsadmittedfromtheacademicyear2021-2022andonwards)

SchemeofExamination

Part	TitleoftheCourse	Hours/ Week	Examination				Credits
			Duration inHours	MaximumMarks			
				CIA	CEE	Total	
SemesterI							
I	Language-I	6	3	50	50	100	4
II	English-I	6	3	50	50	100	4
III	Core1:ObjectOriented ProgramminginC++	4	3	50	50	100	4
III	Core2:DataStructures	4	3	50	50	100	4
III	CoreLab1: ProgrammingLab- C++	3	3	50	50	100	4
III	Allied1:DiscreteMathematics	5	3	50	50	100	4
IV	EnvironmentalStudies*	2	3	-	50	50	2
Total		30		300	350	650	26
SemesterII							
I	Language-II	6	3	50	50	100	4
II	English-II &	4	3	25	25	50	2
	Naan Muthalvan –Skill Course Effective English <a href="http://kb.naanmudhalvan.in/images/c/c7/Cambri
dge_Course_Details.pdf">http://kb.naanmudhalvan.in/images/c/c7/Cambri dge_Course_Details.pdf	2		25	25	50	2
III	Core3:JavaProgramming	5	3	50	50	100	4
III	CoreLab2:ProgramingLab -Java	4	3	50	50	100	4
III	CoreLab3:InternetBasicsLab	2	3	25	25	50	2
III	Allied2:AppliedMathematics	5	3	50	50	100	4
IV	ValueEducation- HumanRights*	2	3	-	50	50	2
Total		30		275	325	600	24
SemesterIII							
III	Core4:Programmingin Python	6	3	50	50	100	4
III	Core5: FuzzylogicandNeuralNetworks	6	3	50	50	100	4
III	CoreLab4:PythonProgrammingLab	5	3	50	50	100	4
III	Allied3:DesignandAnalysisofAlgorithms	6	3	50	50	100	4
III	SkillbasedSubject1:InternetofThings	5	3	30	45	75	3
IV	Tamil**/ AdvancedTamil*(OR)Non- majorelective- I(YogaforHumanExcellence)*/ Women's Rights*	2	3	-	50	50	2
Total		30		230	295	525	21
SemesterIV							
III	Core6:ArtificialIntelligence&KnowledgeRe presentation	6	3	50	50	100	4
III	Core7:RProgramming	6	3	50	50	100	4
III	CoreLab 5:RProgrammingLab	3	3	25	25	50	2
	Naan Muthalvan- Skill Course Office Fundamentals - Lab <a href="http://kb.naanmudhalvan.in/Bharathiar
University_(BU)">http://kb.naanmudhalvan.in/Bharathiar University_(BU)	3		25	25	50	2

B. Sc. Software System 2021-22 onwards - Affiliated Colleges - Annexure No.28(a)(6)

SCAA DATED: 23.06.2021

III	Allied4:MachineLearning -Basics	6	3	50	50	100	4
III	SkillbasedSubject2Lab:CapstoneProject Work(Based on AI&Machine Learning)	4	3	30	45	75	3
IV	Tamil**/Advanced Tamil* (OR) Non-majorelective-II(GeneralAwareness*)	2	3	-	50	100	2
Total		30		230	295	525	21

SemesterV							
III	Core8: MachineLearningTechniques	6	3	50	50	100	4
III	Core9: DeepLearning	6	3	50	50	100	4
III	CoreLab6:Machine LearningLab	6	3	50	50	100	4
III	Elective-IBusiness DataAnalytics/Social NetworkAnalysis/SoftwareAgents	6	3	50	50	100	4
III	SkillbasedSubject 3:EthicalHacking	6	3	30	45	75	3
Total		30		230	245	475	19

SemesterVI							
III	Core10:NaturalLanguageProcessing	6	3	50	50	100	4
III	CorePaperXIProject WorkLab%%	4	-	60	90	150	6
III	Core Practical –VII :Natural LanguageProcessingLab	5	3	50	50	100	4
III	Elective – II : Artificial Neural NetworksandFuzzySystems/WebApplication Security/FundamentalsofRobotics	5	3	50	50	100	4
III	Elective–III:Embedded Systems /PrinciplesofSecureCoding/ Open SourceSoftware	5	3	50	50	100	4
III	SkillBasedSubject4CapstoneProject Work Phase II (Based on AI & MachineLearning)	3	3	30	45	75	3
	Naan Muthalvan- Skill Course Cyber Security @ http://kb.naanmudhalvan.in/images/7/71/Cybersecurity.pdf (or) Machine Learning # http://kb.naanmudhalvan.in/images/1/19/PBL_Google.pdf (or) Android APP Development \$ http://kb.naanmudhalvan.in/images/0/08/AndroidApp_Dev.pdf	2		25	25	50	2
V	ExtensionActivities**		-	50	-	50	2
Total		30		365	360	725	29
GrandTotal		180		1630	1870	3500	140

- *NoContinuousInternalAssessment(CIA).OnlyUniversityExaminations.
- **NoUniversityExaminations. OnlyContinuousInternalAssessment(CIA).
- & The English II - University semester examination will be conducted for 50 marks (As per existing pattern of Examination) and it will be converted for 25 marks.
- # Govt – Non-Autonomous Colleges, \$ Aided – Non-Autonomous Colleges, @ Self - Financing (Non – Autonomous).
- NaanMudhalvan – skill courses- external 25 marks will be assessed by Industry and internal will be offered by respective course teacher.



**First
Semester**

CourseCode	ObjectOriented ProgramminginC++	L	T	P	C
Core/elective/Supportive	Core:1	4	0	0	4
Pre- requisite	<ul style="list-style-type: none"> BasicknowledgeofProcedureOriented Programmingconcepts BasicknowledgeinCProgramming 	Syllabus version	2021-22 Onward		
CourseObjectives					
TointroduceheconceptsofObjectOrientedProgrammingParadigmmandtheprogrammingconstructs ofC++					
ExpectedCourseOutcomes					
1	Describetheproceduralandobjectorientedparadigmwithconceptsofstreams, classes,functions,data andobjects				K1
2	Demonstratethe various basic programming constructs like decision making statements. Loopingstatementsandfunctions				K2
3	Explainthe objectorientedconceptsslikeoverloading,inheritance,polymorphism, virtualfunctions,constructorsanddestructors				K3
4	Explainthevariousfilestreamclasses;filetypes,usageoftemplatesandexception handlingmechanisms.				K3
5	Comparetheprosandcons ofprocedureorientedlanguagewiththeconceptsofobject orientedlanguage				K5
6	Developprogramsincorporatingtheprogrammingconstructsofobjectoriented programmingconcepts				K5
K1-Remember K2 -Understand K3-applyK4-AnalyzeK5-evaluateK6-Create					
UNIT -I	INTRODUCTION				12 Hours
IntroductiontoC++-keyconceptsofObject-OrientedProgramming-Advantages- ObjectOrientedLanguages-I/O inC++- C++Declarations. ControlStructures:- DecisionMakingandStatements:If ...else,jump,goto,break,continue,Switchcasestatements-LoopsinC++:for,while,do-functionsinC++- inline functions- Function Overloading.					
UNITII	CLASSESANDOBJECTS				12 Hours
ClassesandObjects:DeclaringObjects-DefiningMemberFunctions-StaticMembervariablesandfunctions- arrayofobjects-friendfunctions-Overloadingmemberfunctions-Bitfieldsandclasses -Constructoranddestructorwithstaticmembers.					
UNIT-III	OPERATOROVERLOADING				12 Hours
Operator Overloading: Overloading unary, binary operators - Overloading Friend functions - typeconversion - Inheritance: Types of Inheritance - Single, Multilevel, Multiple, Hierarchal, Hybrid,Multipath inheritance -Virtual baseClasses-Abstract Classes.					

UNIT-IV	POINTERS	12 Hours
Pointers–Declaration–PointertoClass, Object–thispointer–PointerstoderivedclassesandBaseclasses– Arrays–Characteristics–arrayofclasses–Memorymodels–newanddeleteoperators– dynamicobject –Binding,PolymorphismandVirtualFunctions.		
UNIT-V	FILESTREAMCLASSES	12 Hours
Files–Filestreamclasses–file modes–SequentialRead/Writeoperations–BinaryandASCIIFiles –RandomAccessOperation–Templates–ExceptionHandling–String– DeclaringandInitializingstringobjects– StringAttributes– Miscellaneousfunctions.		
TotalLectureHours		60 Hours
TextBook(s)		
1	AshokNKamthane, Object-OrientedProgrammingwithAnsiandTurbo C++, Pearson Education, 2003.	
REFERENCEBOOKS:		
1	E. Balagurusamy, Object-OrientedProgrammingwithC++, TMH, 1998	
2	MariaLitvin&GrayLitvin, C++foryou, Vikaspublication, 2002.	
3	JohnRHubbard, ProgrammingwithC, 2ndEdition, TMH publication, 2002.	
4		
RelatedOnlineContents(MOOC, SWAYAM, NPTEL, Websitesetc)		
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	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
CO6	S	M	M	L	L	L	L	L	L	L

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

CourseCode	Programming in Lab C++			L	T	P	C
Core/elective/Supportive	Core Lab :1			-	-	3	4
Pre- requisite	<ul style="list-style-type: none"> BasicknowledgeofProcedureOrientedProgrammingconcepts BasicknowledgeinCProgramming 			Syllabus version		2021-22 Onward	
Course Objectives							
<ul style="list-style-type: none"> To introduce the concepts of Object-Oriented Programming Paradigm and the programming constructs of C++ 							
Expected 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						K3
2	Illustrate the concept of Virtual Classes, inline functions and friend functions						K4
3	Compare the various file stream classes; file types, usage of templates and exception handling mechanisms.						K5
4	Compare the pros and cons of procedure oriented language with the concepts of object oriented language						K5
K1-Remember K2 -Understand K3-apply K4-Analyze K5-evaluate K6-Create							
PROGRAM-1							
Write a C++ Program to create a class to implement the data structure STACK. Write a constructor to initialize the TOP of the STACK. Write a member function PUSH () to insert an element and member function POP () to delete an element check for overflow and underflow conditions.							
PROGRAM-2							
Write a C++ Program to create a class ARITHMETIC which consists of a FLOAT and an INTEGER variable. Write member functions ADD (), SUB (), MUL (), DIV () to perform addition, subtraction, multiplication, division respectively. Write a member function to get and display values.							
PROGRAM-3							
Write a C++ Program to read an integer number and find the sum of all the digits until it reduces to a single digit using constructors, destructors and inline member functions.							
PROGRAM-4							
Write a C++ Program to create a class FLOAT that contains one float data member. Overload all the four Arithmetic operators so that they operate on the object FLOAT.							
PROGRAM-5							
Write a C++ Program to create a class STRING. Write a Member Function to initialize, get and display strings. Overload the operators ++ and == to concatenate two Strings and to compare two strings respectively.							

PROGRAM-6		4
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. Derive a class PAY from the above class and write a member function to calculate DA, HRA and PF depending on the grade.		
PROGRAM-7		5
Write a C++ Program to create a class SHAPE which consists of two VIRTUAL FUNCTIONS Calculate_Area() and Calculate_Perimeter() to calculate area and perimeter of various figures. Derive three classes SQUARE, RECTANGLE, TRIANGLE from class Shape and Calculate Area and Perimeter of each class separately and display the result.		
PROGRAM-8		3
Write a C++ Program to create two classes each class consists of two private variables, a integer and a float variable. Write member functions to get and display them. Write a FRIEND Function common to both classes, which takes the object of above two classes as arguments and the integer and float values of both objects separately and display the result.		
PROGRAM-9		3
Write a C++ Program using Function Overloading to read two Matrices of different Data Types such as integers and floating point numbers. Find out the sum of the above two matrices separately and display the sum of these arrays individually.		
PROGRAM-10		5
Write a C++ Program to check whether the given string is a palindrome or not using Pointers.		
PROGRAM-11		5
Write a C++ Program to create a File and to display the content of that file with line numbers.		
PROGRAM-12		5
Write a C++ Program to merge two files into a single file.		
Total Hours		45 Hours
Text Book(s)		
1	Ashok N Kamthane, Object-Oriented Programming with Ansi and Turbo C++, Pearson Education, 2003.	
Reference Book(s)		
1	E. Balagurusamy, Object-Oriented Programming with C++, TMH, 1998	
Course Designed by :		

	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

CourseCode	DataStructures			L	T	P	C	
Core/elective/Supportive	Core:2			4	0	-	4	
Pre- requisite	<ul style="list-style-type: none"> Basic knowledge of Programming Constructs 			Syllabus version		2021-22 Onward		
CourseObjectives								
<ul style="list-style-type: none"> To introduce the concept of data structures and the types of data structures To demonstrate how various data structures can be implemented and used in various applications 								
ExpectedCourseOutcomes								
1	Define the concept of Data structure and list the various classifications of data structures.						K1	
2	Demonstrate how arrays, stacks, queues, linked lists, trees, heaps, Graphs and Hash Tables are represented in the main memory and various operations are performed on those data structures.						K2	
3	Illustrate the various file organizations like Sequential, Random and Linked organizations.						K2	
4	Discover the real time applications of the various data structures						K3	
5	Design algorithms for various sorting and searching techniques						K4	
K1-Remember K2 -Understand K3-apply K4-Analyze K5-evaluate K6-Create								
UNIT I	INTRODUCTION						12 Hours	
Introduction: Introduction of Algorithms, Analyzing Algorithms. Arrays: Sparse Matrices - Representation of Arrays. Stacks and Queues. Fundamentals - Evaluation of Expression Infix to Postfix Conversion - Multiple Stacks and Queues								
UNIT II	LINKED LIST						12 Hours	
Linked List: Singly Linked List - Linked Stacks and Queues - Polynomial Addition - More on Linked Lists - Sparse Matrices - Doubly Linked List and Dynamic - Storage Management - Garbage Collection and Compaction.								
UNIT III	NONLINEAR DATA STRUCTURES						12 Hours	
Trees: Basic Terminology - Binary Trees - Binary Tree Representations - Binary Trees - Traversal - More on Binary Trees - Threaded Binary Trees - Binary Tree Representation of Trees - Counting Binary Trees. Graphs: Terminology and Representations - Traversals, Connected Components and Spanning Trees, Shortest Paths and Transitive Closure								
UNIT IV	EXTERNAL-SORTING						12 Hours	
External Sorting: Storage Devices - Sorting with Disks: K-Way Merging - Sorting with Tapes Symbol Tables: Static Tree Tables - Dynamic Tree Tables - Hash Tables: Hashing Functions - Overflow Handling.								

UNITV	INTERNAL-SORTING	12 Hours
Internal Sorting: Insertion Sort - Quick Sort - 2 Way Merge Sort - Heap Sort - Shell Sort - Sorting on Several Keys. Files: Files, Queries and Sequential organizations - Index Techniques - File Organizations.		
Total Lecture Hours		60 Hours
Text Book(s)		
1	Ellis Horowitz, Sartaj Shani, Data Structures, Galgotia Publication.	
Reference Book(s)		
1	Ellis Horowitz, Sartaj Shani, Sanguthevar Rajasekaran, Computer Algorithms, Galgotia Publication.	
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 :		

	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
CO5	S	M	L	L	L	L	L	L	L	L

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

CourseCode	DiscreteMathematics			L	T	P	C
Core/elective/Supportive	Allied:1			4	1	-	4
Pre- requisite	Basicknowledgein Mathematics			Syllabus version	2021-22 Onward		
CourseObjectives							
<ul style="list-style-type: none"> • Introducestudentstothe techniques, algorithms, and reasoning processes involved in the study of discrete mathematical structures. • Introducestudentstoset theory, inductive reasoning, elementary and advanced counting techniques, equivalence relations, recurrence relations, graphs, and trees. • Introducestudents to prove mathematical statements by means of inductive reasoning 							
ExpectedCourseOutcomes							
1	Understanddiscretemathematical preliminariesand applydiscretemathematicsin formalrepresentationof variouscomputingconstructs						K1
2	Demonstratean understandingofrelations, functions, Combinatoricsandlattices						K2
3	Applythetechniquesofdiscretestructuresandlogicalreasoningtosolveavarietyof problemsandwriteanargumentusinglogicalnotation						K3
4	Analyzeandconstructmathematicalarguments thatrelateto thestudyofdiscrete structures						K3
5	Developand model problems with the concepts and techniques of discrete mathematics.						K5
K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create							
UNITI MATHEMATICAL LOGIC 15							
Proposition–LogicalOperators–TruthTables–Laws ofLogic–Equivalances–Rules ofinterface– validityArguments–ConsistencyofSpecifications–PropositionalCalculus– Quantifiersanduniverseofdiscourse							
UNITII PROOF TECHNIQUES 19							
Introduction – Methods of proving theorems – Direct Proofs, Proof by Contraposition, Vacuous andtrivialproofs,Proofsbycontradiction–MistakesinProofs–Mathematicalinduction– StrongMathematicalinduction–Strongmathematicalinductionand wellordering–ProgramCorrectness. RELATIONS AND FUNCTIONS: Definition and properties of binary relations– RepresentingRelations – Closures of Relations – Composition of Relations – Equivalence Relations – Partitions andCoveringofsets–PartialOrderings–n-arrayRelationsandtheirapplications.Functions– Injective, Surjective,Bijectivefunctions,Composition,identityandinverse.							
UNITIII COMBINATORICS 14							
BasicsofCounting–ThePigeonholeprinciple– PermutationsandCombinationswithandwithoutrepetition,Permutationswithindistinguishableelements– distributionsofobjects–Generating permutationsandcombinationsinlexicographicorder.							
UNITIV RECURRENCE RELATIONS 14							
SomeRecurrenceRelationModels– Solutionoflinearhomogeneousrecurrencerelationswithconstantcoefficients–solutionoflinearnon- homogeneousrecurrencerelationsbythemethodof characteristicroots –Divideandconquerrecurrencerelations.							

UNITV	LATTICES	13
Latticesaspartiallyorderedset–PropertiesofLattices–Latticesasalgebraicsystem–Sublattices–DirectProductand Homomorphism–Somespeciallattices		
TotalLectureHours		75
TextBook(s)		
1	Kenneth H.Rosen,-Discrete Mathematicsanditsapplications ,McGrawHill, 2011.	
2	JudithL.Gersting, -Mathematical StructuresforComputer Sciencell, W.H>Freeman and Company,2014.	
3	TremblayJ.P. and Manohar R., -Discrete and Combinatorial Mathamatics– AnIntroduction , AddisonWesley,2009	
ReferenceBook(s)		
1	DoerrAlan andLevasseur K., -Applied Discrete StructuresforComputer Sciencell, Galgotia Publications,2002.	
2	BenardKolman,RobertC.BusbyandSharanRoss,—DiscreteMathematicalStructures , PearsonEducation,2014.	
RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)		
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	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**

CourseCode	JavaProgramming	L	T	P	C
Core/elective/Supportive	Core:3	5	0	-	4
Pre- requisite	<ul style="list-style-type: none"> Basic knowledge of ProgrammingConstructs. Knowledge on Object OrientedProgrammingConcepts. 	Syllabus version	2021-22 Onward		
CourseObjectives					
<ul style="list-style-type: none"> To introduce the concepts of Object Oriented Programming Paradigm and the programming constructs of JAVA 					
ExpectedCourseOutcomes					
1	Recite the history of JAVA and its evolution				K1
2	Explain the various programming language constructs, object oriented concepts like overloading, inheritance, polymorphism, Interfaces, threads, exception handling and packages				K2
3	Illustrate the concepts of Applets, files and the concept of stream classes.				K3
4	Outline the benefits and applications of object oriented programming concepts and 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–apply K4-Analyze K5–evaluate K6-Create					
UNIT I	Fundamentals of OOP				16
Fundamentals of Object-Oriented Programming: Object-Oriented Paradigm – Basic Concepts of Object-Oriented Programming – Benefits of Object-Oriented Programming – Application of Object-Oriented Programming. Java Evolution: History – Features – How Java differs from C and C++ – Java and Internet – Java and www – Web Browsers. Overview of Java: simple Java program – Structure – Java Tokens – Statements – Java Virtual Machine.					
UNIT II	Variables & Control Structures				15
Constants, Variables, Data Types - Operators and Expressions – Decision Making and Branching: if, if...else, nested if, switch? : Operator-Decision Making and Looping: while, do, for – Jumps in Loops - Labeled Loops – Classes, Objects and Methods.					
UNIT III	Arrays & Classes				14
Arrays, Strings and Vectors – Interfaces: Multiple Inheritance – Packages: Putting Classes together – Multithreaded Programming.					
UNIT IV	Error Handling & Graphics				13
Managing Errors and Exceptions – Applet Programming – Graphics Programming.					
UNIT V	I/O Streams				17
Managing Input/Output Files in Java: Concepts of Streams - Stream Classes – Byte Stream classes – Character stream classes – Using streams – I/O Classes – File Class – I/O exceptions – Creation of files – Reading/Writing characters, Byte-Handling Primitive Data Types – Random Access Files.					
Total Lecture Hours					75

TextBook(s)	
1	ProgrammingwithJava–APrimer-E. Balagurusamy,3rd Edition,TMH.
ReferenceBook(s)	
1	TheComplete ReferenceJava2-PatrickNaughton&Hebert Schildt, 3rdEdition, TMH
2	Programmingwith Java– JohnR. Hubbard, 2ndEdition, TMH.
	RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)
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	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

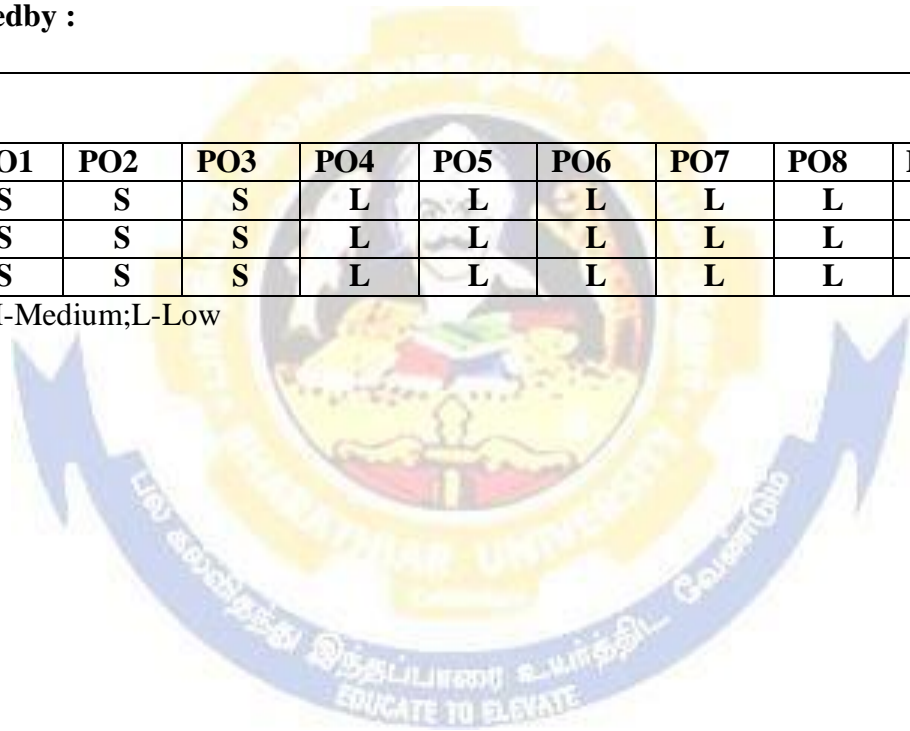


CourseCode		Programming Lab-JAVA	L	T	P	C
Core/elective/Supportive		CoreLab:2	-	-	4	4
Pre- requisite		<ul style="list-style-type: none"> Basic knowledge of ProgrammingConstructs Knowledge on Object OrientedProgrammingC oncepts 	Syllabus version			2021-22 Onward
CourseObjectives						
		<ul style="list-style-type: none"> TointroducetheconceptsofObjectOrientedProgrammingParadigmandtheprogrammingconstructsofJAVA 				
ExpectedCourseOutcomes						
1		ApplythevariousbasicprogrammingconstructsofJAVAlikedecisionmakingstatements.L oopingstatements,overloading,inheritance,polymorphism,constructors anddestructors				K3
2		Illustratetheconceptsofthreadingandmulti-threading				K4
3		Designprogramsusingvariousfilestreamclasses;filetypes,andframes				K4
K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create						
PROGRAM1						3
WriteJavaApplicationsto extractaportion of acharacterstringandprinttheextractedstring.						
PROGRAM2						3
WriteaJavaProgramtoimplementtheconceptof multipleinheritanceusingInterfaces.						
PROGRAM3						3
WriteaJavaProgram tocreatean Exceptioncalledpayout-of-boundsand throwtheexception						
PROGRAM4						3
WriteaJavaProgramtoimplementtheconceptof multithreadingwiththe use ofanythreemultiplicationtables andassign threedifferentpriorities to them.						
PROGRAM5						6
WriteaJavaProgramtodrawseveralshapesinthecreatedwindows						
PROGRAM6						6
WriteaJavaProgramtocreateaframewithfourtextfieldsname,street,cityandpincodewithsuitabletables. Als oaddabuttoncalledmydetails. Whenthebuttonisclickeditscorresponding valuesaretobeappearedin thetext fields.						
PROGRAM7						6
WriteaJavaProgramtodemonstratetheMultipleSelectionList-box.						
PROGRAM8						6
WriteaJavaProgram tocreateaframe withthree textfields forname,age and qualificationandatext fieldformultiplelinefor address						
PROGRAM9						6
WriteaJavaProgramtocreateMenuBars andpulldownmenus.						
PROGRAM10						6
Write a JavaProgramtocreate frameswhichrespondtothe mouseclicks.Foreacheventswithmouse suchas mouseup, mousedown,etc., thecorrespondingmessagetobe displayed.						

PROGRAM11		6
Write a Java Program to draw circle, square, ellipse and rectangle at the mouse click positions.		
PROGRAM12		6
Write a Java Program which open an existing file and append text to that file.		
Total Lecture Hours		60 Hours
Text Book(s)		
1	Programming with Java – A Primer - E. Balagurusamy, 3rd Edition, TMH.	
Reference Book(s)		
1	The Complete Reference Java 2 - Patrick Naughton & Hebert Schildt, 3rd Edition, TMH	
Course Designed by :		

	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

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



CourseCode	InternetBasicsLaboratory		L	T	P	C
Core/elective/Supportive	CoreLab:3		-	0	2	2
Pre- requisite	• BasicknowledgeinComputers		Syllabus		2021-22 Onward	
CourseObjectives						
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.						
ExpectedCourseOutcomes						
1	Apply the predefined procedures to create Gmail account, check and receive messages					K3
2	Apply the predefined 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–apply K4-Analyze K5–evaluate K6-Create						
PROGRAM-1						2
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 50 recipients. Use CC and BCC options accordingly						
PROGRAM-2						2
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						2
Assume that you are studying in final year of your graduation and are eagerly looking for a job. Visit any job portal and upload your resume.						
PROGRAM-4						2
Create a meeting using Google calendar and share meeting id to the attendees. Transfer the ownership to the Manager once the meeting id is generated.						
PROGRAM-5						2
Create a label and upload bulk contacts using import option in Google Contacts						
PROGRAM-6						2
Create your own Google classroom and invite all your friends through email id. Post study material in Google classroom using Google drive. Create a separate folder for every subject and upload all unit wise E-Content Materials.						
PROGRAM-7						2
Create and share a folder in Google Drive using _share link_ option and set the permission to access that folder by your friends only.						
PROGRAM-8						2
Create one-page story in your mother tongue by using voice recognition facility of Google Docs						

PROGRAM-9		2
Create a registration form for your Department Seminar or Conference using Google Forms.		
PROGRAM-10		2
Create a question paper with multiple choice types of questions for a subject of your choice, using Google Forms.		
PROGRAM-11		2
Create a meeting using Google Calendar and record the meeting using Google Meet. Create a Google Slides for a topic and share the same with your friends.		
PROGRAM-12		4
Create a template for a seminar certificate using Google Slides.		
PROGRAM-13		
Create a sheet to illustrate simple mathematical calculations using Google Sheets. Create a student's internal mark statement and share the Google Sheets via link.		4
Total Lecture Hours		30 Hours
Text Book(s)		
1	Ian Lamont, Google Drive & Docs in 30 Minutes, 2 nd 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

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

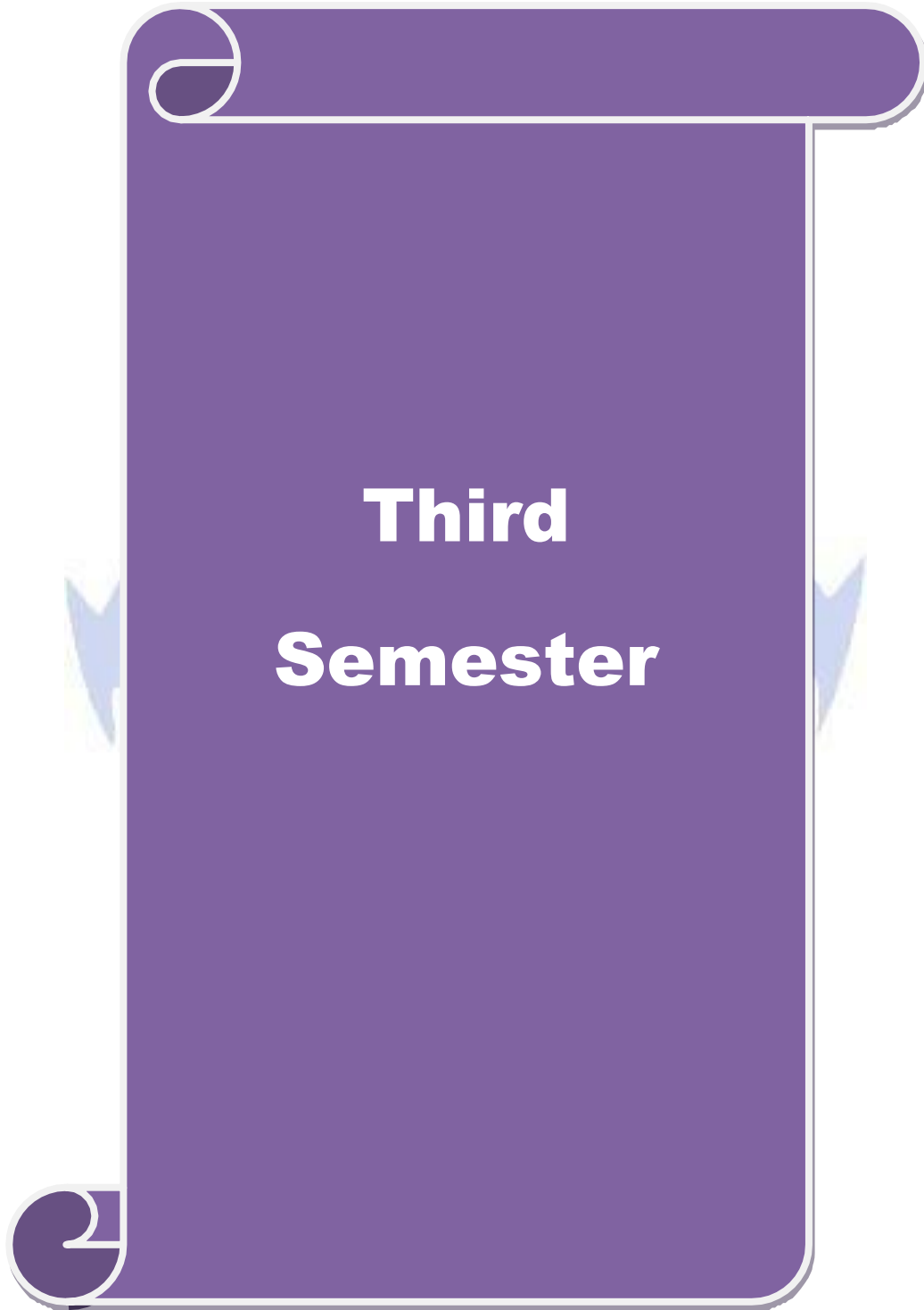
CourseCode	AppliedMathematics		L	T	P	C
Core/elective/Supportive	Allied:2		5	0	0	4
Pre- requisite	BasicKnowledgeinMathematics		Syllabus version	2021-22 Onward		
CourseObjectives						
Tointroducetheconcepts ofNumbers,Quantification, sets,logicalreasoning,probabilityand calculus						
ExpectedCourseOutcomes						
1	DemonstratetheconceptsofNumbers,Quantification,sets,logicalreasoning, probabilityandcalculus					K2
2	Applythe learnedconceptstosolvevariousmathematicalproblemsrelatedtothe domain					K3
3	Applyvariouslawsrelatedtologarithmsandsetstosolvevariousmathematical problems					K4
4	Solveproblemsrelatedtopermutation,combinations,mathematicalandlogical reasoningandcalculus.					K5
K1-Remember K2 -Understand K3-applyK4-AnalyzeK5-evaluateK6-Create						
UNITI	Numbers,QuantificationandNumericalApplications					15
Numbers, Quantification and Numerical Applications - Prime Numbers, Encryptions using PrimeNumbers-Binary Numbers-Complex Numbers (Preliminary idea only) -Indices, Logarithm andAntilogarithm-Lawsandpropertiesoflogarithms-Simpleapplicationsoflogarithmandantilogarithm- Numericalproblemsonaverages,calendar,clock,time,workanddistance, menstruation,seatingarrangement						
UNITII	Algebra					16
Algebra - Sets- Types of sets-Venn diagram-De Morgan's laws-Problem solving using Venndiagram 4-Relations and types of relations-Introduction of Sequences, Series-Arithmetic andGeometric progression-Relationship between AM and GM-Basic concepts of Permutations andCombinations- Permutations,CircularPermutations,Permutationswithrestrictions-Combinations withstandardresults.						
UNITIII	MathematicalandLogicalReasoning					16
Mathematical and Logical Reasoning-Mathematically acceptable statements-Connecting words/phrases in Mathematical statement consolidating the understanding of "if and only if (necessary and sufficient) condition","implies", "and/or","implied by", "and","or","there exists" and their use through variety of examples related to real life and Mathematics-Problems based on logical reasoning (coding-decoding, odd man out, blood relation, syllogism etc).						
UNITIV	Functions					14
Calculus-Introducing functions-Domain and Range of a function- Types of functions (Polynomial function; Rational function; Composite function; Logarithm function; Exponential function; Modulus function; Greatest Integer function, Signum function -Graphical representation of functions-Concept of limits and continuity of a function-Instantaneous rates of change-Differentiation as a process of finding derivative- Derivatives of algebraic functions using Chain rule -Tangent line and equation of tangents.						

UNITV	Probability	14
Probability-Random experiment, sample space, events, mutually exclusive events-Independent and Dependent Events-Law of Total Probability-Bayes' Theorem.		
Total Lecture Hours		75 Hours
Text Book(s)		
1	Applied Mathematics – Dan Simpson, Burning Eye books	
Reference Book(s)		
2	Applied Mathematics -Dr.Hari Arora, Publishing Date Is 2019. Publisher Is S.k. Kataria & Sons	
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

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





CourseCode	PythonProgramming				L	T	P	C	
Core/elective/Supportive	Core:4				6	0	0	4	
Pre- requisite	<ul style="list-style-type: none"> Knowledgein BasicsofObjectOrientedProgramming 				Syllabu	2021-22 Onward			
CourseObjectives									
Tointroducethe conceptsof thevariousprogrammingconstructsof Pythonprogramming									
ExpectedCourseOutcomes									
1	Applythevariousbasicprogrammingconstructslikeoperators,expressions,decision makingstatementsandLoopingstatements							K2	
2	Summarizetheconcept oflists,tuples ,functionsand errorhandling							K2	
3	ApplytheconceptofDecisionmakingstatements,loopingconstructs,functionsfor solvingbasicprograms							K3	
4	Analyzethe conceptsofLists,tuplesanderrorhandlingmechanisms							K4	
5	Evaluateaprogramincorporatingallthepythonlanguage constructs							K5	
K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create									
UNITI	BASICS							18	
Python-Variables-ExecutingPythonfromtheCommandLine-EditingPythonFiles-PythonReservedWords-BasicSyntax-Comments-StandardDataTypes–RelationalOperators-Logical Operators -BitWiseOperators -Simple Inputand Output.									
UNITII	CONTROLSTATEMENTS,LISTS,TUPLES							18	
CONTROLSTATEMENTS: ControlFlowandSyntax-Indenting-ifStatement-statementsandexpressions-stringoperations-BooleanExpressions -whileLoop-breakandcontinue -for Loop. LISTS: List-list slices - list methods - list loop–mutability–aliasing - cloning lists - list parameters. TUPLES: Tupleassignment, tupleasreturn value -Sets–Dictionaries.									
UNITIII	FUNCTIONS:							17	
Definition-Passingparameterstoafunction-Built-infunctions-VariableNumberofArguments-Scope–Typeconversion-Typecoercion-PassingFunctionstoafunction– MappingFunctionsinaDictionary–Lambda- Modules-StandardModules – sys– math – time-dir –help Function.									
UNITIV	ERRORHANDLING:							19	
RunTimeErrors-ExceptionModel-ExceptionHierarchy-HandlingMultipleExceptions-Data Streams- AccessModesWriting-DatatoaFileReading-DataFromaFile-AdditionalFileMethods- UsingPipesasData Streams-HandlingIOExceptions-WorkingwithDirectories.									
UNITV	OBJECTORIENTEDFEATURES:							18	
Classes Principles of Object Orientation - Creating Classes -Instance Methods - File Organization - Special Methods - Class Variables – Inheritance – Polymorphism - Type Identification - SimpleCharacter Matches - Special Characters – Character Classes – Quantifiers - Dot Character - GreedyMatches – Grouping - Matching at Beginning or End - Match Objects – Substituting - Splitting aString-CompilingRegular Expressions.									
TotalLectureHours								90Hours	

TextBook(s)	
1	MarkSummerfield.—ProgramminginPython3:ACompleteintroductiontothePython Language,Addison-WesleyProfessional,2009.
2	MartinC.Brown,—PYTHON:TheCompleteReference,McGraw-Hill,2001
ReferenceBook(s)	
1	AllenB.Downey,`ThinkPython:HowtoThinkLikeaComputerScientist`,2ndedition, UpdatedforPython3,Shroff/O_ReillyPublishers,2016
2	GuidovanRossumandFredL.DrakeJr,—AnIntroductiontoPython–Revisedandupdated forPython 3.2,NetworkTheoryLtd., 2011.
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	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



CourseCode		PythonProgrammingLab	L	T	P	C	
Core/elective/Supportive		CoreLab :4	0	0	5	4	
Pre- requisite		• KnowledgeinbasicProgramming	Syllabus		2021-22 Onward		
CourseObjectives							
Tointroducetheconceptsofpythonprogrammingconstructsof C++							
ExpectedCourseOutcomes							
1	ApplytheconceptofDecisionmakingstatements,loopingconstructs,functionsfor solvingbasicprograms					K3	
2	Analyze the conceptsofLists,tuplesanderrorhandlingmechanisms					K4	
3	Evaluateaprogramincorporatingallthepythonlanguage constructs					K5	
K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create							
PROGRAM-1							
	Writeapypthonprogramthat displaysthefollowinginformation:Yourname,FulladdressMobile number,Collegenname, Coursesubjects.					5	
PROGRAM-2							
	Writeapypthon programto findthelargest threeintegers usingif-else and conditionaloperator.					5	
PROGRAM-3							
	Write a python program that asks the user to enter a series of positive numbers (The user should enteranegativenumberto signal theend oftheseries)andthe programshould displaythenumbers inorder andtheirsum.					9	
PROGRAM-4							
	Writeapypthon programtofind theproductof two matrices [A]m \times pand[B]p \times r					9	
PROGRAM-5							
	Writerecursivefunctions forGCD oftwo integers.					9	
PROGRAM-6							
	Writerecursivefunctionsforthefactorialofpositiveinteger.					5	
PROGRAM-7							
	WriterecursivefunctionsforFibonacciSequence uptogivennumber n.					5	
PROGRAM-8							
	Writerecursive functionsto displayprimenumber from 2to n.					5	
PROGRAM-9							
	Writeapypthon programthatwrites aseries ofrandomnumbers toafilefrom1 ton anddisplay.					5	
PROGRAM-10							
	Writeapypthonprogramtosortagivensequence:String, Listand Tuple.					6	
PROGRAM-11							
	Writeapypthon programto makeasimplecalculator.					6	
PROGRAM-12							
	Writeapypthonprogramfor LinearSearchandBinarySearch.					6	
					TotalHours	75 Hours	

TextBook(s)	
1	MarkSummerfield.—ProgramminginPython3:ACompleteintroductiontothePython Language,Addison-WesleyProfessional,2009.
ReferenceBook(s)	
2	MartinC.Brown,—PYTHON:TheCompleteReferencel,McGraw-Hill,2001
CourseDesignedby :	

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

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



CourseCode	FuzzyLogicand NeuralNetworks			L	T	P	C
Core/elective/Supportive	Core:5			6	0	0	4
Pre- requisite	<ul style="list-style-type: none"> KnowledgeinBasicsofObjectOrientedPro gramming 			Syllabu	2021-22 Onward		
CourseObjectives							
<ul style="list-style-type: none"> Tointroducetheconceptsof neuralnetworksandfuzzysystems To explain thebasic mathematical elementsofthetheoryof fuzzysets. 							
1	Explain thebasicconcepts of fuzzysetsand fuzzylogic						K2
2	Understandingof thebasic mathematicalelements ofthe theoryoffuzzysets.						K2
3	Explainthefundamentals and historyof neural networks						K2
4	Outlineaboutthemappingandrecurrentnetworks						K2
5	Analyze the applicationsoffuzzylogic andneuralnetworkforvariousapplications						K3
K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create							
UNITI	FuzzySetTheoryandFuzzyLogicControl:						18
Basicconceptsoffuzzysets-Operationsoffuzzysets-Fuzzyrelationequations-Fuzzylogiccontrol Fuzzification–Defuzzificatiuon-Knowledgebase-Decisionmakinglogic-Membershipfunctions–Rulebase.							
UNITII	AdaptiveFuzzySystems						18
Performanceindex-Modificationofrulebase0-Modificationofmembershipfunctions-Simultaneous modificationofrulebaseandmembershipfunctions-Geneticalgorithms-AdaptivefuzzysystemNeuro fuzzysystems.							
UNITIII	ArtificialNeuralNetworks:						18
Introduction-Historyofneuralnetworks-multilayerperceptions-Backpropagationalgorithmandits Variants-Differenttypes oflearning,examples.							
UNITIV	MappingandRecurrentNetworks:						18
Counterpropagation–SelforganizationMap–CongnitronandNeocognitron-HopfieldNet-Kohonnen Nets-GrossbergNets- Art-I, Art-IIreinforcementlearning							
UNITV	CaseStudies						18
Applicationoffuzzylogicand neuralnetworkstoMeasurement-Control- AdaptiveNeural Controllers –SignalProcessingandImageProcessing							
TotalLectureHours						90 Hours	
TextBook(s)							
1	VallumB.RAndHayagrivaV.RC++,NeuralnetworksandFuzzylogic, BPBPublications, NewDelhi,1996						
ReferenceBook(s)							
1	Fuzzylogic &NeuralNetworks/ChennakesavaR.Alavala/NewAgeInternational,2008						
2	NeuralNetworks for control,Millon W. T,SuttonR.S and Werbos P.J, MIT Press1992						
3	FuzzysetsFuzzylogic, Klir, G.JanfdYuan B.BPrenticeHalloifIndiaPvt.Ltd.,,NewDelhi						

4	NeuralNetworksand Fuzzysystems,Kosko..Prenticehallof IndiaPvt.Ltd.,,NewDelhi1994
5	IntroductiontoFuzzycontrol,DirankovD.HellendoornH,ReinfrankM.,NarosaPublications House,New Delhi1996
6	IntroductiontoArtificialNeuralsystems,ZuradaJ.MJaicoPublishingHouse,NewDelhi1994
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	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



CourseCode	DesignandAnalysisofAlgorithms			L	T	P	C
Core/elective/Supportive	Allied:3			6	0	0	4
Pre- requisite	<ul style="list-style-type: none"> • Foundationin designingalgorithms • Basic knowledge on data structuralconcepts 			Syllabus version		2021-22 Onward	
CourseObjectives	<ul style="list-style-type: none"> • Toemphasizetheimportanceof analysisofalgorithmsandfindingthetimecomplexity. • Toexplainvariousalgorithmdesigntechniques 						
ExpectedCourseOutcomes							
1	Explainthe importanceof algorithm analysisand thenotation used						K2
2	Applythevariousframeworksforanalyzingrecursiveandnon-recursivealgorithmsto find thetime complexity						K3
3	Illustratethevariousalgorithmdesigntechniqueslikedivideandconquer,greedy algorithms,brute forceanddynamicprogramming						K4
4	IllustratethevariousiterativemethodlikeSimplexMethod,Maximum-FlowProblem, MaximumMatchinginBipartiteGraphs,StablemarriageProblem..						K4
5	ComparetheP, NP, NP –CompleteandNP-Hardtypeofproblems						K4
6	Comparealgorithmsbycalculatingtheirtimeefficiencyusingtheprescribed framework						K5
K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create							
UNITI	INTRODUCTION						18
Notion of Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem types– Fundamentals of the Analysis of Algorithmic Efficiency – Asymptotic Notations and their properties. Analysis Framework – Empirical analysis – Mathematical analysis for Recursive and Non-recursive algorithms							
UNITII	BRUTE FORCE AND DIVIDE-AND-CONQUER						18
Brute Force – Computing an– String Matching – Closest Pair and Convex-Hull Problems - Exhaustive Search – Travelling Salesman Problem– Knapsack Problem– Assignment problem. Divide and Conquer Methodology– Binary Search– Merge sort– Quicksort– Heap Sort– Multiplication of Large Integers– Closest-Pair and Convex–Hull Problems.							
UNITIII	DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE						19
Dynamic programming – Principle of optimality – Coin changing problem, Computing a Binomial Coefficient – Floyd’s algorithm – Multi stage graph – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique– Container loading problem– Prim’s algorithm and Kruskal’s Algorithm.							
UNITIV	ITERATIVE IMPROVEMENT						17
The Simplex Method – The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs, Stable marriage Problem.							

UNITV	COPINGWITH THE LIMITATIONS OFALGORITHMPOWER	18
Lower – Bound Arguments – P, NP NP- Complete and NP Hard Problems. Backtracking – n-Queenproblem – Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound – Assignmentproblem–KnapsackProblem–TravellingSalesmanProblem–ApproximationAlgorithmsforNP-HardProblems –TravellingSalesmanproblem–Knapsackproblem.		
TotalLectureHours		90Hour s
TextBook(s)		
1	AnanyLevitin, -Introduction to the Design andAnalysis of Algorithms, Third Edition, PearsonEducation,2012.	
ReferenceBook(s)		
1	Thomas H.Cormen, Charles E.Leiserson, RonaldL. Rivestand Clifford Stein, -Introduction to Algorithms, ThirdEdition,PHILearning PrivateLimited,2012	
2	Alfred V. Aho, John E. Hopcroft and JeffreyD.Ullman, -Data Structuresand Algorithms, PearsonEducation,Reprint2006.	
3	Donald E. Knuth,-TheArt of ComputerProgramming, Volumes1&3Pearson Education, 2009. Steven S. Skiena, -TheAlgorithm Design Manual, Second Edition, Springer, 2008.	
RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)		
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	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	M	M	L	L	L	L	L	L	L
CO6	S	S	S	L	L	L	L	L	L	L

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

CourseCode		Internet of Things(IoT)	L	T	P	C
Core/elective/Supportive		Skillbased Subject :1	5	0	0	3
Pre- requisite		None	Syllabus version	2021-22 Onward		
Course Objectives						
<ul style="list-style-type: none"> • To explain about the definition and usage of Internet of things • To explain the key components of IoT system 						
Expected Course Outcomes						
1	Explain the definition and usage of the term -Internet of Things in different contexts					K2
2	Understand the key components that make up an IoT system					K2
3	Differentiate between the levels of the IoT stack and be familiar with the key technologies and protocols employed at each layer of the stack					K3
4	Apply the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming and data analysis					K3
5	Discover where the IoT concept fits within the broader ICT industry and possible future trends					K4
K1-Remember K2 –Understand K3–apply K4-Analyze K5–evaluate K6-Create						
UNIT I	Introduction to IoT					16
Introduction–Definition and Characteristics of IoT, Physical Design of IoT; Things in IOT, Logical Design of IoT; IoT Functional Blocks, IoT Communication APIs, IoT Enabling Technologies; WSN, Cloud Computing, Big Data Analysis, Communication Protocols, Embedded Systems						
UNIT II	IoT Hardware					15
IoT Hardware, Devices and Platforms– Basics of Arduino Hardware, The Arduino IDE, Basic Arduino Programming, Basics of Raspberry Pi; Introduction to Raspberry Pi, Programming with Raspberry Pi, CDAC IoT devices: Ubimote, Wi-Fi mote, BLE Mote, WINGZ gateway, Introduction to IoT Platforms, IoT Sensors and actuators						
UNIT III	IoT Protocols					16
IoT Protocols– IoT Data Link Protocols, Network Layer Routing Protocols, Network Layer Encapsulation Protocols, Session Layer Protocols, IoT Security Protocols, Service Discovery Protocols, Infrastructure Protocols.						
UNIT IV	IoT Programming					14
IoT Programming – Arduino Programming: Serial Communications – Getting Input from Sensors, Visual, Physical and Audio Outputs, Remotely Controlling External Devices, Wireless Communication, Programming with Raspberry Pi: Basics of Python Programming, Python Packages of IoT, IoT Programming with CDAC IoT devices.						
UNIT V	Domain Specific IoT					14
Domain Specific IoT – Home automation, smart cities, Smart Environment, IoT in Energy, Logistics, Agriculture, industry and Health & Life style sensors, Case Studies: A Case Study of Internet of Things Using Wireless Sensor Networks and Smart Phones, Security Analysis of Internet-of-Things: A Case Study of August Smart Lock, Open IoT Platform.						
Total Lecture Hours						75 Hours

TextBook(s)	
1	VijayMadiseti andArshdeepBahga,-Internet ofThings(AHands-on-Approach)ll, 1 st Edition,VPT, 2014.
ReferenceBook(s)	
1	Margolis, Michael. -ArduinoCooKbook: Receipestobegin, Expand and Enhance Your Projects.l.O'ReillyMediaInc.2011.
2	Monk,Simon.RaspberryPiCookbook:SoftwareandhardwareproblemsandSolutions. O'ReillyMedia,Inc.2016.
RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)	
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	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





**Fourth
Semester**

CourseCode		Artificial Intelligence and KnowledgeRepresentation	L	T	P	C
Core/elective/Supportive		Core:6	6	0	0	4
Pre- requisite		None	Syllabus version		2021-22 Onward	
CourseObjectives						
<ul style="list-style-type: none"> To expose the students to the fundamental concepts of Artificial Intelligence and its applications. 						
Expected Course Outcomes						
1	Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.					K2
2	Understanding about the basic concepts of Software agents and representation of knowledge					K2
3	Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.					K2
4	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.					K3
K1–Remember K2 –Understand K3–apply K4-Analyze K5–evaluate K6-Create						
UNIT I	Introduction					18
Introduction–Definition–Future of Artificial Intelligence–Characteristics of Intelligent Agents–Typical Intelligent Agents–Problem Solving Approach to Typical AI Problems.						
UNIT II	Problem Solving Methods					19
Problem Solving Methods – Search Strategies – Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems–Searching with Partial Observations–Constraint Satisfaction Problems–Constraint Propagation–Backtracking Search–Game Playing–Optimal Decisions in Games –Alpha–Beta Pruning–Stochastic Games.						
UNIT III	Knowledge Representation					18
Knowledge Representation – First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining – Backward – Chaining – Resolution – Knowledge Representation – Ontological Engineering–Categories and Objects–Events–Mental Events and Mental Objects–Reasoning Systems for Categories–Reasoning with Default Information.						
UNIT IV	Software Agents					17
Software Agents–Architecture for Intelligent Agents–Agent Communication–Negotiation and Bargaining–Argumentation among Agents–Trust and Reputation in Multi-agent Systems.						
UNIT V	AI Applications					18
AI Applications–Language Models–Information Retrieval–Information Extraction–Natural Language Processing–Machine Translation–Speech Recognition–Robot–Hardware–Perception –Planning–Moving.						
Total Lecture Hours						90 Hours

TextBook(s)	
1	S.Russell and P. Norvig, - Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2009.
2	I. Bratko, - Prolog: Programming for Artificial Intelligence, Fourth Edition, Addison-Wesley Educational Publishers Inc., 2011.
ReferenceBook(s)	
1	M. Tim Jones, - Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers Inc.; First Edition, 2008.
2	Nils J. Nilsson, - The Quest for Artificial Intelligence, Cambridge University Press, 2009.
3	William F. Clocksin and Christopher S. Mellish, Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, 2003.
4	Gerhard W. Weiss, - Multi Agents Systems, Second Edition, 2013.
5	David L. Poole and Alan K. Mackworth, - Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.
6	Implement an application that stores big data in Hbase/MongoDB/Pig Using Hadoop
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 :	

	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

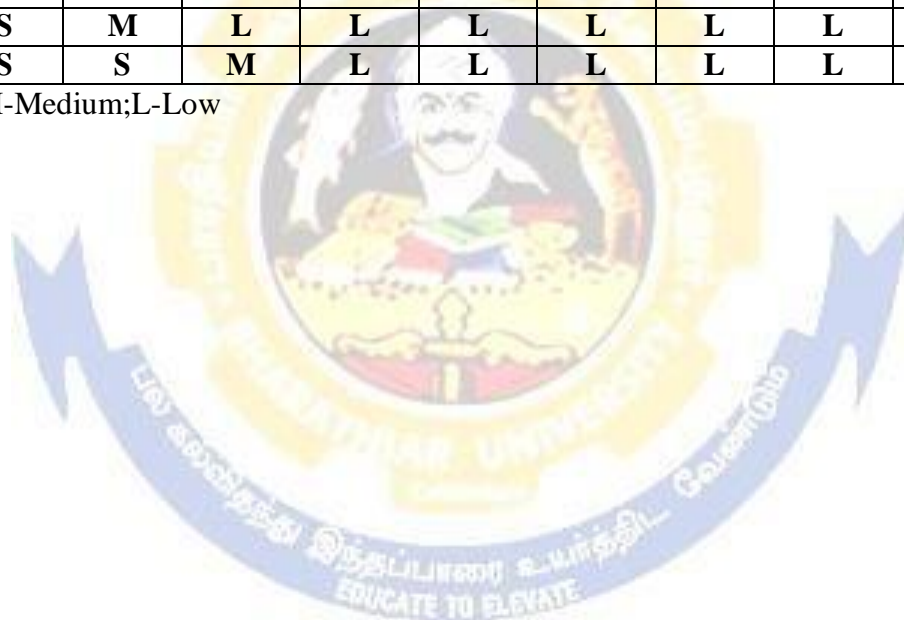
*S-Strong; M-Medium; L-Low

CourseCode	RProgramming			L	T	P	C
Core/elective/Supportive	Core:7			6	0	0	4
Pre- requisite	None			Syllabus version	2021-22 Onward		
CourseObjectives							
<ul style="list-style-type: none"> To expose the student to the fundamental concepts of R Programming 							
Expected Course Outcomes							
1	Understand the basics in R programming in terms of constructs, control statements, string functions						K2
2	Understand the use of R for Big Data analytics						K2
3	Apply R programming for Text processing						K3
4	Appreciate and apply the R programming from a statistical perspective						K3
K1-Remember K2 -Understand K3-apply K4-Analyze K5-evaluate K6-Create							
UNIT I	Introducing to R						18
Introducing to R – R Data Structures – Help Functions in R – Vectors – Scalars – Declarations – Recycling – Common Vector Operations – Using all and any – Vectorized operations – NA and NULL values – Filtering – Vectorised if-then else – Vector Element names.(9).							
UNIT II	Matrices						18
Creating matrices – Matrix Operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns - Vector/Matrix Distinction – Avoiding Dimension Reduction – Higher Dimensional arrays – lists – Creating lists – General list operations – Accessing list components and values – applying functions to lists – recursive lists.							
UNIT III	Data Frames						18
Creating Data Frames – Matrix-like operations in frames – merging Data frames – Applying functions to Data Frames – Factors and Tables – Factors and levels – Common Functions used with factors – Working with tables – Other factors and table related functions – Control statements – Arithmetic and Boolean operators and values – Default Values for arguments – Returning Boolean Values – Functions are objects – Environment and scope issues – Writing Upstairs – Recursion – Replacement functions – Tools for Composing function code – Math and Simulation in R.							
UNIT IV	Classes						18
S3 Classes – S4 Classes – Managing your objects – Input/output – accessing keyboard and monitor – reading and writing files – accessing the internet – String Manipulation – Graphics – Creating Graphs – Customizing Graphs – Saving Graphs to files – Creating Three-Dimensional plots.							
UNIT V	Interfacing R						18
Interfacing R to other languages – Parallel R – Basic Statistics – Linear Model – Generalized Linear models – Non-linear Models – Time Series and Auto-Correlation – Clustering.							
Total Lecture Hours						90 Hours	
Text Book(s)							
1	Norman Matloff, – The Art of R Programming: A Tour of Statistical Software Design II, No Starch Press, 2011.						
2	Jared P. Lander, – R for Everyone: Advanced Analytics and Graphics II, Addison-Wesley Data & Analytics Series, 2013.						

ReferenceBook(s)	
1	Mark Gardner,-BeginningR– TheStatistical Programming Languagell, Wiley, 2013.
2	Robert Knell, -IntroductoryR: ABeginner’s Guideto Data Visualisation,Statistical Analysis and programmingin Rl,Amazon DigitalSouth Asia ServicesInc,2013. Richard Cotton(2013).LearningR,O’ReillyMedia.
3	GarretGrolemund(2014).Hands-onProgrammingwithR.O’ReillyMedia, Inc.
4	RogerD.Peng(2018).R ProgrammingforDataScience. LeanPublishing.
RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)	
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	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



CourseCode		RProgrammingLab	L	T	P	C
Core/elective/Supportive		CoreLab :5	0	0	3	2
Pre- requisite		None	Syllabus version		2021-22 Onward	
CourseObjectives						
<ul style="list-style-type: none"> Toexposethestudent sotthefundamentalconcepts ofRProgramming 						
ExpectedCourseOutcomes						
1	UnderstandthebasicsinRprogrammingintermsofconstructs,controlstatements, stringfunctions					K2
2	UnderstandtheuseofRforBigDataanalytics					K2
3	ApplyR programmingfor Text processing					K3
4	Appreciateandapplythe Rprogrammingfromastatistical perspective					K3
K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create						
ListofPrograms						
<ol style="list-style-type: none"> RExpressionsandDataStructures Manipulationofvectorsandmatrix OperatorsonFactorsinR DataFramesinR ListsandOperators Workingwith loopingstatements. GraphsinR 3D plotsin R 						
TotalLectureHours						90Hours
TextBook(s)						
1	S.RussellandP.Norvig,-ArtificialIntelligence:AModernApproach,,PrenticeHall,Third Edition, 2009.					
2	I. Bratko,-Prolog:ProgrammingforArtificialIntelligence, FourthEdition,Addison- Wesley EducationalPublishers Inc.,2011.					
ReferenceBook(s)						
1	M.TimJones,- ArtificialIntelligence:ASystemsApproach(ComputerScience),Jonesand BartlettPublishers Inc.; FirstEdition,2008.					
2	NilsJ.Nilsson,-TheQuestforArtificialIntelligence,CambridgeUniversityPress,2009.					

3	WilliamF.ClocksinandChristopherSMellish,ProgramminginProlog:UsingtheISO Standard,FifthEdition,Springer,2003.
4	GerhardWelss,-MultiAgentsSystems,SecondEdition,2013.
5	DavidL. Poole and Alan K. Mackworth, - Artificial Intelligence: Foundations of ComputationalAgents, CambridgeUniversityPress, 2010.
6	Implement an applicationthatstoresbigdatainHbase/MongoDB/PigUsingHadoop
	RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)
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	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



CourseCode		MachineLearning-Basics	L	T	P	C
Core/elective/Supportive		Allied:4	6	0	0	4
Pre- requisite		None	Syllabus version		2021-22 Onward	
CourseObjectives						
<ul style="list-style-type: none"> To explain about the basics of machine learning 						
ExpectedCourseOutcomes						
1	Understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.					K2
2	Understanding of the strengths and weaknesses of many popular machine learning approaches.					K2
3	Explain about the concepts of computational learning theory and dimensionality reduction					K2
4	Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and unsupervised learning.					K3
K1–Remember K2 –Understand K3–apply K4-Analyze K5–evaluate K6-Create						
UNIT I	Introduction to Learning					18
Algorithmic models of learning, Learning classifiers, functions, relations, grammars, probabilistic models, value functions, behaviors and programs for experience. Bayesian, maximum a posteriori, and minimum description length frameworks.						
UNIT II	ML-Models					18
Parameter Estimation, sufficient statistics, decision trees, neural networks, support vector machines, Bayesian networks, bag of words classifiers, N-gram models; Markov and Hidden Markov models, probabilistic relational models, association rules, nearest neighbor classifiers, locally weighted regression, ensemble classifiers.						
UNIT III	Computational Learning					17
Computational Learning theory, mistake bound analysis, sample complexity analysis, VC dimension, Occam learning, accuracy and confidence boosting, Dimensionality reduction: Principal component Analysis, feature selection and visualization.						
UNIT IV	Unsupervised Learning					18
Unsupervised Learning: Clustering, mixture models, k-means clustering, hierarchical clustering, distributional clustering, Reinforcement learning; Learning from heterogeneous, distributed, data and knowledge.						
UNIT V	Applications in Data Mining					19
Selected applications in data mining, automated knowledge acquisition, pattern recognition, program synthesis, text and language processing, internet-based information systems, human computer interaction, semantic web, and bioinformatics and computational biology.						
Total Lecture Hours						90 Hours

TextBook(s)	
1	Bishop,C.(2006).PatternRecognitionandMachineLearning. Berlin:Springer-Verlag.
ReferenceBook(s)	
1	Russel,S.AndNorving, P.(2003).Artificial Intelligence:AModernApproach.2 nd Edition, NewYork:Prentice-Hall.
2	Baldi,P.,Frasconi,P.,Smyth,P.(2002).Bioinformatics:AMachineLearningApproach. Cambridge,MA:MITPress.
3	Baldi,P.,Frasconi,P.,Smyth,P.(2003).Modelingthe InternetandtheWeb–Probabilistic MethodsandAlgorithms.NewYork:Wiley.
4	Bishop,C.M.NeuralNetworksforpatternrecognition.NewYork: OxfordUniversitypress (1995).
5	Hastie,T.,Tibshirani,R.,andFriedman,J.(2001).TheelementsofStatisticalLearning –Data mining, Inference,andPrediction,Berlin:Springer- Verlag.
6	Cohen,P.R.(1995)EmpiricalMethodsInArtificial Intelligence.Cambridge,MA:MITPress.
7	Cowell,R.G.,Dawid,A.P., Lauritzen,S.L., andSpiegelhalter.D.J.(1999). GraphicalModels andExpertSyatems. Berlin:Springer.
RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)	
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	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

CourseCode		CapstoneProjectWork	L	T	P	C
Core/elective/Supportive		SkillBasedSubject2	0	0	4	3
Pre- requisite		<ul style="list-style-type: none"> Students should have a good understanding of software engineering Students should possess strong analytical skills Strong coding skills in any one programming paper 	Syllabus version		2021-22 Onward	
Course Objectives						
<ul style="list-style-type: none"> 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 a real world problem and identify the list of project requirements					K3
2	Judge the features of the project including forms, databases and reports					K5
2	Design code to meet the input requirements and to achieve the required output					K6
3	Compose a project report incorporating the features of the project					K6
K1-Remember K2 -Understand K3-apply K4-Analyze K5-evaluate K6-Create						
Aim of the project work						
<p>1. The aim of the project work is to acquire practical knowledge on the implementation of the programming concepts studied.</p> <p>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.</p> <p>3. The project work should be compulsorily done in the college only under the supervision of the department staff concerned.</p>						
Viva Voce						
<p>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 of 75 marks at the last day of the practical session.</p> <p>2. Out of 75 marks, 45 marks for project report and 30 Marks for Viva Voce.</p>						

ProjectWork Format

PROJECTWORK

TITLE OF THE DISSERTATION

Bonafide Work Done

by STUDENT

NAMEREG.NO.

Dissertation submitted in partial fulfillment of the requirements for the award of
<Name of the Degree>
of Bharathiar University, Coimbatore-46.

College Logo

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

Signature of the

Internal Examiner External Examiner Month- Year

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Acknowledgement

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1.1 Organization Profile

1.2 System Specification

1.2.1 Hardware Configuration

1.2.2 Software Specification

2. System Study

2.1 Existing System

2.1.1 Drawbacks

2.2 Proposed System

2.2.1 Features

3. System Design and Development

3.1 File Design

3.2 InputDesign

3.3 OutputDesign

3.4 DatabaseDesign

3.5 SystemDevelopment

3.5.1 DescriptionofModules(Detailedexplanation abouttheprojectwork)

4SoftwareTestingandImplementationC

onclusion

Bibliography

Appendices

A. DataFlow Diagram

B. TableStructure

C. SampleCoding

D. Sample Input

E. SampleOutput

	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

Coursecode		Office Fundamentals	L	T	P	C
Core/Elective/Supportive		Naan Mudhalvan Skill Based Course	0	0	3	2
<p>http://kb.naanmudhalvan.in/Bharathiar University (BU)</p> <p>Refer the Content of the Serial. No. 2</p>						



**Fifth
Semester**

CourseCode	MachineLearningTechniques	L	T	P	C
Core/elective/Supportive	Core:8	6	0	0	4
Pre- requisite	None	Syllabus version		2021-22 Onward	
CourseObjectives					
<ul style="list-style-type: none"> To introduce students to the concepts and techniques of Machine Learning. 					
ExpectedCourseOutcomes					
1	Understand the basic concepts and techniques of Machine Learning.				K2
2	Explain the regression methods, classification methods, clustering methods.				K2
3	Understand the inference and learning algorithms for the hidden Markov model.				K2
4	Demonstrate Dimensionality reduction Techniques				K2
5	Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.				K3
K1-Remember K2-Understand K3-apply K4-Analyze K5-evaluate K6-Create					
UNIT I	Introduction to Machine Learning				18
Introduction – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search- Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – Linear Separability – Linear Regression.					
UNIT II	Machine Learning Models				19
Linear Models – Multi-Layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-Layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines.					
UNIT III	Tree & Probabilistic Model				19
Tree and Probabilistic Models – Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers - Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms – Vector Quantization – Self Organizing Feature Map.					
UNIT IV	Dimensionality Reduction and Evolutionary Models				17
Dimensionality Reduction and Evolutionary Models – Dimensionality Reduction – Linear Discriminant Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic Algorithms – Genetic Offspring – Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process.					
UNIT V	Graphical Model				17
Graphical Models – Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods.					

TotalLectureHours		90Hours
TextBook(s)		
1	EthemAlpaydin,-introductiontoMachine Learning3e (AdaptiveComputationandMachine LearningSeries),ThirdEdition,MITPress,2014.	
ReferenceBook(s)		
1	JasonBell,-Machine Learning–HandsonforDevelopersandTechnicalprofessionals,First Edition,Wiley,2014.	
2	PeterFlach,-Machine Learning:TheArtand Scienceof AlgorithmsthatMakeSenseof Data, FirstEdition,Cambridge UniversityPress,2012.	
RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)		
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	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



CourseCode	MachineLearningLab	L	T	P	C
Core/elective/Supportive	CoreLab :6	0	0	6	4
Pre- requisite	None	Syllabus version		2021-22 Onward	
CourseObjectives					
<ul style="list-style-type: none"> To introduce students to the concepts and techniques of Machine Learning. 					
ExpectedCourseOutcomes					
1	Understand the basic concepts and techniques of Machine Learning.				K2
2	Explain the regression methods, classification methods, clustering methods.				K2
3	Understand the inference and learning algorithms for the hidden Markov model.				K2
4	Demonstrate Dimensionality reduction Techniques				K2
5	Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.				K3
K1–Remember K2 –Understand K3–apply K4-Analyze K5–evaluate K6-Create					
List of Programs					
<p>1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file</p> <p>2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples</p> <p>3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate dataset for building the decision tree and apply this knowledge to classify a new sample.</p> <p>4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.</p> <p>5. Write a program to implement the naïve Bayesian classifier for a sample training dataset stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.</p> <p>6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your dataset.</p>					
Total Lecture Hours					90 Hours

TextBook(s)	
1	EthemAlpaydin,- introductiontoMachineLearning3e(AdaptiveComputationandMachineLearningSeries), Third Edition, MIT Press, 2014.
ReferenceBook(s)	
1	JasonBell,-Machine Learning–HandsonforDevelopersandTechnicalprofessionals,First Edition, Wiley,2014.
2	PeterFlach,-Machine Learning:TheArtandScienceof AlgorithmsthatMakeSenseof Data, FirstEdition,CambridgeUniversityPress,2012.
RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)	
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	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



CourseCode	DeepLearning				L	T	P	C
Core/elective/Supportive	Core:9				6	0	0	4
Pre- requisite	None				Syllabus version		2021-22 Onward	
CourseObjectives								
<ul style="list-style-type: none"> To introduce students to the basic concepts and techniques of deep Learning. 								
ExpectedCourseOutcomes								
1	Understand the basic concepts and techniques of Deep Learning.							K2
2	To understand and apply the Machine learning principles							K2
3	To study the deep learning architectures							K2
4	Explore and create deep learning applications with tensorflow							K3
K1-Remember K2 -Understand K3-apply K4-Analyze K5-evaluate K6-Create								
UNIT I	Introduction to Learning							18
The Neural Network - Limits of Traditional Computing - Machine Learning - Neuron - FF Neural Networks - Types of Neurons - Softmax output layers								
UNIT II	Deep Learning Models							18
Tensorflow - Variables - Operations - Placeholders - Sessions - Sharing Variables - Graphs - Visualization								
UNIT III	CNN							19
Convolution Neural Network - Feature Selection - Max Pooling - Filters and Feature Maps - Convolution Layer - Applications								
UNIT IV	RNN							17
Recurrent Neural Network - Memory cells - sequence analysis - word2vec - LSTM - Memory augmented Neural Networks - NTM - Application								
UNIT V	Reinforcement Learning							18
Reinforcement Learning - MDP - Q Learning - Applications								
Total Lecture Hours							90 Hours	
Text Book(s)								
1	Nikhil Buduma, Nicholas Locascio, - Fundamentals of Deep Learning: Designing Next Generation Machine Intelligence Algorithms , O'Reilly Media, 2017.							
Reference Book(s)								
1	Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning (Adaptive computation and Machine Learning series , MIT Press, 2017.							
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 :								

	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



CourseCode	BusinessDataAnalytics			L	T	P	C
Core/elective/Supportive	Elective:I			6	0	0	4
Pre-requisite	None			Syllabu	2021-22		
CourseObjectives				Onward			
<ul style="list-style-type: none"> To introducethefundamentalconceptsofBusinessdataanalyticsand associatedmethodologies 							
ExpectedCourseOutcomes							
1	Understandandcriticallyapplytheconceptsand methods ofbusiness analytics						K2
2	Demonstrationthevariousmethodologiesofdescriptivestatistics						K2
3	Understandingofmodelinguncertaintyand statistical inference						K2
4	Understandingofanalyticalframeworks						K2
K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create							
UNITI	OVERVIEWOFBUSINESS ANALYTICS						18
Introduction – Drivers for Business Analytics – Applications of Business Analytics: Marketing andSales, Human Resource, Healthcare, Product Design, Service Design, Customer Service and Support –SkillsRequiredforaBusinessAnalyst–Frameworkfor BusinessAnalyticsLifeCycleforBusiness AnalyticsProcess.							
UNITII	ESSENTIALSOFBUSINESSANALYTICS						17
Descriptive Statistics – Using Data – Types of Data – Data Distribution Metrics: Frequency, Mean,Median,Mode,Range,Variance,StandardDeviation,Percentile,Quartile,z-Score,Covariance,Correlation– DataVisualization: Tables,Charts,LineCharts,BarandColumnChart,BubbleChart, HeatMap–DataDashboards.							
UNITIII	MODELINGUNCERTAINTYANDSTATISTICALINFERENCE						19
Modeling Uncertainty: Events and Probabilities – Conditional Probability – Random Variables – Discrete Probability Distributions – Continuous Probability Distribution – Statistical Inference: DataSampling–SelectingaSample–PointEstimation–SamplingDistributions–IntervalEstimation– HypothesisTesting.							
UNITIV	ANALYTICSUSING HADOOPAND MAPREDUCEFRAMEWORK						19
Introducing Hadoop – RDBMS versus Hadoop – Hadoop Overview – HDFS (Hadoop Distributed FileSystem) – Processing Data with Hadoop – Introduction to MapReduce – Features of MapReduce – AlgorithmsUsingMap-Reduce:Matrix-VectorMultiplication,RelationalAlgebraOperations, GroupingandAggregation–ExtensionstoMapReduce.							
UNITV	OTHERDATAANALYTICALFRAMEWORKS						17
Overview of Application development Languages for Hadoop – PigLatin – Hive – Hive QueryLanguage(HQL)–IntroductiontoPentaho,JAQL– IntroductiontoApache:Sqoop,DrillandSpark,Cloudera Impala–Introduction to NoSQLDatabases– Hbase and MongoDB.							
TotalLectureHours						90Hours	

TextBook(s)	
1	VigneshPrajapati, -Big Data Analytics with R and Hadoop, Packt Publishing, 2013.
2	UmeshR Hodeghatta, UmeshaNayak, -BusinessAnalyticsUsingR- APractical Approach, Apress, 2017.
ReferenceBook(s)	
1	AnandRajaraman, JeffreyDavid Ullman, -Miningof Massive Datasets, Cambridge University Press, 2012.
2	JeffreyD. Camm, James J. Cochran, MichaelJ. Fry, JeffreyW. Ohlmann, DavidR. Anderson, -Essentials of BusinessAnalytics, Cengage Learning, second Edition, 2016
3	U. Dinesh Kumar, -Business Analytics: The Science of Data-Driven Decision Making, Wiley, 2017.
4	A. Ohri, -R for BusinessAnalytics, Springer, 2012 7. Rui Miguel Forte, -Mastering Predictive Analytics with R, Packt Publication, 2015.
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 :	

	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

CourseCode	SocialNetworkAnalysis	L	T	P	C
Core/elective/Supportive	Elective:I	6	0	0	4
Pre- requisite	None	Syllabus		2021-22	
CourseObjectives					Onward
<ul style="list-style-type: none"> To explain the methodologies used in social network analysis 					
Expected Course Outcomes					
1	Understand a broad range of network concepts and theories.				K2
2	Appreciate how network analysis can contribute to increasing knowledge about diverse aspects of society.				K2
3	Use a relational approach to answer questions of interest to them (i.e. be able to apply 'network thinking').				K3
4	Analyse social network data using various software packages.				K3
5	Present results from social network analysis, both orally and in writing.				K5
K1-Remember K2-Understand K3-apply K4-Analyze K5-evaluate K6-Create					
UNIT I	CLUSTERING AND CLASSIFICATION				17
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				17
Data Mining Essentials-Data Mining Algorithms-Web Content Mining-Latent semantic Indexing-Automatic Topic Extraction-Opinion Mining and Sentiment Analysis-Document Sentiment Classification					
UNIT III	EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS				18
Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Definition of Community - Evaluating Communities - Methods for Community Detection & Mining-Applications of Community Mining Algorithms-Tools for Detecting Communities-Social Network Infrastructure and Communities-Decentralized Online Social Networks-Multi-Relational Characterization of Dynamic Social Network Communities					
UNIT IV	HUMAN BEHAVIOR ANALYSIS AND PRIVACY ISSUES				19
Understanding and Predicting Human Behavior for Social Communities - Use Data Management, Inference and Distribution-Enabling New Human Experiences-Reality Mining-Context Awareness - Privacy in Online Social Networks - Trust in Online Environment - Trust Models Based on Subjective Logic-Trust Network Analysis-Trust Transitivity Analysis-Combining Trust and Reputation-Trust Derivation Based on Trust Comparisons-Attack Spectrum and Countermeasures.					
UNIT V	VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS				19
Graph Theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing Online Social Networks - Visualizing Social Networks with Matrix-Based Representations - Node-Link Diagrams-Hybrid Representations-Applications-Covert Networks-Community Welfare-Collaboration Networks-Co-Citation Networks-Recommendation in Social Media: Challenges-					

Classical Recommendation Algorithms – Recommendation Using Social Context – Evaluating Recommendations.	
Total Lecture Hours	
90 Hours	
Text Book(s)	
1	Peter Mika, -Social networks and the Semantic Web, Springer, 2007.
2	Borko Furht, — Handbook of Social Network Technologies and Applications, Springer, 2010.
Reference Book(s)	
1	Bing Liu, -Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (Data Centric Systems and Applications), Springer; Second Edition, 2011.
2	Reza Zafarani, Mohammad Ali Abbasi, Huan Liu, Social Media Mining, Cambridge University Press, 2014.
3	Guandong Xu, Yanchun Zhang and Lin Li, — Web Mining and Social Networking Techniques and Applications, Springer, 2011
4	Dion Goh and Schubert Foo, -Social information retrieval systems: emerging technologies and Applications for searching the Web effectively, Idea Group, 2007.
Related Online Contents (MOOC, SWAYAM, NPTEL, Websites etc)	
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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	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

CourseCode	SoftwareAgents	L	T	P	C
Core/elective/Supportive	Elective:I	6	0	0	4
Pre-requisite	None	Syllabus		2021-22	
CourseObjectives					Onward
<ul style="list-style-type: none"> Toexplainthefundamentalsofagentsandagentprogrammingparadigms. Toexplainabout agentsandsecurity 					
ExpectedCourseOutcomes					
1	Understandingthefundamentals ofagents and agentprogrammingparadigms.				K2
2	Discussingthe basics ofjavaagents.				K2
3	Learningtheconceptsof multivalentssystem.				K2
4	Understandingtheconceptsofintelligentsoftwareagents.				K2
5	Understandingtheagentsandsecurity.				K2
K1-Remember K2 -Understand K3-applyK4-AnalyzeK5-evaluateK6-Create					
UNITI	AGENTS-OVERVIEW				16
UNITI Agent Definition-Agent Programming Paradigms-Agent Vs Object-Aglet-Mobile Agents-Agent Frameworks-Agent Reasoning					
UNITII	JAVAAGENTS				17
UNITII Processes-Threads-Daemons-Components-JavaBeans-ActiveX-Sockets-RPCs-Distributed Computing-Aglets Programming-Jini Architecture-Actors and Agents-Typed and Proactive Messages					
UNITIII	MULTIAGENTS SYSTEMS				19
Interaction between Agents-Reactive Agents-Cognitive Agents-Interaction Protocols-Agent Coordination-Agent negotiation-Agent Cooperation-Agent Organization-Self-Interested Agents in Electronic Commerce Applications					
UNITIV	INTELLIGENT SOFTWARE AGENTS				19
Interface Agents-Agent Communication Languages-Agent Knowledge Representation-Agent Adaptability-Belief Desire Intension-Mobile Agent Applications					
UNITV	AGENTS AND SECURITY				19
Agent Security Issues- Mobile Agents Security-Protecting Agents against Malicious Hosts-Untrusted Agent - Black Box Security-Authentication for Agents-Security Issues for Aglets					
Total Lecture Hours					90 Hours

TextBook(s)	
1	1.Bigus&Bigus,—ConstructingIntelligentagentswithJaval,Wiley,2010.
2	2. Bradshaw,-Software Agents,MIT Press,2012.
ReferenceBook(s)	
1	Russel&Norvig, -ArtificialIntelligenceamodernapproach, Prentice Hall,1994.
2	Richard Murchand TonyJohnson, -Intelligent SoftwareAgents, PrenticeHall, 2000.
3	Michael Wooldridge,-AnIntroduction to Multi Agent Systems,John Wiley, 2002.
RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)	
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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



CourseCode	EthicalHacking			L	T	P	C
Core/elective/Supportive	SkillBasedSubject:3			6	0	0	3
Pre- requisite	None			Syllabus	2021-22		
CourseObjectives							Onward
<ul style="list-style-type: none"> To introduce the concepts of security and various 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-apply K4-Analyze K5-evaluate K6-Create							
UNIT I	Introduction To Hacking						18
Introduction to Hacking – Importance of Security – Elements of Security – Phases of an Attack – Types of Hacker Attacks – Hacktivism – Vulnerability Research – Introduction to Footprinting – Information Gathering Methodology – Footprinting Tools – WHOIS Tools – DNS Information Tools – Locating the Network Range – Meta Search Engines.							
UNIT II	Scanning And Enumeration						18
Introduction to Scanning – Objectives – Scanning Methodology – Tools – Introduction to Enumeration – Enumeration Techniques – Enumeration Procedure – Tools.							
UNIT III	System Hacking						18
Introduction – Cracking Passwords – Password Cracking Websites – Password Guessing – Password Cracking Tools – Password Cracking Countermeasures – Escalating Privileges – Executing Applications – Keyloggers and Spyware.							
UNIT IV	Programming For Security Professionals						18
Programming Fundamentals – C language – HTML – Perl – Windows OS Vulnerabilities – Tools for Identifying Vulnerabilities – Countermeasures – Linux OS Vulnerabilities – Tools for Identifying Vulnerabilities – Countermeasures							
UNIT V	Penetration Testing						18
Introduction – Security Assessments – Types of Penetration Testing – Phases of Penetration Testing – Tools – Choosing Different Types of Pen-Test Tools – Penetration Testing Tools.							
Total Lecture Hours							90 Hours
Text Book(s)							
1	EC-Council, -Ethical Hacking and Countermeasures: Attack Phases, Cengage Learning, 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 and Network Defense, Cengage Learning, 2013.						
Reference Book(s)							
1	Patrick Engebretson, -The Basics of Hacking and Penetration Testing – Ethical Hacking and Penetration Testing Made Easy, Second Edition, Elsevier, 2013.						
2	Rafay Boloch, -Ethical Hacking and Penetration Testing Guide, CRC Press, 2014						

	RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)	
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	L	L	L	L	L	L	L	L

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





**Sixth
Semester**

CourseCode	NaturalLanguageProcessing				L	T	P	C
Core/elective/Supportive	Core:10				6	0	0	4
Pre-requisite	None				Syllabus		2021-22	
CourseObjectives								Onward
<ul style="list-style-type: none"> To introduce the fundamental concepts and techniques of natural language processing (NLP) 								
Expected Course Outcomes								
1	Understand the fundamental concepts and techniques of natural language processing (NLP)							K2
2	Understanding of the models and algorithms in the field of NLP.							K2
3	Demonstrate the computational properties of natural languages and the commonly used algorithms for processing linguistic information.							K2
4	Understanding semantics and pragmatics of languages for processing							K2
K1–Remember K2 –Understand K3–apply K4-Analyze K5–evaluate K6-Create								
UNIT I	Introduction to NLP							13
Introduction: application of NLP techniques and key issues- MT grammar checkers- dictation- document generation- NL interfaces- Natural language processing key issues- the different analysis level used for NLP: morpho-lexical-syntactic-semantic-pragmatic-markup (TEI, UNICODE)- finite state automata- Recursive and augmented transition networks- open problems								
UNIT II	Lexical Level							14
Lexical level: error tolerant lexical processing (spelling error correction)- transducers for the design of morphological analyzers features- toward syntax: part-of-speech tagging (BRILL, HMM)- efficient representations for linguistic resources (lexica, grammars, ...) tries and finite state automata.								
UNIT III	Syntactic Level							16
Syntactic level: grammars (eg. formal/Chomsky hierarchy, DCSGs, systematic case, unification, stochastic)- parsing (top-down, bottom up, char (early algorithm), CYK algorithm)- automated estimation of probabilistic model parameters (inside-outside algorithm)- data oriented parsing- grammar formalisms and treebanks- efficient parsing for context-free grammars (CFGs)- statistical parsing and probabilistic CFGs (PCFGs)- lexicalized PCFGs.								
UNIT IV	Semantic Level							15
Semantic level: logical forms- ambiguity resolution- semantic network and parsers- procedural semantics- Montague semantics- vector space approaches- distributional semantics- lexical semantics and word sense disambiguation- compositional semantics- semantic role labeling and semantic parsing								
UNIT V	Pragmatic Level							17
Pragmatic level: knowledge representation- reasoning- plan/goal recognition- speech acts/intentions – belief models- discourse- reference. Natural language generation: content determination – sentence planning- surface realization, subjectivity and sentiment analysis: information extraction – automatic summarization- information retrieval and question answering – named entity recognition and relation extraction – IE using sequence labeling- machine translation: basic issues in MT- statistical translation- word alignment- phrase-based translation and synchronous grammars.								
Total Lecture Hours								75 Hours

TextBook(s)	
1	DanielJandJamesH.Martin, speechandlanguageprocessing anintroductiontonatural languageprocessing,computationallinguistics&speechrecognition prenticehall,2009.
ReferenceBook(s)	
1	LanHWrittenandElbef,MarkA.Hall, datamining:practicalmachinelearningtoolsand techniques ,MorganKaufmann,2013
	RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)
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	L	L	L	L	L	L	L	L

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



CourseCode	NaturalLanguageProcessingLab			L	T	P	C
Core/elective/Supportive	CoreLab :7			0	0	5	4
Pre-requisite	None			Syllabu		2021-22	Onward
CourseObjectives							
<ul style="list-style-type: none"> To introduce the fundamental concepts and techniques of natural language processing (NLP) 							
ExpectedCourseOutcomes							
1	Understand the fundamental concepts and techniques of natural language processing (NLP)						K2
2	Understanding of the models and algorithms in the field of NLP.						K2
3	Demonstrate the computational properties of natural languages and the commonly used algorithms for processing linguistic information.						K2
4	Understanding semantics and pragmatics of languages for processing						K2
K1–Remember K2 –Understand K3–apply K4-Analyze K5–evaluate K6-Create							
LIST OF PROGRAMS							
<ol style="list-style-type: none"> Implementing word similarity Implementing simple problems related to word disambiguation Simple demonstration of part of speech tagging. Lexical analyzer. Semantic Analyzer. Sentiment Analysis. 							
Total Lecture Hours						90 Hours	
Text Book(s)							
1	Daniel J and James H. Martin, speech and language processing an introduction to natural language processing, computational linguistics & speech recognition prentice hall, 2009						
Reference Book(s)							
1	Lan H Written and El bef, Mark A. Hall, data mining: practical machine learning tools and techniques , Morgan Kaufmann, 2013						
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 :							

	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



CourseCode	ProjectWorkLab			L	T	P	C
Core/Elective/Supportive	Core-11			0	0	4	6
Pre- requisite	Students should have the strong knowledge in any one of the programming languages in this course.			Syllabus version		2021-22 Onward	
Course Objectives							
<ul style="list-style-type: none"> • 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. • Express technical and behavioral ideas and thought in oral settings. • Prepare and conduct oral presentations 							
Expected 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 a design solution for a set of requirements						K3
2	Test and validate the conformance of the developed prototype against the original requirements of the problem						K5
3	Work as a responsible member and possibly a leader of a team in developing software solutions						K3
4	Express technical ideas, strategies and methodologies in written form. Self-learn tools, algorithms and techniques that contribute to the software solution of project						K1- K4 new the
5	Generate alternative solutions, compare them and select the optimum one						K6
K1-Remember K2-Understand K3-apply K4-Analyze K5-evaluate K6-Create							
Aim of the project work							
<p>1. The aim of the project work is to acquire practical knowledge on the implementation of the programming concepts studied.</p> <p>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.</p> <p>3. The project work should be compulsorily done in the college only under the supervision of the department staff concerned.</p>							
Viva Voce							
<p>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 of 150 marks at the last day of the practical session.</p> <p>2. Out of 150 marks, 60 marks for CIA and 90 for CEE (60 evaluation of project report + 30 Viva Voce).</p>							

Project Work Format

PROJECTWORK

TITLE OF THE DISSERTATION

Bonafide Work Done

by STUDENT

NAMEREG.NO.

Dissertation submitted in partial fulfillment of the requirements for the award of
<Name of the Degree>
of Bharathiar University, Coimbatore-46.

College Logo

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

Signature of the

Internal Examiner

External

Examiner Month- Year

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Acknowledgement

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1.2 System Specification

1.2.1 Hardware Configuration

1.2.2 Software Specification

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2.1.1 Drawbacks

2.2 Proposed System

2.2.1 Features

3. System Design and Development

3.1 File Design

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)

4. Testing and Implementation

5. Conclusion Bibliography Appendices

A. Data Flow 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	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

CourseCode		ArtificialNeuralNetworkandFuzzyS ystems	L	T	P	C
Core/elective/Supportive		Elective:II	5	0	0	4
Pre-requisite		None	Syllabu	2021-22	Onward	
CourseObjectives						
<ul style="list-style-type: none"> To introduce the concepts of artificial neural networks and fuzzy systems To explain the basic mathematical elements of the theory of fuzzy sets. 						
ExpectedCourseOutcomes						
1	Explain the concepts of neural networks and fuzzy logic					K2
2	Understanding of the basic mathematical elements of the theory of fuzzy sets.					K2
3	Understanding the differences and similarities between fuzzy sets and classical sets theories					K2
4	Solve problems that are appropriately solved by neural networks and fuzzy logic					K3
K1–Remember K2 –Understand K3–apply K4-Analyze K5–evaluate K6-Create						
UNIT I	Introduction					14
Basic concepts - single layer perceptron - Multilayer perceptron - Adaline - Madaline - Learning rules - Supervised learning - Back propagation networks - Training algorithm, Advanced algorithms - Adaptive network - Radial basis network - modular network - Applications						
UNIT II	Learning					16
Introduction - unsupervised learning - Competitive learning networks - Kohonenself organising networks - Learning vector quantisation - Hebbian learning - Hopfield network - Content addressable network, Binary Hopfield network, Continuous Hopfield network Travelling Salesperson problem - Adaptive resonance theory - Bidirectional Associative Memory - Principle component Analysis						
UNIT III	Fuzzy Sets					16
Introduction - crisp sets and overview - the notion of fuzzy sets - Basic concepts of fuzzy sets - classical logic and overview - Fuzzy logic. Operations on fuzzy sets - fuzzy complement - fuzzy union - fuzzy intersection - combinations of operations - general aggregation operations						
UNIT IV	Relations					14
Crisp and fuzzy relations - binary relations - binary relations on a single set - equivalence and similarity relations - Compatibility or tolerance relations - orderings - Membership functions - methods of generation - defuzzification methods						
UNIT V	Tree Learning					15
Adaptive Neuro Fuzzy based inference systems - classification and regression trees: decision tree, Cart algorithm - Data clustering algorithms: K means clustering, Fuzzy C means clustering, Mountain clustering, Subtractive clustering - rule base structure identification - Neuro fuzzy control: Feedback Control Systems, Expert Control, Inverse Learning, Specialized Learning, Back propagation through Real - Time Recurrent Learning.						
Total Lecture Hours						75 Hours

TextBook(s)	
1	-NeuroFuzzyand Soft computing , JangJ.S.R.,Sun C.T and Mizutani E–Pearson education, 2004
2	FundamentalsofNeuralNetworks ,LaureneFauseett,PrenticeHallIndia,NewDelhi,1994.
ReferenceBook(s)	
1	FuzzyLogicEngineeringApplications ,TimothyJ.Ross,McGrawHill,NewYork,1997.
2	-Neural networks,Fuzzylogics,andGeneticalgorithms , S.Rajasekaranand G.A.VijayalakshmiPaiPrenticeHallof India,2003
3	FuzzySetsandFuzzyLogic ,GeorgeJ.KlirandBoYuan,PrenticeHallInc.,New Jersey,1995
4	-Principlesof SoftComputing S.N.Sivanandam,S.N.DeepaWileyIndia PvtLtd.
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CourseDesignedby :	

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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

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

CourseCode		WebApplicationSecurity	L	T	P	C
Core/elective/Supportive		Elective:II	5	0	0	4
Pre-requisite		None	Syllabus		2021-22	
CourseObjectives						Onward
<ul style="list-style-type: none"> To introduce the concepts of security in web applications To explain about crime prevention and routine duties in a police station 						
Expected Course Outcomes						
1	Illustrate about the concept of HTML, DHTML, CSS and JavaScript					K2
2	Explain the history, characteristics, technologies, concepts, usage in web 2.0 and web 3.0					K2
3	Apply the core concepts of web application to create web pages					K3
4	Apply the concepts of server side programming					K3
K1-Remember K2-Understand K3-apply K4-Analyze K5-evaluate K6-Create						
UNIT I	Introduction to Web					14
Data with URL- HTML - DHTML: Cascading Style Sheets, Common Gateway Interface: Programming CGI! Scripts-HTML Forms-:-Custom Database Query Scripts-Server Side Includes-Server security issues.						
UNIT II	XHTML					13
XHTML: Introduction, CSS-Scripting languages- JavaScript: Control statements, Functions, Arrays, Objects-DOM- Ajax enable rich internet applications.						
UNIT III	Server Side Programming					15
Server side Programming- Active server pages- Java server pages- Java Servlets: Servlet container- Exceptions- Sessions and Session Tracking_- Using Servlet context- Dynamic Content Generation- Servlet Chaining and Communications.						
UNIT IV	HTML5					16
HTML review, Feature detection, The HTML5 new Elements, Canvas, Video and audio, Web storage, Geolocation, Offline Web pages, Microdata, HTML5 APLS, Migrating from HTML4 to HTML5, CSS 3.						
UNIT V	WEB2.0					17
WEB2.0- HISTORY, characteristics, technologies, concepts, usage, web 2.0 in education, philanthropy, social work. Web 3.0- Theory and history understanding. basic web artifacts and applications, implementation. MS share point - Share point 2013 overview ,share (Put social to work ,Share your stuff, Take share point on the go), Discover (find experts, discover answers, find what you are looking for), Manage(cost,risk, time)						
Total Lecture Hours						75 Hours
Text Book(s)						
1	1. Deitel, Deitel and Neita, -Internet and World Wide Web-How to program it, Pearson Education 4th Edition, 2009.					
2	Elliotte Rusty Herold, -Java Network Programming II, O'Reilly Publications, 3rd Edition, 2004.					

onAsia,

ReferenceBook(s)	
1	JeffyDwight,MichaelErwinand RobertNikes-USINGCGIII, PH.IPublications,1997
2	JasonHunter,WilliamCrawford-JavaServletProgrammingO'ReillyPublications,2nd Edition, 2001.
3	EricLaddandJimO'Donnell,etal,-USINGHTML4,XML, andJAVA1.2,PrenticeHall, 2003
4	JeremyKeith,-Html5forwebdesigners
RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)	
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	S	M	L	L	L	L	L	L	L

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



CourseCode	Fundamentals of Robotics				L	T	P	C
Core/elective/Supportive	Elective:II				5	0	0	4
Pre-requisite	None				Syllabus	2021-22 Onward		
Course Objectives								
<ul style="list-style-type: none"> To introduce the basic concepts of robotics and its characteristics 								
Expected Course Outcomes								
1	Describe the different physical forms of robot architectures.							K2
2	Explain about the actuators and characteristics of actuating system							K2
3	Demonstrate to mathematically describe a kinematic robot system.							K2
4	Analyze manipulation and navigation problems using knowledge of coordinate frames, kinematics, optimization, control, and uncertainty.							K3
K1-Remember K2-Understand K3-apply K4-Analyze K5-evaluate K6-Create								
UNIT I	Introduction to Robotics							14
Introduction to Robotics: Classification, Components, Characteristics, Applications.								
UNIT II	Robotics Kinematics							16
Robotics Kinematics: Position Analysis, Robots as Mechanisms, Matrix Representation, Transformation Matrices, Forward and Inverse Kinematics.								
UNIT III	Actuators							15
Actuators: Characteristics of Actuating Systems, Actuating Devices and Control.								
UNIT IV	Sensors							16
Sensors: Sensor Characteristics, Description of Different Sensors. Dynamic characteristics- speed of motion, load carrying capacity & speed of response- Sensors- Internal sensors: Position sensors, & Velocity sensors, External sensors: Proximity sensors, Tactile Sensors, & Force or Torque sensors.								
UNIT V	Kinematics							14
Kinematics- Manipulators Kinematics, Rotation Matrix, Homogenous Transformation Matrix, D-H transformation matrix, D-H method of assignment of frames. Direct and Inverse Kinematics for industrial robots. Differential Kinematics for planar serial robots								
Total Lecture Hours							75 Hours	
Text Book(s)								
1	Saed B. Niku, Introduction to Robotics Analysis, Application, Pearson Education Asia, 2001							
Reference Book(s)								
1	R.K. Mittal and I.J. Nagrath, Robotics and Control, TMH, 2003.							
2	Computational Intelligence, Davis Poole, Alan Mackwath, Randy Coehel, Oxford University Press 1998.							
3	Industrial Robotics/Groover MP/McGraw Hill							
4	Introduction to Robotics /John J. Craig/Pearson							
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 :								

	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

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



CourseCode	EmbeddedSystems	L	T	P	C
Core/elective/Supportive	Elective:III	5	0	0	4
Pre-requisite	None	Syllabus		2021-22	
CourseObjectives					Onward
<ul style="list-style-type: none"> To introduce the concepts of embedded systems and its architecture 					
Expected Course Outcomes					
1	Understand hardware and software design requirements of embedded systems.				K2
2	Explain about the architecture of microprocessor and operating systems in embedded systems				K2
3	Analyze the embedded systems' specification and develop software programs.				K4
4	Evaluate the requirements of programming Embedded Systems, related software architectures and tool chain for Embedded Systems.				K5
K1-Remember K2 -Understand K3-apply K4-Analyze K5-evaluate K6-Create					
UNIT I	Introduction to Embedded System	15			
Examples of Embedded Systems – Typical Hardware – Memory – Microprocessors – Buses – Direct Memory Access – Introduction to 8051 Microcontroller – Architecture – Instruction set – Programming.					
UNIT II	Microprocessor	16			
Microprocessor Architecture – Interrupt Basics – The Shared-Dataprobe – Interrupt Latency – Round-Robin Architecture – Round-Robin with Interrupts Architecture – Function-Queue Scheduling Architecture – Real-Time Operating Systems Architecture – Selection of Architecture.					
UNIT III	Semaphores	14			
Tasks and Task States – Tasks and Data – Semaphores and Shared Data – Semaphore Problems – Semaphore variants.					
UNIT IV	Message Queues & RTOS	15			
Message Queues – Mailboxes – Pipes – Timer Functions – Events – Memory Management – Interrupt Routines in RTOS Environment. RTOS design – Principles – Encapsulation Semaphores and Queues – Hard Real-Time Scheduling Considerations – Saving Memory Space – Saving Power.					
UNIT V	Host machine & Testing	15			
Host and Target Machines – Linker/Locator for Embedded Software – Getting Embedded Software into the Target System. Testing on your Host Machine – Instruction Set Simulators – Laboratory Tools used for Debugging.					
Total Lecture Hours					75 Hours
Text Book(s)					
1	The 8051 Microcontroller Architecture, Programming & Applications, Kenneth J. Ayala, Penram International.				
2	An Embedded Software Primer, David E. Simon, Pearson Education, 2005.				
Reference Book(s)					
1	Embedded Systems: Architecture, Programming and Design, Raj Kamal, Tata McGraw-Hill Education, 2008				

	RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)	
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	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



CourseCode	PrinciplesofSecureCoding			L	T	P	C
Core/elective/Supportive	Elective:III			5	0	0	4
Pre-requisite	None			Syllabus	2021-22		
CourseObjectives							Onward
<ul style="list-style-type: none"> To understand the secure software development lifecycle To explain about these secure coding techniques 							
Expected Course Outcomes							
1	Explain about the secure software development lifecycle						K2
2	Understand these secure coding techniques						K2
3	Demonstrate the threat modeling process and benefits						K2
4	Explain about the database and web specific issues						K2
K1-Remember K2-Understand K3-apply K4-Analyze K5-evaluate K6-Create							
UNIT I	Introduction to Security						15
Need for secure systems: Proactive Security development process, Secure Software Development Cycle (S-SDLC) , Security issues while writing SRS, Design phase security, Development Phase, Test Phase, Maintenance Phase, Writing Secure Code- Best Practices SD3 (Secure by design, default and deployment), Security principles and Secure Product Development Timeline							
UNIT II	Threat modelling process and its benefits						14
Threat modelling process and its benefits: Identifying the threats by using Attack Trees and rating threats using DREAD, Risk Mitigation Techniques and Security Best Practices. Security techniques, authentication, authorization. Defense in Depth and Principle of Least Privilege.							
UNIT III	Secure Coding Techniques						16
Secure Coding Techniques: Protection against DoS attacks, Application Failure Attacks, CPU Starvation Attacks, Insecure Coding Practices in Java Technology. ARPS spoofing and its countermeasures. Buffer Overrun- Stack overrun, Heap Overrun, Array Indexing Errors, Format String Bugs. Security Issues in C Language: String Handling, Avoiding Integer Overflows and Underflows and Type Conversion Issues- Memory Management Issues, Code Injection Attacks, Canary based counter measures using Stack Guard and Propolice. Socket Security, Avoiding Server Hijacking, Securing RPC.							
UNIT IV	Database and Web-specific issues						16
Database and Web-specific issues: SOL Injection Techniques and Remedies, Race conditions, Time of Check Versus Time of Use and its protection mechanisms. Validating Input and Interprocess Communication, Securing Signal Handlers and File Operations. XSS scripting attack and its types- Persistent and Non-persistent attack XSS Countermeasures and Bypassing the XSS Filters.							
UNIT V	Testing Secure Applications						14
Testing Secure Applications: Security code overview, secure software installation. The Role of the Security Tester, Building the Security Test Plan. Testing HTTP- Based Applications, Testing File-Based Applications, Testing Clients with Rogue Servers							
Total Lecture Hours							75 Hours
Text Book(s)							
1	Writing Secure Code, Michael Howard and David LeBlanc, Microsoft Press, 2nd Edition, 2004						

ReferenceBook(s)	
1	ProgrammingPHP,RasmusLerdorfandLevinTatroe,O_Reilly,2002
2	CorePythonProgramming,WesleyJ.Chun, PrenticeHall,2001
3	Perl:TheComplete Reference,2 nd Edn,MartinC. Brown,TMH, 2009
4	MySQL:TheComplete Reference,2 nd Edn,VikramVaswani,TMH,2009
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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

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



CourseCode	OpenSourceSoftware	L	T	P	C
Core/elective/Supportive	Elective:III	5	0	0	4
Pre-requisite	None	Syllabus		2021-22	
CourseObjectives					Onward
<ul style="list-style-type: none"> To explain the need and importance of open source software To introduce the various open source software's like Linux, MySQL, PHP and Python 					
Expected Course Outcomes					
1	Explain about the need and importance of open source software				K2
2	Demonstrate the concepts of open source software's				K2
3	Apply the programming constructs of MySQL, PHP, Python and PERL to create programs				K3
4	Develop small programs using open source software's				K3
K1-Remember K2-Understand K3-apply K4-Analyze K5-evaluate K6-Create					
UNIT I	Introduction to open sources				15
Introduction to open sources-Need of open sources-advantages of open sources-application of open sources. Open source operating systems: LINUX: Introduction – general overview – Kernel mode and user mode – process – advanced concepts – scheduling – personalities – cloning – signals – development with Linux.					
UNIT II	MySQL				15
MySQL: Introduction – setting up account – starting, terminating and writing your own SQL programs – record selection Technology – working with strings – Date and Time – sorting Query results – generating summary – working with meta data – using sequences – MySQL and Web.					
UNIT III	PHP				16
PHP: Introduction – programming in web environment – variables – constants – data types – operators – statements – functions – arrays – OOP – string manipulations and regular expression – file handling and data storage – PHP and SQL database – PHP and LDAP – PHP connectivity – sending and receiving E-mails – debugging and error handling – security – templates					
UNIT IV	Python				15
Syntax and style – python objects – numbers – sequences – strings – lists and tuples – dictionaries – conditional loops – files – input and output – errors and exceptions – functions – modules – classes and OOP – execution environment					
UNIT V	Pearl				14
Pearl background – pearl overview – pearl parsing rules – variables and data – statements and control structures – subroutines – packages and modules – working with files – data manipulation.					
Total Lecture Hours					75 Hours
Text Book(s)					
1	The Linux Kernel Book, Remy Card, Eric and Frank Mevel, Wiley Publications 2003				
2	MySQL Bible, Steve Suchring, John Wiley 2002.				
Reference Book(s)					
1	Programming PHP, Rasmus Lerdorf and Levin Tatroe, O'Reilly, 2002				
2	Core Python Programming, Wesley J. Chun, Prentice Hall, 2001				

3	Perl:TheComplete Reference,2 nd Edn,MartinC. Brown,TMH, 2009
4	MySQL:TheComplete Reference,2 nd Edn,VikramVaswani,TMH,2009
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CourseDesignedby :	

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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



CourseCode	CapstoneProjectWorkPhaseII				L	T	P	C	
Core/elective/Supportive	SkillBasedSubject:4				0	0	3	3	
Pre- requisite	<ul style="list-style-type: none"> • StudentsshouldhavecompletedCapstoneProjectWork Phase –I • Strong coding skills in any oneprogrammingpaper 				Syllabus version		2021-22 Onwards		
CourseObjectives									
<ul style="list-style-type: none"> • Tounderstandand selectthetask basedontheircoreskills. • Togettheknowledge aboutanalyticalskillforsolvingtheselectedtask. • Togetconfidencefor implementingthetaskandsolvingtherealtimeproblems. 									
ExpectedCourseOutcomes									
Onthesuccessful completionofthecourse,student willbe ableto:									
1	Selectappropriateinput,output,formandtabledesign							K3	
2	Designcodetomeettheinputrequirementsandtoachievetherequiredoutput							K6	
3	Composeaprojectreportincorporatingthefeaturesof theproject							K6	
K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create									
Aimoftheproject work									
<p>1. Theaimof theprojectworkis toacquirepracticalknowledgeonthe implementationoftheprogrammingconcepts studied.</p> <p>2. Each student should carry out individually one project work and it may be a work using thesoftware packages that they have learned or the implementation of concepts from the papers studiedorimplementation of anyinnovative ideafocusing on application oriented concepts.</p> <p>3. Theprojectwork should be compulsorilydonein thecollegeonlyunderthe supervision of thedepartmentstaff concerned.</p> <p>VivaVoce</p> <p>1. Viva-Voce will be conducted at the end of the year by both Internal (Respective Guides) andExternalExaminers,afterdulyverifyingtheAnnexureReport availableinthe College,foratotal of75marks at the last dayof the practical session.</p> <p>2. Outof75marks, 45 marksforproject reportand 30 MarksforVivaVoce.</p>									

ProjectWork Format

PROJECTWORK

TITLE OF THE DISSERTATION

Bonafide Work Done

by STUDENT

NAMEREG.NO.

Dissertation submitted in partial fulfillment 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

Acknowledgement

Contents

Synopsis

1. Introduction

1.1 OrganizationProfile

1.2 SystemSpecification

1.2.1 HardwareConfiguration

1.2.2 SoftwareSpecification

2. SystemStudy

2.1 ExistingSystem

2.1.1 Drawbacks

2.2 ProposedSystem

2.2.1 Features

3. SystemDesign andDevelopment

3.1 FileDesign

3.2 InputDesign

3.3 OutputDesign

3.4 DatabaseDesign

3.5 SystemDevelopment

3.5.1 DescriptionofModules(Detailedexplanation abouttheprojectwork)

4SoftwareTestingandImplementationC

onclusion

Bibliography

Appendices

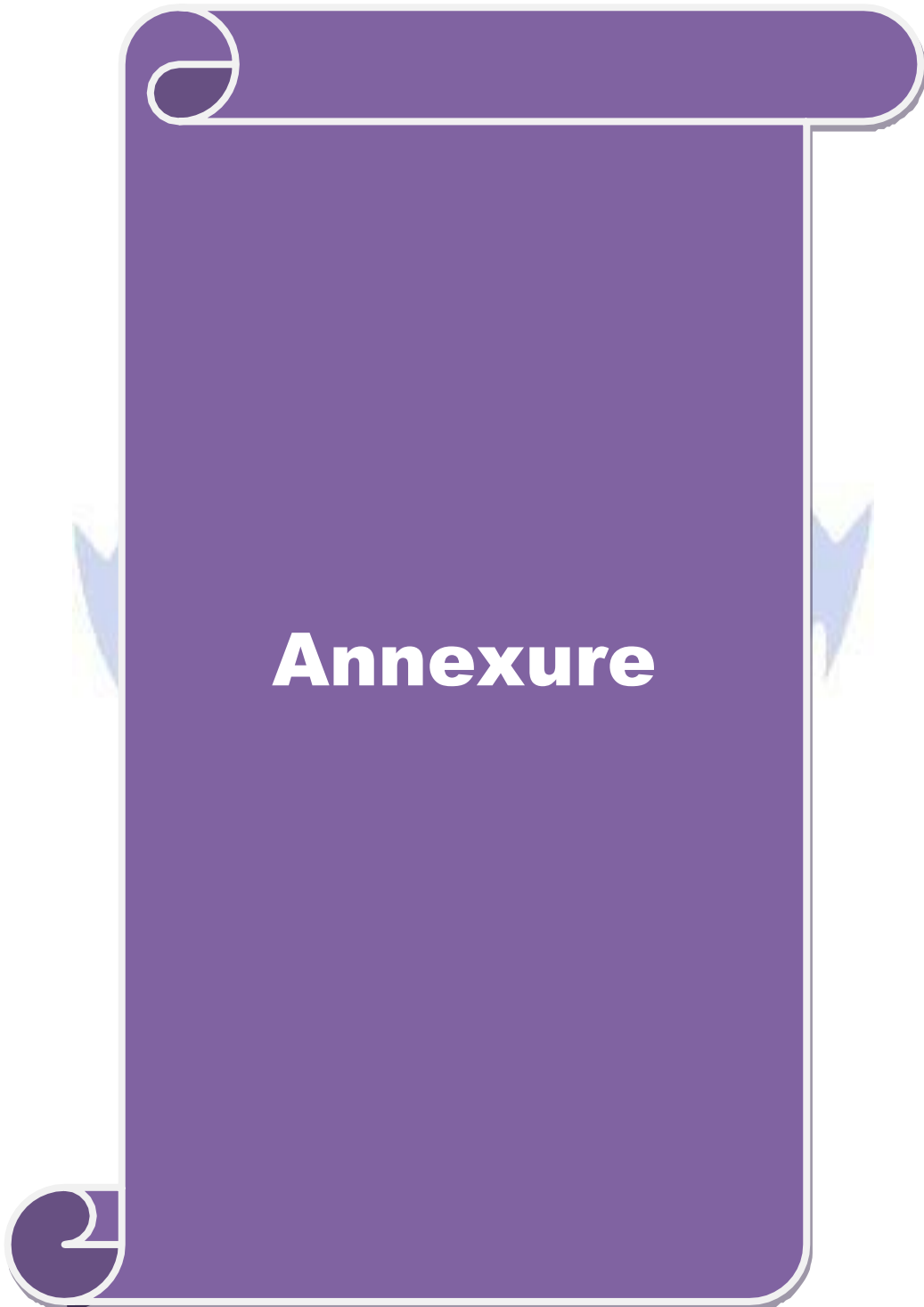
A.DataFlow Diagram

<p>B. TableStructure</p> <p>C. SampleCoding</p> <p>D. Sample Input</p> <p>E. SampleOutput</p>

	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





B.Sc.ArtificialIntelligenceandMachineLearning

Syllabus
(Witheffectfrom 2021-22)

ProgramCode:26G



DEPARTMENTOFARTIFICIALINTELLIGENCEANDMACHINELEARNING
BharathiarUniversity
(AStateUniversityAccreditedwith“a”byNAAACand13th
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NIRF)Coimbatore641046, INDIA