P.K.R. ARTS COLLEGE FOR WOMEN

(Re-Accredited with 'A' Grade by NAAC)
An Autonomous Institution – Affiliated to Bharathiar University
No.21 Pariyur Road, Gobichettipalayam – 638476.

DEPARTMENT OF COMPUTER SCIENCE

Bachelor of Science – Artificial Intelligence & Machine Learning

RULES AND REGULATIONS

SCHOLASTIC COURSES
AND
CO-SCHOLASTIC COURSES
For the candidates admitted from the Academic Year
2023-2024 and onwards
Under CBCS PATTERN

B.Sc. – Artificial Intelligence & Machine Learning
Programme Structure
CBCS – 2023-24 & Onwards

Category	Component	No. of Courses	Credit(s) / Course	Total Credits	Proposed Semester
Part – I	Tamil/Hindi/French/Kannada/Malayalam/Sanskrit	4	3	12	I – IV
Part – II	English	4	3	12	I – IV
Part – II	Effective English	2	1	1	II
Part - III	**Core Courses** *(Core Theory /Core Practical/ Core Allied/ Elective/Open Elective)*	23	2/3/4/5	89	I - VI
Part - III	Project Work	2	5	5	To be done in V & VI Semester, ESE in Semester VI
Part –IV	**A. Foundation Courses:** i. Environmental Studies ii. Yoga and Ethics	1 1	2 2	4	I II
	B. Ability Enhancement Courses: i. Information Security ii. Consumer Rights	1 1	2 2	4	III IV
	C. Skill Enhancement Courses: i. Capstone Project Work(Based on AI & Machine Learning)/ **Naan Mudhalvan Course** ii. Life Skills iii. Capstone Project Work (Based on AI & Machine Learning) / **Naan Mudhalvan Course**	1 1 1	2 2 2	6	IV V VI
	D. Non-Major Elective: i. Indian Women and Society / Advanced Tamil	1	2	2	III
Part –V	**A. Proficiency Enhancement** i. Ethical Hacking (Self Study) **B. Competency Enhancement:** i. NSS/YRC/RRC/CCC/PHY.EDU/ OTHERS ii. Professional Grooming iii. Students Social Activity	1 1 1 1	2 1 1 1	5	V Sem I to VI Sem I to VI Sem I to VI

Total Marks : 3700 Total Credits : 140

P.K.R. ARTS COLLEGE FOR WOMEN (Autonomous)
Gobichettipalayam – 638 476.
BACHELOR OF SCIENCE IN
ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
Programme Scheme and Scheme of Examinations
(For students admitted in 2023 - 2024 & onwards)
CBCS Pattern: 2023-2024

Scholastic Courses:

Category	Component	Course Code	Course Title	Contact Hrs/ week	Exam hrs.	Max. Marks			Credit
						CIA	ESE	Total	
SEMESTER- I									
I	Language: I	23LTU01/ 23LHU01/ 23LFU01/ 23LKU01/ 23LMU01/ 23LSU01	Tamil- I/ Hindi-I/ French-I/ Kannada-I/ Malayalam-I / Sanskrit-I	4	3	25	75	100	3
II	English: I	23LEU01	English - I	4	3	25	75	100	3
III	Core : I	23AMU01	Programming in C++	5	3	25	75	100	4
III	Core : II Practical : I	23AMU02	Programming in C++ - Practical	5	3	40	60	100	4
III	Core : III	23AMU03	Data Structures	5	3	25	75	100	4
III	Core : IV Allied : I	23AMU04	Discrete Mathematics	5	3	25	75	100	3
IV	Foundation : I	23FCU01	Environmental Studies	2	3	50	-	50	2
			TOTAL	**30**				**650**	**23**
SEMESTER-II									
I	Language: II	23LTU02/ 23LHU02/ 23LFU02/ 23LKU02/ 23LMU02/ 23LSU02	Tamil- II/ Hindi-II/ French-II/ Kannada-II/ Malayalam-II/ Sanskrit-II	4	3	25	75	100	3
II	English: II	23LEU02	English - II	4	3	25	25	50	4
		23LEEU02	Effective English	2	-	25	25	50	
III	Core : V	23AMU05	Programming in Java	5	3	25	75	100	4
III	Core : VI Practical : II	23AMU06	Programming in Java - Practical	4	3	40	60	100	4
III	Core : VII Practical :III	23AMU07	Internet Basics - Practical	4	3	40	60	100	2
III	Core : VIII Allied : II	23AMU08	Applied Mathematics	5	3	25	75	100	3
IV	Foundation : II	23FCU02	Yoga and Ethics	2	3	50	-	50	2
			TOTAL	**30**				**650**	**22**

SEMESTER-III									
I	Language: III	23LTU03/ 23LHU03/ 23LFU03/ 23LKU03/ 23LMU03/ 23LSU03	Tamil- III/ Hindi-III/ French-III/ Kannada-III/ Malayalam-III/ Sanskrit-III	4	3	25	75	100	3
II	English: III	23LEU03	English- III	4	3	25	75	100	3
III	Core : IX	23AMU09	Programming in Python	5	3	25	75	100	4
III	Core : X Practical : IV	23AMU10	Programming in Python – Practical	4	3	40	60	100	4
III	Core : XI	23AMU11	Artificial Intelligence & Knowledge Representation	5	3	25	75	100	4
III	Core : XII Allied :III	23AMU12	Internet of Things	4	3	25	75	100	3
IV	Ability Enhancement : I	23AEU01	Information Security	2	3	50	-	50	2
IV	Non - Major Elective : I	23NMU01A / 23NMU01B	Indian Women and Society/ Advanced Tamil	2	3	50	-	50	2
			TOTAL	**30**				**700**	**25**
SEMESTER-IV									
I	Language: IV	23LTU04/ 23LHU04/ 23LFU04/ 23LKU04/ 23LMU04/ 23LSU04	Tamil- IV/ Hindi-IV/ French-IV/ Kannada-IV/ Malayalam-IV/ Sanskrit-IV	4	3	25	75	100	3
II	English: IV	23LEU04	English- IV	4	3	25	75	100	3
III	Core : XIII	23AMU13	Programming in R	6	3	25	75	100	4
III	Core : XIV Practical:V	23AMU14	Programming in R - Practical	6	3	40	60	100	4
III	Core : XV Allied:IV	23AMU15	Machine Learning -Basics	5	3	25	75	100	3
IV	Skill Enhancement: I	23SEAMU01/ 23SEU01	Capstone Project Work(Based on AI & Machine Learning)/ **Naan Mudhalvan Course**	3	3	50	-	50	2
IV	Ability Enhancement : II	23AEU02	Consumer Rights	2	3	50	-	50	2
			TOTAL	**30**				**600**	**21**

SEMESTER-V									
III	Core : XVI	23AMU16	Machine Learning Techniques	6	3	25	75	100	5
III	Core : XVII Practical : VI	23AMU17	Machine Learning-Practical	6	3	40	60	100	4
III	Core : XVIII	23AMU18	Project Work	6	-	-	-	-	-
III	Core : XIX Elective : I	23AMU19A/ 23AMU19B/ 23AMU19C	Deep Learning /Business Data Analytics / Software Agents	5	3	25	75	100	5
III	Core : XX Open Elective	*****	(Opted by the students offered by other departments)	4	3	40	60	100	2
IV	Skill Enhancement: II	23SEU02	Life Skills (Jeevan Kaushal)	3	3	50	-	50	2
V	Proficiency Enhancement	23PEAMU01	Ethical Hacking (Self Study)	-	3	-	100	100	2
			TOTAL	**30**				**550**	**20**
SEMESTER-VI									
III	Core : XXI	23AMU20	Natural Language Processing	6	3	25	75	100	5
III	Core : XXII Practical : VII	23AMU21	Natural Language Processing-Practical	6	3	40	60	100	4
III	Core : XVIII	23AMU18	Project Work	5	3	20	80	100	5
III	Core : XXIII Elective : II	23AMU22A/ 23AMU22B/ 23AMU22C/	Artificial Neural Networks and Fuzzy Systems / Web Application Security/ Fundamentals of Robotics	5	3	25	75	100	5
III	Core : XXIV Elective : III	23AMU23A/ 23AMU23B/ 23AMU23C	Embedded Systems / Principles of Secure Coding/ Open Source Software	5	3	25	75	100	5
IV	Skill Enhancement: III	23SEAMU03/ 23SEU03	Capstone Project Work (Based on AI & Machine Learning) / **Naan Mudhalvan Course**	3	3	50	-	50	2
			TOTAL	**30**				**550**	**26**
V	Competency Enhancement		NSS/YRC/RRC/CCC/PHY.EDU/ Others		SEMESTERS I – VI				1
			Professional Grooming		SEMESTERS I – VI				1
			Students Social Activity (Related to the Curriculum)		SEMESTERS I - VI				1
Total Marks: 3700								**Total Credits: 140**	

NOTE: CREDIT TRANSFERABILITY FOR ALL COURSES FROM UGC SWAYAM MOOC COURSES.

Chair Person

Name, designation

Syllabus

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : I	23AMU01	PROGRAMMINGINC++	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
First	I	25	75	100

Preamble

To learn about Object Oriented Concepts through C++.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the basics of OOPS	K1
CO2	Summarize the concepts of functions, operator overloading , pointers, exceptions	K2
CO3	Classify constructors, classes	K3
CO4	Analyze pointers , exceptions	K4
CO5	Determine operator overloading , strings, exceptions	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	7	5	5	5	5	5	1
CO2	7	5	5	5	5	5	1
CO3	7	5	5	5	5	5	1
CO4	7	5	5	5	5	5	1
CO5	7	5	5	5	5	5	1
Total Contribution of COs to POs	35	25	25	25	25	25	5
Weighted Percentage of COs Contribution to POs	2.08	1.59	1.66	1.83	2.64	2.67	0.60

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT I Introduction to C++ (12 Hours)

Software Evolution- A Look at Procedure-Oriented Programming- Object Oriented Paradigm- Basic Concepts of OOP- Benefits of OOP- Object Oriented Languages- Applications of OOP- Beginning With C++ - Tokens- Expressions and Control Structures.

UNIT II Function in C++ (12 Hours)

Main Function- Function Prototyping- Call By Reference- Return By Reference- Inline Function- Function Overloading – Classes and Objects: C Structures Revisited- Specifying a Class- Defining Member Function- C++ Program with Class- Nesting of Member Function- Private Member Function- Memory Allocation for Objects- Static Data Members and Functions- Array of Objects- Objects as Function Arguments- Friendly Functions – Constructors and Destructors: Constructor- Parameterized Constructors- Multiple Constructor in a Class- Copy Constructor- Destructor.

UNIT III Operator Overloading (12 Hours)

Introduction- Defining Operator Overloading- Overloading Unary Operator- Overloading Binary Operator- Overloading Binary Operator Using Friends- Rules for Overloading Operator – Inheritance: Defining Derived Classes- Single Inheritance- Making a Private Member Inheritable- Multilevel Inheritance- Multiple Inheritance- Hierarchical Inheritance- Hybrid Inheritance- Virtual Base Classes- Abstract Classes.

UNIT IV Pointers (12 Hours)

Introduction- Pointers- Array of Pointers- Pointers to Objects- This Pointer- Pointer to Derived Class- Virtual Functions- Rules for Virtual Function- Pure Virtual Function – Managing Console I/O Operations.

UNIT V Exception Handling and Strings (12 Hours)

Working with Files –Exception Handling: Introduction- Basics of Exception Handling- Exception Handling Mechanism- Throwing Mechanism- Catching Mechanism – Strings: Introduction- Creating (String) Objects- Manipulating String Objects- Relational Operators- String Characteristics.

TEXT BOOK(S):

1. E.Balagurusamy,Object Oriented Programming with C++, Fifth Edition, TMH Publication.

REFERENCE BOOK(S):

1.John R Hubbard, Programming with C++, 2nd Edition, TMH Publication, 2002.
2.Maria Litvin & Gary Litvin, C++ for you, Vikas Publication, 2002.
3.Yashavant Kanetkar, Let us C++, BPB Publication, 2nd Edition, 2010.

WEB REFERENCES

1. https://youtu.be/s0g4ty29Xgg
2. https://www.w3schools.com/c/c_functions.php
3. https://www.programiz.com/cpp-programming/operator-overloading
4. https://youtu.be/zuegQmMdy8M?si=GxV0CLaMYPcynQI7
5. https://www.tutorialspoint.com/cplusplus/cpp_exceptions_handling.htm

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : II PRACTICAL : I	23AMU02	PROGRAMMING IN C++ -PRACTICAL	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
First	I	40	60	100

Preamble

To learn about Object Oriented Concepts through C++.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the basics of OOPS	K1
CO2	Summarize the concepts of functions, operator overloading , pointers, exceptions	K2
CO3	Classify constructors, classes	K3
CO4	Analyze pointers , exceptions	K4
CO5	Determine operator overloading , strings,exceptions	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	7	5	5	5	5	5	1
CO2	7	5	5	5	5	5	1
CO3	7	5	5	5	5	5	1
CO4	7	5	5	5	5	5	1
CO5	7	5	5	5	5	5	1
Total Contribution of COs to POs	35	25	25	25	25	25	5
Weighted Percentage of COs Contribution to POs	2.08	1.59	1.66	1.83	2.64	2.67	0.60

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

Practical List

1. Write a C++ program to find a factorial for a given number using recursive function
2. Write a C++ program to find a Fibonacci series using while loop
3. Define a class to represent a bank account. Include the following members:

   Data members: Name of the depositor, Account number, Type of account Balance amount in the account

   Member functions: To assign initial values, To deposit an amount, To withdraw an amount after checking the balance, To display the name and balance. Write a main program to invoke the member functions
4. 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.
5. Write a C++ program to swap two numbers using friend function
6. Write a C++ Program to create class, which consists of EMPLOYEE Detail like E_Number, E_Name, Department, Basic, Salary, and 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. Create array of objects for the derived class
7. Write a C++ program to add two complex numbers using operator overloading concept
8. Write a C++ Program to check whether the given string is a palindrome or not using Pointers
9. Write a C++ Program to merge two files into a single file
10. Write a C++ Program to implement exception handling concept using divide by zero
11. Write a C++ program to implement the concept of class template
12. Write a C++ Program to implement any four built in string functions

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : III	23AMU03	DATA STRUCTURES	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
First	I	25	75	100

Preamble

This Paper offers the basic understanding and knowledge of different data structures, sorting algorithms and symbol tables.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recall various data structures, algorithms and sorting methods	K1
CO2	Describe the basic concepts of data structures, sorting and symbol table	K2
CO3	Use appropriate data structures for varied problems	K3
CO4	Examine different data structures and algorithms to find best solution for the real time applications	K4
CO5	Recommend a specific data structure and sorting algorithm for an application.	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	1	1
CO2	9	9	9	9	9	1	1
CO3	9	9	9	9	9	3	1
CO4	9	9	9	9	9	3	3
CO5	9	9	9	9	9	3	3
Total Contribution of COs to POs	45	45	45	45	39	14	9
Weighted Percentage of COs Contribution to POs	2.68	2.87	2.98	3.30	4.12	1.49	1.08

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT I Introduction and Elementary Data Structure (12 Hours)

Introduction - Data structure- Overview - Definition - How to create a program – Arrays - Ordered List –Sparse Matrices - Representation of Arrays - Stacks and Queues – Fundamentals - Evaluation of Expressions.

UNIT II Linked List and Tree (12 Hours)

Linked Lists - Singly Linked List - Linked Stacks and Queues – Polynomial Addition - Doubly Linked Lists and Storage Management. Trees: Basic Terminology - Binary Trees - Binary Tree Representation - Binary Tree Traversal.

UNIT III Graph and its applications (12 Hours)

Graphs-Introduction – Definition and Terminology - Graph Representation – Traversals - Connected components and spanning Trees - Shortest path - Transitive Closure.

UNIT IV Internal Sorting (12 Hours)

Internal Sorting- Insertion sort - Quick sort - Merge sort - Heap sort – Sorting on Several Keys.

UNIT V Symbol Tables (12 Hours)

Symbol Tables - Static Tree Tables - Dynamic Tree Tables - Hash Tables - Hashing Functions -Overflow Handling.

TEXT BOOK(S):

1. Ellis Horowitz, Sartaj Shani, (1994), Fundamentals of Data Structures, First Edition, Galgotia Publication.

REFERENCE BOOK(S):

1. Seymour Lipschutz, Data Structures, Tata McGrawhill, Year 2006.
2. D. Samanta, "Classical Data Structure", Prentice Hall India.
3. G A V PAI, Data Structures and Algorithms Concepts, Techniques Applications, McGraw Hill Education, New Delhi.

WEB REFERENCES

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.javatpoint.com/data-structure-tutorial
3. https://www.youtube.com/watch?v=DFpWCl_49i0
4. https://www.geeksforgeeks.org/classification-of-sorting-algorithms/
5. https://www.javatpoint.com/data-structure-for-symbol-table

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-IV	FOUNDATION : I	23FCU01	ENVIRONMENTAL STUDIES	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
First	I	50	-	50

Preamble

To bring about an awareness of a variety of environmental concerns and to create a pro-environmental attitude and a behavioural pattern in society that is based on creating sustainable lifestyle

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Define environment, ecosystem, biodiversity, environmental pollution and social issues.	K1
CO2	Explain the natural resources, types of ecosystem, geographical classification of India, causes of environmental pollution and the problems related to the society.	K2
CO3	Identify the information related to environment and the resources to protect it.	K3
CO4	Analyze the classification of natural resources, energy flow in the ecosystem, threats to biodiversity, disaster management and the role of information technology in environment and human	K4
CO5	Assess the environmental issues with a focus on sustainability.	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	1	3
CO3	9	9	9	9	1	1	3
CO4	9	9	9	9	1	1	3
CO5	9	9	3	3	1	1	3
Total Contribution of COs to POs	45	45	39	39	9	7	15
Weighted Percentage of COs Contribution to POs	2.68	2.87	2.58	2.86	0.95	0.75	1.79

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT I **(4 Hours)**

Environment: Definition, Components, Segments and Types. Natural Resources: Meaning, Components: (1. Forest-Meaning, Importance and Types 2. Water- Meaning, Types and Problems 3. Mineral- Meaning and Classification 4.Food-Meaning and Problems 5.Energy-Meaning, Forms and Types 6.Land- Meaning, Structure and Functions, Components), Classification: Renewable and Non-Renewable Resources, Role of an Individual in Conservation of Natural Resources.

UNIT II **(5 Hours)**

Ecosystems – Definition, Features, Structure and Function of an Ecosystem, Producers, Consumers and Decomposers, Energy Flow in the Ecosystem (Water,Carbon,Nitrogen,Oxygen and Energy), Food Chains, Food Webs and Ecological Pyramids.

Introduction Types, Characteristics Features, Structure and Function of the following Ecosystem:

- Forest Ecosystem
- Grassland Ecosystem
- Desert Ecosystem
- Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Ocean, Estuaries)

UNIT III **(5 Hours)**

Biodiversity and its Conservation-Introduction – Definition – Genetic, Species and Ecosystem Diversity, Bio geographical Classification of India -Value of Biodiversity – Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Value- Biodiversity at Global, National and Local Levels- India as a Mega-Diversity Nation- Hot-Spots of Biodiversity- Threats to Biodiversity – Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts- Endangered and Endemic Species of India Conservation of Biodiversity – In-situ and Ex-situ and Conservation of Biodiversity.

UNIT IV **(5 Hours)**

Environmental Pollution: Definition, Causes, Effects, control measures and Prevention Acts for Air, Water, Soil, Noise, Thermal Pollutions and Nuclear Hazards. Solid Waste Management: Meaning, Causes, effects and control measures of urban and industrial wastes. Disaster Management: Meaning, Types of Disasters: floods, earthquake, cyclone and landslides. Environmental Ethics: Issues and possible solutions- Climate change, global warming, acid rain, ozone layer depletion, nuclear - accidents and holocaust. Consumerism and waste products, Public Awareness.

Unit V **(5 Hours)**

Social Issues and the Environment: From Unsustainable to Sustainable development- Urban problems related to energy- Water conservation, rain water harvesting, watershed management- Resettlement and rehabilitation of people; its problems and concerns.

Human Population and the Environment**:** Population growth and distribution- Population explosion – Family Welfare Programme-Environment and human health- HIV/AIDS- Role of Information Technology in Environment and human health- Medical transcription and bio-informatics.

REFERENCE BOOKS

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,
6. Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down to Earth, Centre for Science and Environment (R)
9. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev.,
10. Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
11. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural
12. History Society, Bombay (R)
13. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment,Cambridge Univ. Press 1140p.
14. Jadhav, H &Bhosale, V.M. 1995. Environmental Protection and Laws, Himalaya Pub. House, Delhi 284 p.
15. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
16. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
17. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
18. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
19. Rao M N. &Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ.Co. Pvt. Ltd. 345p.
20. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
21. Survey of the Environment, The Hindu (M)
22. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : V	23AMU05	PROGRAMMING IN JAVA	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
First	II	25	75	100

Preamble

To understand the basic programming constructs of Java Language.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Outline the basic concepts of Java Programming Language	K1
CO2	Explain the concepts of tokens, control structures and looping, arrays, applet programming and Exception handling	K2
CO3	Apply java programming for practical solutions	K3
CO4	Analyze wide range of Applications by using java programming	K4
CO5	Determine the usage of all given concepts in the development of programming solutions	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	1	3
CO3	9	9	9	9	1	1	3
CO4	9	9	9	9	1	1	3
CO5	9	9	3	3	1	1	3
Total Contribution of COs to POs	45	45	39	39	9	7	15
Weighted Percentage of COs Contribution to POs	2.68	2.87	2.58	2.86	0.95	0.75	1.79

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT I Fundamentals of Object-Oriented Programming (12 Hours)

BasicConcepts of Object-Oriented Programming–Benefits of Object-Oriented Programming – Application of Object-Oriented Programming. Java Evolution: Features –How Java differs from C and C++.Overview of Java: Simple Java Program –Structure –Java Tokens –Statements –Java Virtual Machine.

UNIT II Control Structures (12Hours)

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, Strings and Vectors (12Hours)

Arrays, Strings and Vectors –Interfaces: Multiple Inheritance –Packages: Putting Classes together –Multithreaded Programming.

UNIT IV Programming with JAVA (12Hours)

Applet Programming – Graphics Programming.

UNIT V Managing Input / Output Files in Java (12Hours)

Concepts of Streams-Stream Classes –Byte Stream Classes –Character Stream Classes –Using Streams –I/O Classes –File Class –I/O Exceptions -Creation of Files.

TEXT BOOK(S):

1.E. Balagurusamy, Programming with Java a Primer,3rd Edition, TMH.

REFERENCE BOOK(S):

1. Patrick Naughton &Hebert Schildt, The Complete Reference Java 2, 3rd Edition,TMH.
2. John R. Hubbard, Programming with Java, 2nd Edition, TMH.

WEB REFERENCES:

1. https://www.javatpoint.com/java-basics
2. https://www.w3schools.com/java/
3. https://www.softwaretestinghelp.com/java-basics-and-core-java-concepts/
4. https://www.iitk.ac.in/esc101/share/downloads/javanotes5.pdf
5. https://www.cp.eng.chula.ac.th/books/wp-content/uploads/sites/5/2018/01/java101.pdf

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : VI PRCATICAL : II	23AMU06	PROGRAMMING IN JAVA -PRACTICAL	48	4

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
First	II	40	60	100

Preamble

To understand the basic programming constructs of Java Language.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Outline the basic concepts of Java Programming Language	K1
CO2	Explain the concepts of Arrays and String	K2
CO3	Summarizes the concepts of Inheritance	K3
CO4	Demonstrate the interface and threads.	K4
CO5	Applying the java programming techniques in graphics and applets.	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	1	3
CO3	9	9	9	9	1	1	3
CO4	9	9	9	9	1	1	3
CO5	9	9	3	3	1	1	3
Total Contribution of COs to POs	45	45	39	39	9	7	15
Weighted Percentage of COs Contribution to POs	2.68	2.87	2.58	2.86	0.95	0.75	1.79

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation;9- High correlation between COs and POs.

Practical list

1. Design a Java Program to define a class, define instance methods for setting and retrieving values of instance variables and instantiate its object

2. Demonstrate a Java Program to demonstrate use of subclass

3. Create a Java Program to implement array of objects

4. Construct a Java program to practice using String class and its methods

5. Apply a Java program to practice using String Buffer class and its methods

6. Design a Java Program to implement multilevel inheritance by applying various access controls to its data members and methods

7. Generate a program to demonstrate use of implementing interfaces

8. Apply a program to Implementing Thread based applications

9. Create a program using Applet to display a message in the Applet

10. Design an applet program working with Colors and Fonts

11. Construct a program using Applet for configuring Applets by passing parameters

12. Design programs for using Graphics class
    - to display basic shapes and fill them
    - draw different items using basic shapes
    - set background and foreground colors

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART – III	CORE : VII PRACTICAL : III	23AMU07	INTERNET BASICS-PRACTICAL	48	2

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
First	II	40	60	100

Preamble

To learn about the operations of Internet.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Outline the basics concepts of Internet, Web Browsers	K1
CO2	Explain the usage of internet concepts and analyze its components	K2
CO3	Apply the online information resources	K3
CO4	Analyze and utilize the appropriate Google Apps for education effectively	K4
CO5	Evaluate and determine the usage of all online information resources	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyse; K5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	**9**	**9**	**9**	**9**	**9**	**9**	**9**
CO 2	**9**	**9**	**9**	**9**	**9**	**9**	**9**
CO 3	**9**	**9**	**9**	**9**	**9**	**9**	**9**
CO 4	**9**	**9**	**9**	**9**	**7**	7	**9**
CO 5	**9**	**9**	**9**	**9**	**9**	**3**	**3**
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**43**	**43**	**39**
Weighted Percentage of COs Contribution to POs	**2.68**	**2.87**	**2.98**	**3.30**	**4.54**	**4.58**	**4.67**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

PRACTICAL LIST

1. Create an email-id.
2. Compose and send a mail.
3. Forward a mail and to reply for a mail.
4. Send a mail with an attachment.
5. Download the attached document of a mail received.
6. Send a mail to a large number of recipients using cc and bcc options.
7. Search a thing using a search engine.
8. Open and read newspaper sites, TV programmes schedules using Internet.
9. Verify a university /college details by opening their websites.
10. Upload your resume with any one job portal.

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-IV	FOUNDATION : II	23FCU02	YOGA AND ETHICS	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
First	II	50	-	50

Course Objective

To enable the learners to acquire the knowledge on basic yogasanas and values and practice them in real life.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recollect the basic terminologies in yoga and value education	K1
CO2	Demonstrate the importance of yoga, mental exercises, principles of life and components of values.	K2
CO3	Apply the techniques of dynamic & mental exercises and philosophical values in real life	K3
CO4	Classify the different types of asanas, stages of mind, analysis of thought, ethical values and social values.	K4
CO5	Evaluate how the yoga and value education make a person strong both physically and mentally	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	3	1	1	3
CO2	9	9	9	3	3	1	3
CO3	9	9	9	3	3	3	3
CO4	9	9	9	3	3	3	3
CO5	9	9	9	3	3	3	3
Total Contribution of COs to POs	45	45	45	15	13	11	15
Weighted Percentage of COs Contribution to POs	2.68	2.87	2.98	1.10	1.37	1.17	1.79

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT I YOGA AND HEALTH (5 Hours)

Theory:

Yoga-Meaning- Importance of Yoga – Pancha Koshas - Benefits of Yoga-General Guidelines.

Practice:

Dynamic Exercise- Surya Namaskar-Basic Set of Asanas-Pranayama &Kriya.

UNIT II ART OF NURTURING THE MIND (5 Hours)

Theory:

Ten Stages of Mind-Mental Frequency – Methods for Concentration

Eradication of Worries- Benefits of Blessings- Greatness of Friendship- Individual Peace and World Peace

Practice: - Worksheet

UNIT III PHILOSOPHY AND PRINCIPLES OF LIFE (5 Hours)

Purpose and Philosophy of Life- Introspection – Analysis of Thought - Moralization of Desires-Neutralization of Anger.Vigilance and Anti- Corruption- Redressal mechanism - Urban planning and Administration.

Practice - Worksheet

UNIT IV VALUE EDUCATION (Part-I) (5 Hours)

Ethical Values: Meaning – Need and Significance- Types - Value education – Aim of education and value education.Components of value education: Individual values – Self discipline, Self Confidence, Self Initiative, Empathy, Compassion, Forgiveness, Honesty, Sacrifice, Sincerity, Self-control, Tolerance and Courage.

Practice - Worksheet

UNIT V VALUE EDUCATION (Part-II) (4 Hours)

Family Values -Constitutional or National values – Democracy, Socialism, Secularism, Equality, Justice, Liberty, Freedom and Fraternity.Social values – Pity and probity, self control, universal brotherhood.Professional values – Knowledge thirst, sincerity in profession, regularity, punctuality and faith.Religious values – Tolerance, wisdom, character.

Practice - Worksheet

REFERENCE BOOKS:

1 Vethathiri Maharishi (2015), 'Yoga for human excellence'- Sri Vethathiri Publications.

2. Value Education for human excellence- study material by Bharathiar University.

3. Value Education - Study Material by P.K.R Arts College for Women.

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : IX	23AMU09	PROGRAMMING IN PYTHON	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Second	III	25	75	100

Preamble

The Paper offers the understanding of basic principles in python and skills to create computer programs for small scale usage.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recall syntax and semantics of various programming constructs.	K1
CO2	Illustrate the process of structuring data using lists, tuples, and dictionaries	K2
CO3	Identify appropriate programming structure for a given problem.	K3
CO4	Convert an algorithm into a python program	K4
CO5	Infer the object oriented concepts in python	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	8	8	8	8	8	9	9
CO2	8	8	8	8	8	9	9
CO3	8	8	8	8	8	9	3
CO4	8	8	8	8	8	4	3
CO5	8	8	8	8	8	4	3
Total Contribution of COs to POs	40	40	40	40	40	35	27
Weighted Percentage of COs Contribution to POs	2.38	2.55	2.65	2.93	4.22	3.73	3.23

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT I Basics and Functions (12 Hours)

The way of the program: What is a program? - Running Python. - The first program.- Arithmetic operators - Values and types - Variables, expressions and statements: Assignment statements - Variable names - Expressions and statements - Script mode - Order of operations - String operations Comments – Debugging. Functions: Function calls - Math functions - Composition – Adding new functions – Definition and uses - Flow of execution - Parameters and arguments- Variables and parameters are local - Fruitful functions and void functions - Why functions?

UNIT II Conditionals, Recursion, Iteration, Strings (12 Hours)

Conditionals and Recursion: Floor division and modulus - Boolean expressions - Logical operators - Conditional execution - Alternative execution - Chained conditionals - Nested conditionals Recursion - Infinite recursion – Keyboard input. Fruitful functions: Return values Incremental development- Composition - Boolean functions. Iteration: Reassignment - Updating variables - The while statement - break - Square roots - Strings: String is a sequence - Traversal with a for loop - String slices - Strings are immutable - Searching - Looping and counting - String methods - The in operator - String comparison.

UNIT III Lists, Dictionaries, Tuples (12 Hours)

Lists: A list is a sequence - Lists are mutable - Traversing a list - List operations - List slices - List methods - Map, filter and reduce Deleting elements - Lists and strings Objects and values - Aliasing - List arguments - Dictionaries: A dictionary is a mapping Dictionary as a collection of counters - Looping and dictionaries - Reverse lookup Dictionaries and lists - Memos - Global variables. Tuples: Tuples are immutable - Tuple assignment - Tuples as return values - Variable length argument tuples - Lists and tuples . Dictionaries and tuples.

UNIT IV Files, Classes and Objects (12 Hours)

Files: Persistence - Reading and writing - Format operator - Filenames and paths - Catching exceptions - Databases - Pickling - Pipes - Writing modules – Classes and objects: Programmer -defined types . Attributes - Rectangles - Instances as return values - Objects are mutable Copying - Classes and Functions: Time - Pure functions - Modifiers - Prototyping versus planning.

UNIT V Classes and Methods (12 Hours)

Classes and methods: Object-oriented features - Printing objects - Another example - A more complicated example - The init method- The_str_method - Operator overloading - Type-based dispatch - Polymorphism - Interface and implementation - Inheritance: Card objects - Class attributes Comparing cards. Decks Printing the deck, add, remove, shuffle and sort - Inheritance - Class diagrams - Data encapsulation.

TEXT BOOK

1. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd Edition 2012, O’Reilly.

REFERENCE BOOKS

1. Kenneth A. Lambert, “Fundamentals of Python First Programs”, Second Edition
2. Rashi Gupta, “Makinf Use of Python”, Willey publishing Inc

WEB REFERENCES:

1. https://www.w3schools.com/python/python_intro.asp
2. https://www.geeksforgeeks.org/python-programming-language/
3. https://www.programiz.com/python-programmingg
4. https://www.geeksforgeeks.org/file-objects-python/
5. https://www.geeksforgeeks.org/python-classes-and-objects/

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : X PRACTICAL : IV	23AMU10	PROGRAMMING IN PYTHON - PRACTICAL	48	4

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
Second	III	40	60	100

Preamble

The Paper offers the understanding of basic principles in python and skills to create computer programs for small scale usage.

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the syntax and semantics of various programming constructs while writing simple programs	K1
CO2	Understand the basic programming concepts of python	K2
CO3	Organise data using lists, tuples, dictionaries and files and program using control structures, functions, class and objects	K3
CO4	Assume appropriate programming structure and data type to solve the given problem efficiently	K4
CO5	Interpret the given problem statement into a python program	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	8	8	8	8	8	9	9
CO2	8	8	8	8	8	9	9
CO3	8	8	8	8	8	9	3
CO4	8	8	8	8	8	4	3
CO5	8	8	8	8	8	4	3
Total Contribution of COs to POs	40	40	40	40	40	35	27
Weighted Percentage of COs Contribution to POs	2.38	2.55	2.65	2.93	4.22	3.73	3.23

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

Practical List

1. Write a Program to find prime numbers between 1 to n.

2. Construct a Program to print the decimal equivalents of 1/2, 1/3, 1/4,.....1/n. code

3. Design a Program to check given number is Armstrong or not.

4. Simulate a basic calculator using various arithmetic operators.

5. Compute GCD and LCM of two numbers using functions

6. Develop a program to accept a line of text and find the number of characters, number of vowels and number of blank spaces in it.

7. Demonstrate various List operations.

8. Write a Program to create a List and split it into two lists for odd and even numbers.

9. Design a Program to create a tuple and perform various slicing operations,

10. Build a Program to display the file contents and copy the file contents from one file to another.

11. Develop a Program to create a dictionary, add a key-value pair , change and retrieve the values based on the key.

12. Device a Program to implement class and object concepts.

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART: III	CORE : XI	23AMU11	Artificial Intelligence and Knowledge Representation	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Second	III	25	75	100

Preamble

The paper offers the understanding of how to create intelligent machines.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.	K1
CO2	Understanding the concepts of problem solving methods	K2
CO3	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.	K3
CO4	UnderstandingaboutthebasicconceptsofSoftwareagentsadrepresentationof knowledge	K4
CO5	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyse; K5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	9	9	9	9	8	7	9
CO 2	9	9	9	9	8	7	9
CO 3	9	9	9	9	8	7	9
CO 4	9	9	9	9	8	7	9
CO 5	9	9	9	9	8	7	9
Total Contribution of COs to POs	45	45	45	45	40	35	45
Weighted Percentage of COs Contribution to POs	2.68	2.87	2.98	3.30	4.22	3.73	5.38

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNITI **Introduction** **(12 Hours)**

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** **(12 Hours)**

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** **(12 Hours)**

Knowledge Representation – First Order Predicate Logic – Prolog Programming – Unification –Forward Chaining – Backward – Chaining – Resolution – Knowledge Representation – OntologicalEngineering–CategoriesandObjects–Events– MentalEventsandMentalObjects–Reasoning Systems for Categories–Reasoning with Default Information.

UNIT IV **Software Agents** **(12 Hours)**

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** **(12 Hours)**

AI Applications–LanguageModels–InformationRetrieval–InformationExtraction– NaturalLanguageProcessing–MachineTranslation–SpeechRecognition–Robot–Hardware– Perception –Planning-Moving.

TEXTBOOK(S)

1. S.RussellandP.Norvig,–Artificial Intelligence:AModernApproach‖,PrenticeHall,Third Edition, 2009.
2.I. Bratko,-Prolog:Programming for Artificial Intelligence,Fourth Edition,Addison-Wesley Educational Publishers Inc.,2011.

ReferenceBook(s)

1. M.TimJones, Artificial Intelligence:A Systems Approach(Computer Science),Jones and Bartlett Publishers Inc.; FirstEdition,2008
2. NilsJ.Nilsson,-TheQuestforArtificialIntelligence,CambridgeUniversityPress,2009.
3. DavidL. Poole and Alan K. Mackworth, - Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.

WEB REFERENCES:

1. **https://www.investopedia.com/terms/a/artificial-intelligence-ai.asp**
2. **https://www.javatpoint.com/problem-solving-techniques-in-ai**
3. **https://www.javatpoint.com/knowledge-representation-in-ai**
4. **https://youtu.be/bvrhcsQHRNo?si=nb6NYmPs2P6xdO-l**
5. **https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/artificial-intelligence-applications**

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART: III	CORE : XII ALLIED:III	23AMU12	INTERNET OF THINGS	48	3

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
Second	III	25	75	100

Preamble

This course gives an overview of the basic concepts of building an IoT system and its application in Industrial 4.0

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the general concepts of Internet of Things (IoT)	K1
CO2	Illustrate various IoT sensors and applications	K2
CO3	Apply design concepts to IoT solutions for Industrial 4.0	K3
CO4	Compare various IoT architectures	K4
CO5	Evaluate Design issues in IoT applications	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyse; K5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	**9**	**9**	**9**	**9**	**5**	**5**	**9**
CO 2	**9**	**9**	**9**	**9**	**5**	**5**	**9**
CO 3	**9**	**9**	**9**	**9**	**5**	**5**	**9**
CO 4	**9**	**9**	**9**	**9**	**5**	**5**	**9**
CO 5	**9**	**9**	**9**	**9**	**5**	**5**	**9**
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**25**	**25**	**45**
Weighted Percentage of COs Contribution to POs	**2.68**	**2.87**	**2.98**	**3.30**	**2.64**	**2.67**	**5.38**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT I **Fundamentals of IoT** **(12 Hours)**

Introduction – Characteristics - Physical Design - Protocols – Logical Design – Enabling Technologies – IoT Levels and deployment Templates

UNIT II **IoT Communication and Network Protocols** **(10 Hours)**

M2M -IoT Vs M2M – Software Defined Network and Network Function Virtualization - IoT Systems Management – Simple Network Management Protocol - NETCONF-YANG

UNIT III **IoT Design Methodology** **(10 Hours)**

IoT Design Methodology – Case study on IoT System for Home Automation –Weather Monitoring – Python in IoT

UNIT IV **Physical Devices and Endpoints** **(8 Hours)**

Basic Building blocks – Raspberry Pi- Interfaces – Programming with Raspberry Pi- IoT with Arduino-Connecting -Testing Sensors using Arduino sketch

UNIT V **IoT Cloud offerings and Case Studies** **(8 Hours)**

Cloud Storage Models and Communication APIs –WAMP- Xively Cloud- Amazon Web Services for IoT- Various Real Time Applications of IoT.- Industrial IoT.

TEXT BOOK(S):

1.Arshdeep Bahga, Vijay Madisetti, Internet of Things – A hands-on approach, Universities Press, 2015.

REFERENCE BOOK(S):

1.Marco Schwartz, Internet of Things with the Arduino Yun, Packt Publishing, 2014.
2.Adrian McEwen, Hakim Cassimally,Designing the Internet of Things, ISBN: 978-1-118-43062-0,Wiley,November 2013

WEB REFERENCES:

1.**https://www.oracle.com/in/internet-of-things/what-is-iot/**
2.**https://www.youtube.com/watch?v=uLbtexcw39Y**
3.**https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/**
4.**https://www.youtube.com/watch?v=h0gWfVCSGQQ**
5. **https://www.techtarget.com/iotagenda/definition/Industrial-Internet-of-Things-IIoT**

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-IV	ABILITY ENHANCEMENT : I	23AEU01	INFORMATION SECURITY	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
Second	III	50	-	50

Preamble

To learn about the basics of Information Security.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the fundamental concepts of Information Security, Risk and Security policies	K1
CO2	Discuss the concepts of Risks, vulnerabilities, ethical and privacy issues	K2
CO3	Apply the ideas in security planning and construct the policies	K3
CO4	Categorize the Privacy, Ethical Issues, Laws, Software Issues and Crimes	K4
CO5	Summarize Cryptography, cipher text and threats in information security	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	3	1	1
Total Contribution of COs to POs	45	45	45	45	27	16	19
Weighted Percentage of COs Contribution to POs	2.68	2.87	2.98	3.30	2.85	1.71	2.27

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT I Introduction to Information Security (5 Hours)

Information Security: Principles, Concepts and Definitions - The need for Information Security - Benefits of Information Security. The Security Problem in Computing: The Meaning of Computer Security - Computer Criminals.

UNIT II Information Risk (4 Hours)

Information Risk: Threats and Vulnerabilities of Information Systems – Introduction to Risk Management. Information Security Management Policy, Standards and Procedures.

UNIT III Security Planning (5 Hours)

Administering Security: Security Planning - Security Planning Team Members - Assuring Commitment to a Security Plan - Business Continuity Plan - Incident Response Plan - Organizational Security Policies, Physical Security.

UNIT IV Privacy and Ethical Issues in Information Security (5 Hours)

Legal Privacy and Ethical Issues in Information Security: Protecting Programs and Data - Information and the Law - Rights of Employees and Employers - Software Failures - Computer Crime - Ethical Issues in Information Security.

UNIT V Cryptography (5 Hours)

Cryptography: Introduction to Cryptography -What is Cryptography – Plain Text – Cipher Text – Substitution Ciphers - Transposition Ciphers.

TEXT BOOK(S):

1.Sumitra Kisan and D.ChandrasekharRao, Information Security Lecture Notes, Department of Computer Science and Engineering & Information Technology, Veer Surendra Sai University of Technology (Formerly UCE, Burla) Burla, Sambalpur, Odisha.

REFERENCE BOOK(S):

1.Andy Taylor (Editor), David Alexander, Amanda Finch & David Sutton, Information Security Management Principles An ISEB Certificate, The British ComputerSociety, 2008.

WEB REFERENCES:

1. https://www.imperva.com/learn/data-security/information-security-infosec/#:~:text=Information%20security%20protects%20sensitive%20information,financial%20data%20or%20intellectual%20property.
2. https://www.geeksforgeeks.org/what-is-information-security
3. https://www.techtarget.com/searchsecurity/definition/information-security-infosec
4. https://www.exabeam.com/information-security/information-security
5. https://www.sans.org/information-security

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-IV	NON - MAJOR ELECTIVE :I	23NMU01A	INDIAN WOMEN AND SOCIETY	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
Second	III	50	-	50

Preamble

To familiarize students with the specific cultural contexts of women in India

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Know women status in Indian society as an academic discipline	K1
CO2	Interpret the various roles of women, challenges and issues faced by them in the society	K2
CO3	Find out solutions to their legal issues and product themselves from the violence against women emphasize on women entrepreneurship for their empowerment	K3
CO4	Critically analyze the lifestyle and challenges of women	K4
CO5	Discuss the importance of women health and issues related to women in general	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	0	0	0
CO2	9	9	9	9	3	0	3
CO3	9	9	9	9	9	9	9
CO4	3	3	3	9	9	9	9
CO5	3	3	1	1	1	9	9
Total Contribution of COs to POs	33	33	31	37	22	27	30
Weighted Percentage of COs Contribution to POs	1.96	2.10	2.05	2.71	2.32	2.88	3.59

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT I Historical Background (5 Hours)

History of Women's status from Vedic times, Women's participation in India's Pre and Post Independence movement and Economic Independence, fundamental rights and importance of women in Modern Society

UNIT II Role of Women (Challenges & Remedies) (5 Hours)

Women in Family, Agriculture, Education, Business, Media, Defense, Research and Development, Sports, Civil Services, Banking Services, Social Work, Politics and Law

UNIT III Women and Health (5 Hours)

Women and health issues, Malnutrition, Factors leading to anemia, Reproductive maternal health and Infant mortality, Stress

UNIT IV Issues of Women (5 Hours)

Women's issues, Dowry Related Harassment and Dowry Deaths, Gender based violence against women, Sexual harassment, Loopholes in Practice to control women issues

UNIT V Women Empowerment (4 Hours)

Meaning, objectives, Problems and Issues of Women Empowerment, Factors leading to Women Empowerment, Role and Organization of National Commission for Women, Central and State Social Welfare Board for Women Empowerment, Reality of women empowerment in the era of globalization

REFERENCE BOOK(S)

S.No	Authors	Title	Publishers	Year of Publication
1	Mala Khullar	Writing the Women's Movement: A Reader	Zubaan	2005
2	IAWS	The State and the Women's Movement in India	IAWS, Delhi	1994
3	Kosambi,Meera	Crossing Thresholds: Feminist Essays in Social History	Permanent Black	2007
4	TRowbotham, Sheila	Hidden from History: Women's Oppression and the Fight against It	Pluto Press, London	1975
5	Susheela Mehta	Revolution and the Status of Women	Metropolitan Book co.pvt ltd, New Delhi	1989

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XIII	23AMU13	PROGRAMMING IN R	72	4

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Second	IV	25	75	100

Preamble

To expose the students the fundamental concepts of R Programming.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the importance of R Programming Languages	K1
CO2	Understand the basics in R programming in terms of constructs, control statements, String functions	K2
CO3	Understand the use of R for Big Data analytics	K3
CO4	Apply R programming for Text processing	K4
CO5	Appreciate and apply the R programming from a statistical perspective	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	8	4	9	5
CO2	9	9	9	8	4	9	5
CO3	9	9	9	8	4	9	5
CO4	9	9	9	8	4	9	5
CO5	9	9	9	8	4	9	5
Total Contribution of COs to POs	45	45	45	40	20	45	25
Weighted Percentage of COs Contribution to POs	2.68	2.87	2.98	2.93	2.11	4.80	2.99

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT I INTRODUCTION TO R (14 Hours)

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 – Victoriesed if-then else – Vector Element names.

UNIT II MATRICES (14 Hours)

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 (15 Hours)

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 (15 Hours)

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 (14 Hours)

Interfacing R to other languages – Parallel R – Basic Statistics – Linear Model – Generalized Linear models – Non-linear Models – Time Series and Auto-Correlation – Clustering

TEXT BOOK(S):

1. Norman Matloff,–TheArt of R Programming: A Tour of Statistical Software Design‖, No StarchPress,2011.
2. Jared P.Lander, –R for Everyone: Advanced Analytics and Graphics‖, Addison-Wesley Data &AnalyticsSeries,2013.

REFERENCE BOOK(S):

1. Mark Gardner, ―Beginning R – The Statistical Programming Language‖, Wiley, 2013.
2. Robert Knell, ―Introductory R: A Beginner‘s Guide to Data Visualisation, Statistical Analysis and programming in R‖, Amazon Digital South Asia Services Inc, 2013. Richard Cotton(2013). Learning R, O‘Reilly Media.
3. Garret Grolemund (2014). Hands-on Programming with R. O‘Reilly Media, Inc.
4. Roger D.Peng (2018). R Programming for Data Science. Lean Publishing.

WEB REFERENCES:

1. https://www.w3schools.com/r
2. https://www.programiz.com/r/matrix
3. https://www.javatpoint.com/r-tutorial
4. https://youtu.be/-qDiqnEVaLk?si=zRH9YTSBCshfa2Uq
5. https://youtu.be/hW7WD9DyDXs?si=J-5HCMSoD7tqXZmR

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XIV PRACTICAL : V	23AMU14	PROGRAMMING IN R - PRACTICAL	72	4

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Second	IV	40	60	100

Preamble

To expose the students the fundamental concepts of R Programming.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the importance of R Programming Languages	K1
CO2	Understand the basics in R programming in terms of constructs, control statements, String functions	K2
CO3	Understand the use of R for Big Data analytics	K3
CO4	Apply R programming for Text processing	K4
CO5	Appreciate and apply the R programming from a statistical perspective	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**8**	**4**	**9**	**5**
CO2	**9**	**9**	**9**	**8**	**4**	**9**	**5**
CO3	**9**	**9**	**9**	**8**	**4**	**9**	**5**
CO4	**9**	**9**	**9**	**8**	**4**	**9**	**5**
CO5	**9**	**9**	**9**	**8**	**4**	**9**	**5**
Total Contribution of COs to POs	**45**	**45**	**45**	**40**	**20**	**45**	**25**
Weighted Percentage of COs Contribution to POs	**2.68**	**2.87**	**2.98**	**2.93**	**2.11**	**4.80**	**2.99**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

Practical List

1. R Expressions and Data Structures
2. Manipulation of vectors and matrix
3. Operators on Factors in R
4. Data Frames in R
5. Lists and Operators
6. Working with looping statements.
7. Graphs in R
8. 3D plots in R

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XV ALLIED:IV	**23AMU15**	MACHINE LEARNING -BASICS	60	3

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Second	IV	25	75	100

Preamble

To explain about the basics of machine learning.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the importance of Machine Learning Basics	K1
CO2	Understanding of the fundamental issues and challenges of machine learning: data, Model selection, model complexity,etc	K2
CO3	Understanding of the strengths and weaknesses of many popular machine learning approaches.	K3
CO4	Explain about the concepts of computational learning theory and dimensionality reduction	K4
CO5	Appreciate the underlying mathematical relationships with in and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**3**	**3**
CO2	**9**	**9**	**9**	**3**	**3**	**3**	**3**
CO3	**9**	**9**	**9**	**3**	**3**	**1**	**3**
CO4	**9**	**9**	**9**	**1**	**1**	**2**	**3**
CO5	**9**	**9**	**9**	**1**	**0**	**2**	**3**
Total Contribution of COs to POs	**45**	**45**	**45**	**17**	**10**	**11**	**15**
Weighted Percentage of COs Contribution to POs	**2.68**	**2.87**	**2.98**	**1.25**	**1.06**	**1.17**	**1.79**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT I INTRODUCTION TO LEARNING (12 Hours)

Algorithmic models of learning, Learning classifiers, functions, relations, grammars, probabilistic models, value functions, behaviors and programs for experience. Bayesian, maximum some posterior, and minimum description length frameworks.

UNIT II ML- MODELS (12 Hours)

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 (12 Hours)

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 (12 Hours)

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 (12 Hours)

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.

TEXT BOOK(S):

1. Bishop,C.(2006).Pattern Recognition and Machine Learning. Berlin: Springer - Verlag.

REFERENCE BOOK(S):

1. Russel,S. and Norving, P.(2003).Artificial Intelligence:A ModernApproach.2nd Edition, NewYork:Prentice-Hall.
2. Baldi,P.,Frasconi,P.,Smyth,P.(2002).Bioinformatics:A Machine Learning Approach. Cambridge,MA:MITPress.
3. Baldi,P.,Frasconi,P.,Smyth,P.(2003).Modeling the Internet and the Web–Probabilistic Methods and Algorithms.NewYork:Wiley.
4. Bishop,C.M. Neural Networks for pattern recognition. NewYork: Oxford University press (1995).
5. Hastie,T.,Tibshirani,R.,and Friedman,J.(2001).The elements of Statistical Learning – Data mining, Inference, and Prediction, Berlin:Springer-Verlag.
6. Cohen,P.R.(1995)Empirical Methods in Artificial Intelligence.Cambridge,MA:MITPress.
7. Cowell,R.G.,Dawid,A.P., Lauritzen,S.L., and Spiegel halter.D.J.(1999). Graphical Models and Expert Systems. Berlin:Springer.

WEB REFERENCES:

1.https://www.simplilearn.com/tutorials/machine-learning-tutorial/introduction-to-machine-learning

2.https://towardsdatascience.com/all-machine-learning-models-explained-in-6-minutes-9fe30ff6776a

3. https://www.turing.com/kb/how-machine-learning-can-be-helpful-in-data-mining

4.https://intellipaat.com/blog/tutorial/machine-learning-tutorial/types-of-machine-learning/

5. https://intellipaat.com/blog/top-data-mining-applications/

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-IV	Skill Enhancement: I	23SEAMU01	CAPSTONE PROJECT WORK (Based on AI & Machine Learning)	36	2

Contact hours per week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
Second	IV	50	-	50

Pre-requisite:

- Students should have a good understanding of software engineering.
- Students should possess strong analytical skills.
- Strong coding skills in any one programming paper.

Preamble:

- 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.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Illustrate a real world problem and identify the list of project requirements	**K3**
CO2	Judge the features of the project including forms, databases and reports	**K5**
CO3	Based on the analysis and interpretation of the data collected, student will be able to arrive at logical conclusions and propose suitable recommendations on the project	**K6**
CO4	Designcodetomeettheinputrequirementsandtoachievetherequiredoutput	**K6**
CO5	Compose a project report incorporating the features of the project	**K6**

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	9	**9**	**9**	**9**
CO2	**9**	**9**	**9**	9	**9**	**9**	**9**
CO3	**9**	**9**	**9**	9	**9**	**9**	**9**
CO4	**9**	**9**	**9**	9	**9**	**9**	**9**
CO5	**9**	**9**	**9**	9	**9**	**9**	**9**
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**45**
Weighted Percentage of COs Contribution to POs	**2.68**	**2.87**	**2.98**	**3.30**	**4.75**	**4.80**	**5.38**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

Aim of the project work

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

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

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

Viva Voce

Viva-Voce will be conducted at the end of the semester only by the Internal Examiners, after duly verifying the Annexure Report available in the college, for a total of 50 marks.

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-IV	ABILITY ENHANCEMENT : II	23AEU02	CONSUMER RIGHTS	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
Second	IV	50	-	50

Preamble

This paper seeks to familiarize the students with their rights and responsibilities as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Memorize the procedure of redress of consumer complaints, and the role of different agencies in establishing product and service standards	K1
CO2	Explain the Consumer Protection Law in India	K2
CO3	Impart sound practical grounding about the practice of consumer law and the procedure Followed	K3
CO4	Evaluate the regulations and legal actions that helps to protect consumers	K4
CO5	Analyse the knowledge and skills needed for a career in this field	K5

K1 – Remember; K2 – Understand;K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	1	0	1
CO2	9	9	9	9	1	0	1
CO3	9	9	9	3	3	1	1
CO4	9	3	1	1	3	3	3
CO5	9	1	3	0	9	9	9
Total Contribution of COs to POs	45	31	31	22	17	13	15
Weighted Percentage of COs Contribution to POs	2.68	1.98	2.05	1.61	1.80	1.39	1.79

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT I Conceptual Framework (5 Hours)

Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology. Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000 suite.

UNIT II The Consumer Protection Law in India (5 Hours)

Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, and restrictive trade practice. Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, and National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

UNITIII Grievance Redressal Mechanism under the Indian Consumer Protection Law (5 Hours)

Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal; Offences and penalties. Leading Cases decided under Consumer Protection law by Supreme Court/National Commission: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

UNIT IV Role of Industry Regulators in Consumer Protection (5 Hours)

i. Banking: RBI and Banking Ombudsman
ii. Insurance: IRDA and Insurance Ombudsman
iii. Telecommunication: TRAI
iv. Food Products: FSSAI
v. Electricity Supply: Electricity Regulatory Commission
vi. Real Estate Regulatory Authority

UNIT V Contemporary Issues in Consumer Affairs (4 Hours)

Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings. Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview.

Note: Unit 2 and 3 refers to the Consumer Protection Act, 1986. Any change in law would be added appropriately after the new law is notified

Suggested Readings:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) *Consumer Affairs*, Universities Press.
2. Choudhary, Ram Naresh Prasad (2005). *Consumer Protection Law Provisions and Procedure,* Deep and Deep Publications Pvt Ltd.
3. G. Ganesan and M. Sumathy. (2012). *Globalisation and Consumerism: Issues and Challenges*, Regal Publications
4. Suresh Misra and SapnaChadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, New Delhi
5. Rajyalaxmi Rao (2012), *Consumer is King,* Universal Law Publishing Company
6. Girimaji, Pushpa (2002). *Consumer Right for Everyone* Penguin Books.
7. E-books :- www.consumereducation.in
8. Empowering Consumers e-book,
9. ebook, www.consumeraffairs.nic.in
10. *The Consumer Protection Act, 1986 and its later versions.* www.bis.org

Articles

1. Misra Suresh, (Aug 2017) "Is the Indian Consumer Protected? One India One People.
2. Raman Mittal, SonkarSumit and Parineet Kaur (2016) Regulating Unfair Trade Practices: An Analysis of the Past and Present Indian Legislative Models, Journal of Consumer Policy.
3. Chakravarthy, S. (2014). MRTP Act metamorphoses into Competition Act. CUTS Institute for Regulation and Competition position paper. Available online at www.cuts-international.org/doc01.doc.
4. Kapoor Sheetal (2013) "Banking and the Consumer" Akademos (ISSN 2231-0584)
5. Bhatt K. N., Misra Suresh and ChadahSapna (2010). Consumer, Consumerism and Consumer Protection, Abhijeet Publications.
6. Kapoor Sheetal (2010) "Advertising-An Essential Part of Consumer's Life-Its Legal and Ethical Aspects", Consumer Protection and Trade Practices Journal, October 2010.
7. Verma, D.P.S. (2002). Regulating Misleading Advertisements, Legal Provisions and Institutional Framework.Vikalpa.Vol. 26.No. 2. pp. 51-57.

Periodicals

1. Consumer Protection Judgments (CPJ) (Relevant cases reported in various issues)
2. Recent issues of magazines: International Journal on consumer law and practice, National Law School of India University, Bengaluru
3. '*Consumer Voice*', Published by VOICE Society, New Delhi.

Websites:

www.ncdrc.nic.in
www.consumeraffairs.nic.in
www.iso.org.
www.bis.org.in
www.consumereducation.in
www.consumervoice.in
www.fssai.gov.in
www.cercindia.org

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XVI	23AMU16	MACHINE LEARNING TECHNIQUES	72	5

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	25	75	100

Preamble:

To introduce students to the concepts and techniques of Machine Learning.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts and techniques of Machine Learning.	K1
CO2	Explain the regression methods, classification methods, clustering methods.	K2
CO3	Understand the inference and learning algorithms for the hidden Markov model.	K3
CO4	Demonstrate Dimensionality reduction Techniques	K4
CO5	Appreciatetheunderlyingmathematicalrelationshipswithinandacr ossMachine Learning algorithms and the paradigms of supervised and un-supervised learning.	K5

K1 – Remember; K2 – Understand; K3 – Apply;K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**5**	**9**	**5**
CO2	**9**	**9**	**9**	**9**	5	**9**	**5**
CO3	**9**	**9**	**9**	**9**	5	**9**	**5**
CO4	**9**	**9**	**9**	**9**	5	**9**	**5**
CO5	**9**	**9**	**9**	**9**	5	**9**	**5**
Total contribution of COs to POs	45	45	45	45	25	45	25
Weighted Percentage COs Contribution to POs	2.68	2.87	2.98	3.30	2.64	4.80	2.99

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT I: Introduction to Machine Learning (14 Hours)

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 theCandidateEliminationAlgorithm–LinearDiscriminants– Perceptron–LinearSeparability–Linear Regression.

UNIT II: Machine Learning Models (15 Hours)

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–RadialBasisFunctionsandSplines–Concepts– RBFNetwork–CurseofDimensionality–Interpolations and Basis Functions– Support Vector Machines.

UNIT III: Tree& Probabilistic Model (15 Hours)

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 (14 Hours)

Dimensionality Reduction and Evolutionary Models-Dimensionality Reduction–Linear Discriminant Analysis–Locally Linear Embedding–Iso map–Least Squares Optimization– Evolutionary Learning–Genetic Algorithms–Genetic Offspring–Genetic Operators–Using Genetic Algorithms–Reinforcements Learning–Overview–Getting Lost Example–Markov Decision Process.

UNIT V: Graphical Model (14 Hours)

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.

TEXT BOOK(S):

1. Ethem Alpaydin,- Introduction to Machine Learning3e (Adaptive Computation and Machine Learning Series),ThirdEdition,MITPress,2014.

REFERENCE BOOK(S):

1. Jason Bell,-Machine Learning–Hands on for Developers and Technical professionals, First Edition,Wiley,2014.
2. Peter Flach,-Machine Learning:The Art and Science of Algorithms that Make Sense of Data, First Edition,Cambridge UniversityPress,2012.

WEB REFERENCES:

1. https://www.geeksforgeeks.org/introduction-machine-learning/
2. https://www.javatpoint.com/machine-learning-models
3. https://youtu.be/f_0d6ybv16c?feature=shared
4. https://towardsdatascience.com/introduction-to-evolutionary-algorithms-a8594b484ac
5. https://jonathan-hui.medium.com/machine-learning-graphical-model-b68b0c27a749

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XVII PRACTICAL : VI	23AMU17	MACHINE LEARNING - PRACTICAL	72	4

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	40	60	100

Preamble:

To introduce students to the concepts and techniques of Machine Learning.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Gain knowledge about basic concepts of Machine Learning.	K1
CO2	Identify machine learning techniques suitable for a given problem	K2
CO3	Apply suitable machine learning techniques for various applications.	K3
CO4	Compare various supervised and unsupervised learning algorithms	K4
CO5	Assess strengths and weaknesses of popular machine learning approaches.	K5

K1 – Remember; K2 – Understand; K3 – Apply;K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**5**	**9**	**5**
CO2	**9**	**9**	**9**	**9**	**5**	**9**	**5**
CO3	**9**	**9**	**9**	**9**	**5**	**9**	**5**
CO4	**9**	**9**	**9**	**9**	**5**	**9**	**5**
CO5	**9**	**9**	**9**	**9**	**5**	**9**	**5**
Total contribution of COs to POs	45	45	45	45	25	45	25
Weighted Percentage COs Contribution to POs	2.68	2.87	2.98	3.30	2.64	4.80	2.99

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

Practical List

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

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

3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

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.

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.

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XVIII	23AMU18	PROJECT WORK	72	-

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Third	**V**	**-**	**-**	**-**

Preamble

To expose the students to practice themselves and find solution the problems in the respective area.

Course Outcomes

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

CO NUMBER	CO Statement	Knowledge Level
CO1	Remember the thrust areas of project	K1
CO2	Demonstrate the problem pertaining to the domain	K2
CO3	Apply various algorithms in their relevant field	K3
CO4	Explore the real time applications	K4
CO5	Evaluate demographic variables and factors influencing software development	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyse; K5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	9	9	9	9	9	9	9
CO 2	9	9	9	9	9	9	9
CO 3	9	9	9	9	9	9	9
CO 4	9	9	9	9	9	9	9
CO 5	9	9	9	9	9	9	9
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**45**
Weighted Percentage of COs Contribution to POs	2.68	2.87	2.98	3.30	4.75	4.80	5.38

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs. As per UGC Notification

****Viva-Voce will be conducted in the ESE (VI Semester)**

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XIX ELECTIVE : I	23AMU19A	DEEP LEARNING	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	25	75	100

Preamble

To introduce students to the basic concepts and techniques of deep Learning.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the importance of Deep Learning Basics	K1
CO2	Understand the basic concepts and techniques of Deep Learning	K2
CO3	To understand and apply the Machine learning principles	K3
CO4	To study the deep learning architectures	K4
CO5	Explore and create deep learning applications with tensor flow	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**4**	**3**	**2**
CO2	**9**	**9**	**9**	**9**	**4**	**3**	**2**
CO3	**9**	**9**	**9**	**9**	**4**	**2**	**2**
CO4	**9**	**9**	**9**	**9**	**4**	**2**	**2**
CO5	**3**	**9**	**9**	**9**	**4**	**2**	**2**
Total Contribution of COs to POs	39	45	45	45	20	12	10
Weighted Percentage of COs Contribution to POs	2.32	2.87	2.98	3.30	2.11	1.28	1.20

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT I INTRODUCTION TO LEARNING (12 Hours)

The Neural Network – Limits of Traditional Computing – Machine Learning – Neuron – FF Neural Networks – Types of Neurons – Softmax output layers

UNIT II DEEP LEARNING MODELS (12 Hours)

Tensor flow – Variables – Operations – Placeholders – Sessions – Sharing Variables – Graphs – Visualization.

UNIT III CNN (12 Hours)

Convolution Neural Network – Feature Selection – Max Pooling – Filters and Feature Maps – Convolution Layer –Applications.

UNIT IV RNN (12 Hours)

Recurrent Neural Network – Memory cells – sequence analysis – word2vec- LSTM — Memory augmented Neural Networks – NTM—Application

UNIT V REINFORCEMENT LEARNING (12 Hours)

Reinforcement Learning – MDP – Q Learning – Applications

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 Good fellow, Yoshua Bengio, Aaron Courville, ‖Deep Learning (Adaptive computation and Machine Learning series‖, MIT Press, 2017.

WEB REFERENCES:

1. **https://www.geeksforgeeks.org/deep-learning-tutorial/**
2. **https://www.analyticsvidhya.com/blog/2021/05/a-comprehensive-tutorial-on-deep-learning-part-1/**
3. **https://www.javatpoint.com/reinforcement-learning**
4. **https://www.analyticsvidhya.com/blog/2021/02/introduction-to-reinforcement-learning-for-beginners/**
5. **https://www.geeksforgeeks.org/what-is-reinforcement-learning/**

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XIX ELECTIVE : I	23AMU19B	BUSINESS DATA ANALYTICS	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	25	75	100

Preamble

To introduce the fundamental concepts of Business data analytics and associated methodologies

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand and critically apply the concepts and methods of business analytics	K1
CO2	Demonstration the various methodologies of descriptive statistics	K2
CO3	Understanding of modeling uncertainty and statistical inference	K3
CO4	Understanding of analytical frameworks.	K4
CO5	Understanding of Social and collaboration Networks	K5

K1 – Remember;K2 – Understand;K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**4**	**3**	**2**
CO2	**9**	**9**	**9**	**9**	**4**	**3**	**2**
CO3	**9**	**9**	**9**	**9**	**4**	**2**	**2**
CO4	**9**	**9**	**9**	**9**	**4**	**2**	**2**
CO5	**3**	**9**	**9**	**9**	**4**	**2**	**2**
Total Contribution of COs to POs	39	45	45	45	20	12	10
Weighted Percentage of COs Contribution to POs	2.32	2.87	2.98	3.30	2.11	1.28	1.20

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT

UNIT I OVERVIEWOFBUSINESS ANALYTICS (12 Hours)

Introduction – Drivers for Business Analytics – Applications of Business Analytics: Marketing and Sales, Human Resource, Healthcare, Product Design, Service Design, Customer Service and Support –Skills Required for a Business Analyst–Frame work for Business Analytics Life Cycle for Business Analytics Process.

UNIT II ESSENTIALSOFBUSINESSANALYTICS (12 Hours)

Descriptive Statistics – Using Data – Types of Data – Data Distribution Metrics: Frequency, Mean, Median, Mode, Range, Variance, Standard Deviation, Percentile, Quartile, z-Score, Covariance, Correlation–Data Visualization: Tables, Charts, Line Charts, Bar and Column Chart, Bubble Chart, Heat Map–Data Dash boards.

UNIT III MODELINGUNCERTAINTYANDSTATISTICALINFERENCE (12 Hours)

Modeling Uncertainty: Events and Probabilities – Conditional Probability – Random Variables –Discrete Probability Distributions – Continuous Probability Distribution – Statistical Inference: DataSampling–SelectingaSample–PointEstimation–SamplingDistributions–IntervalEstimation–HypothesisTesting.

UNIT IV ANALYTICSUSING HADOOPAND MAPREDUCEFRAMEWORK **(12 Hours)**

Introducing Hadoop – RDBMS versus Hadoop – Hadoop Overview – HDFS (Hadoop Distributed File System) – Processing Data with Hadoop – Introduction to Map Reduce – Features of Map Reduce –AlgorithmsUsingMap-Reduce:Matrix-VectorMultiplication,RelationalAlgebraOperations,
Grouping and Aggregation–Extensions to Map Reduce.

UNIT V OTHERDATAANALYTICALFRAMEWORKS (12 Hours)

Overview of Application development Languages for Hadoop – Pig Latin – Hive – Hive Query Language(HQL)–Introduction to Pentaho, JAQL– Introduction to Apache: Sqoop, Drill and Spark, Cloudera Impala–Introduction to No SQL Databases– Hbase and Mongo DB.

TEXT BOOK(S):

1. Vignesh Prajapati, ‑Big Data Analytics with R and Hadoop‖, Packt Publishing, 2013.
2.Umesh R Hodeghatta, Umesha Nayak,‑Business Analytics Using R– A Practical Approach‖, A press,2017.

REFERENCE BOOK(S):

1. Anand Rajaraman, Jeffrey David Ullman, ‑Mining of Massive Datasets‖, Cambridge University Press, 2012.
2. JeffreyD. Camm, JamesJ.Cochran, MichaelJ. Fry, JeffreyW.Ohlmann, DavidR. Anderson ‑Essentials of Business Analytics‖, 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 Business Analytics‖, Springer, 2012 7. Rui Miguel Forte, ‑Mastering Predictive Analytics with R‖,Packt Publication,2015.

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1. https://www.oracle.com/in/business-analytics/what-is-business-analytics//
2. https://www.simplilearn.com/r-programming-language-business-analytics-quick-guide-article
3. https://www.tutorialspoint.com/business_analysis/index.htm
4. https://www.tutorialspoint.com/big_data_analytics/index.htm
5. https://www.analyticssteps.com/blogs/9-techniques-used-business-analytics-framework

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XIX ELECTIVE : I	23AMU19C	SOFTWARE AGENTS	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	25	75	100

Preamble

To explain the fundamentals of agents and agent programming paradigms and explain about agents and security

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understanding the fundamentals of agents and agent programming paradigms.	K1
CO2	Discussing the basics of java agents.	K2
CO3	Learning the concepts of multi valent systems.	K3
CO4	Understanding the concepts of intelligent software agents.	K4
CO5	Understanding the agents and security.	K5

K1 – Remember;K2 – Understand;K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**4**	**3**	**2**
CO2	**9**	**9**	**9**	**9**	**4**	**3**	**2**
CO3	**9**	**9**	**9**	**9**	**4**	**2**	**2**
CO4	**9**	**9**	**9**	**9**	**4**	**2**	**2**
CO5	**3**	**9**	**9**	**9**	**4**	**2**	**2**
Total Contribution of COs to POs	39	45	45	45	20	12	10
Weighted Percentage of COs Contribution to POs	2.32	2.87	2.98	3.30	2.11	1.28	1.20

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT

UNIT I (13 Hours) **AGENTS–OVERVIEW** **(12 Hours)**

Agent Definition–Agent Programming Paradigms–Agent Vs Object–Aglet–Mobile Agents–Agent Frameworks–Agent Reasoning

UNIT II (14 Hours) **JAVAAGENTS** **(12 Hours)**

Processes–Threads–Daemons–Components–JavaBeans–ActiveX–Sockets–RPCs–Distributed Computing–Aglets Programming–Jini Architecture–Actors and Agents–Typed and Proactive Messages

UNIT III **MULTIAGENT SYSTEM** **(12 Hours)**

Interaction between Agents–Reactive Agents–Cognitive Agents–Interaction Protocols–Agent Coordination–Agent negotiation–Agent Cooperation–Agent Organization–Self-Interested Agents in Electronic Commerce Applications

UNIT IV **INTELLIGENTSOFTWAREAGENTS** **(12 Hours)**

Interface Agents–Agent Communication Languages–Agent Knowledge Representation–Agent Adaptability–Belief Desire Intension–Mobile Agent Applications

UNIT V **AGENTS AND SECURITY** **(12 Hours)**

Agent Security Issues– Mobile Agents Security–Protecting Agents against Malicious Hosts–Untrusted Agent – Black Box Security–Authentication for Agents–Security Issues for Aglets

TEXT BOOK(S):

1. Bigus&Bigus,―ConstructingIntelligentagentswithJava‖,Wiley,2010.
2. Bradshaw,–Software Agents‖,MITPress,2012.

REFERENCE BOOK(S):

1. Russel & Norvig, –Artificial Intelligence a modern approach‖, Prentice Hall, 1994.
2. Richard Murchand Tony Johnson, –Intelligent Software Agents‖, Prentice Hall, 2000.
3. Michael Wooldridge,–An Introduction to Multi Agent Systems‖, John Wiley, 2002.

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1. https://www.sce.carleton.ca/netmanage/docs/AgentsOverview/ao.html
2. https://www.aiforanyone.org/glossary/multi-agent-system
3. https://www.techtarget.com/searchenterpriseai/definition/agent-intelligent-agent
4. https://www.turing.ac.uk/research/interest-groups/multi-agent-systems
5. https://www.paloaltonetworks.com/cyberpedia/what-is-the-difference-between-agent-based-and-agentless-security

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XX OPEN ELECTIVE		INTERNET FOR EVERYONE	48	2

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	25	75	100

Preamble

This paper provides an insight of formal introduction to internet, WWW, Finding Information in the Internet and awareness on Internet Security and Privacy, illustrate the Possibilities of Social Networking. Learning discussion forum software, Effective use of video conferencing, Blogging& Making Money in the Internet.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Outline the basic concept of the Internet, World Wide Web and Web browsers	K1
CO2	Explain the Knowledge of Finding Information in the Internet and awareness on Internet Security and Privacy	K2
CO3	Apply tips for effective use of Email, Advantages and Disadvantages of Email	K3
CO4	Analyze the Possibilities of Social Networking, Learning discussion forum software & effective use of video conferencing	K4
CO5	Evaluate the learn Blogging & Making Money in the Internet	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	1
CO2	9	9	9	3	3	3	1
CO3	9	9	3	3	3	1	1
CO4	9	3	3	1	1	0	1
CO5	3	3	3	1	0	0	1
Total Contribution of COs to POs	39	33	27	17	10	7	5
Weighted Percentage of COs Contribution to POs	2.32	2.10	1.79	1.25	1.06	0.75	0.60

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT I Introduction to Internet, WWW & Web Browsers (10 Hours)

What is Internet? - How does Internet Work? - What is Special about the Internet? - What is WWW? - Internet and Web - How does the web works? - What are web browsers? - Types of Browsers - Web Browsing Tips.

UNIT II Searching the Web, Safety & Privacy (10 Hours)

Information Sources - Finding Information on the internet - Searching the Web - Search Engines - Making Your Search- Improving Your Searching - Tips for Internet Research- Privacy - Anonymity - Understanding Security and Privacy.

UNIT III EMAIL (10 Hours)

Introduction - How E-mail works? - Why use E-mail? - E-mail Names and Addresses - Mailing Basics - How Private is the e-mail?- Email Ethics - Spamming - E-mail Advantages and Disadvantages - Tips for effective E-mail use - E-mail Safety tips.

UNIT IV Social Networking and Discussion Forums (8 Hours)

Introduction - Social Networking Timeline - Why Social Networking? - Dangers of Social Networking?-Discussion Forums - Discussion Forum Software - Internet Telephony - Video Conferencing.

UNIT V Making Money On the Internet And Blogging (10 Hours)

What is a Blog? - Why Blog? - Why is Blogging so Popular? - Blog Search Engines and Communities - Blogs and Employment - Pitfalls to avoid while Blogging. Introduction - Writing Product Reviews - Sharing Your Knowledge - Advertising - Affiliate programs - Selling - Online Tutoring.

TEXT BOOK(S):

1. Alexis Leon, Mathews Leon , INTERNET FOR EVERYONE ,Vikas Publishing Housing Pvt Ltd , 15th Anniversary Edition

REFERENCE BOOK(S):

1. Keiko Pitter, Sara Amato,John Callahan, Niger Kerr, Eric Tilton, Robert Minato,Tata McGraw-Hill Edition 2003
2. Peter Weverka, The Everyday Internet All-in-One Desk Reference for Dummies,Wiley Publishing Inc, 3rd Edition

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1. **https://www.tutorialspoint.com/computer_concepts/computer_concepts_introduction_to_internet_www_web_browsers.htm**
2. **https://www.tutorialspoint.com/internet_technologies/e_mail_overview.htm**
3. **https://geekflare.com/make-money-with-blogging/**
4. **https://www.britannica.com/technology/social-network**
5. **https://www.geeksforgeeks.org/working-of-email/**

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XX OPEN ELECTIVE		BASICS OF COMPUTER TECHNOLOGY	48	2

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	25	75	100

Preamble

To learn about the basics of Computer Technology

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the basics of Computer	K1
CO2	Illustrate the concepts of data communication and Computer networks	K2
CO3	Ultilize Middle ware and Gateways	K3
CO4	Analyze the concepts of Mobile Computing	K4
CO5	Examine the DBMS Architecture	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	1
CO2	9	9	9	3	3	3	1
CO3	9	9	3	3	3	1	1
CO4	9	3	3	1	1	0	1
CO5	3	3	3	1	0	0	1
Total Contribution of COs to POs	39	33	27	17	10	7	5
Weighted Percentage of COs Contribution to POs	2.32	2.10	1.79	1.25	1.06	0.75	0.60

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT I Computer Basics (9 Hours)

Introduction-Generations of Computers-Classification of Computers- Central Processing Unit-Communication among Various Units-Memory Hierarchy-RAM-ROM-Secondary Storage Devices-Operating System: Introduction- Definition-Types.

UNIT II Data Communication and Computer Networks (10 Hours)

Introduction- Data Communication- Transmission Media- Multiplexing- Switching. Computer Network: Types of Computer Networks- Network Topologies- Communication Protocol. Internet: Introduction-Basic Internet Terms- Internet Applications-Search Engines.

UNIT III Database Fundamentals (9 Hours)

Introduction-Definition-Logical Data Concepts-Physical Data Concepts-Database Management System-DBMS Architecture-Types of Databases.SQL: Introduction-Getting Started with SQL.

UNIT IV Mobile Computing (10 Hours)

Wireless The beginning –Mobile Computing –Dialogue Control-–Networks –Middleware and Gateways –Application and Services-Developing Mobile Computer Applications –Security in Mobile Computing–Architecture for Mobile Computing-Mobile Computing through Telephone-– IVR Applications.

UNIT V Cloud Computing (10 Hours)

Introduction- From- Collaboration to cloud- Working of cloud computing-Pros and Cons-Benefits- Developing cloud computing services- Cloud service development-Discovering cloud services-Collaborating on schedules-Collaborating on calendars-Evaluating web conference tools- Creating groups on social networks- Understanding cloud storage-Evaluating on line file storage.

TEXT BOOK(S):

1. Alexis Leon ,MathewsLeon, Introduction to Information Technology, 2nd Edition, ITL Limited ITL Education Solutions Limited, Publisher(s): Pearson Education India,ISBN: 9789332525146
2. Asoke K Talukder , Roopa R Yavagal,Mobile Computing, TMH, 2005
3. Anthony T. Velte, "Cloud Computing- A Practical Approach", Tata McGraw Hill Education Private Limited, 1st Edition (2013).

REFERENCE BOOK(S):

1. Alexis Leon ,Mathews Leon,Fundamentals of Information Technology, ITL Limited
2. KumkumGarg,Mobile Computing, Pearson Education, 2010.
3. Michael Miller, Cloud Computing, Pearson Education, New Delhi, First Edition, 2013

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1. https://mrcet.com/pdf/Lab%20Manuals/IT/R15A0529_CloudComputing_Notes-converted.pdf
2. https://mjginfologs.com/mobile-computing-architecture/
3. https://www.guru99.com/dbms-architecture.html
4. https://www.tutorialspoint.com/data_communication_computer_network/index.htm
5. https://www.tutorialspoint.com/basics_of_computers/basics_of_computers_introduction.htm

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XX OPEN ELECTIVE		MACHINE LEARNING	48	2

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	25	75	100

Preamble

To provide an in-depth knowledge about machine learning concepts, techniques, models, and algorithms.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Remember the Machine Learning Fundamentals	K1
CO2	Understanding the machine learning concepts	K2
CO3	Summarize the impact of machine learning applications	K3
CO4	Analyze machine learning support to business goals	K4
CO5	Evaluate the knowledge of machine skills	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	1
CO2	9	9	9	3	3	3	1
CO3	9	9	3	3	3	1	1
CO4	9	3	3	1	1	0	1
CO5	3	3	3	1	0	0	1
Total Contribution of COs to POs	39	33	27	17	10	7	5
Weighted Percentage of COs Contribution to POs	2.32	2.10	1.79	1.25	1.06	0.75	0.60

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT I Overview of Machine learning (10 Hours)

Understanding Machine Learning- What Is Machine Learning?- Defining Big Data- Big Data in Context with Machine Learning- The Need to Understand and Trust your Data- The Importance of the Hybrid Cloud- Leveraging the Power of Machine Learning- The Roles of Statistics and Data Mining with machine learning- Putting Machine Learning in Context- Approaches to Machine Learning.

UNIT II Machine Learning Techniques (9 Hours)

Getting Started with a Strategy- Understanding Machine Learning Techniques- Tying Machine Learning Methods to Outcomes- Applying Machine Learning to Business Needs.

UNIT III Machine Learning on Applications (9 Hours)

Looking Inside Machine Learning- The Impact of Machine Learning on Applications- Data Preparation- The Machine Learning Cycle.

UNIT IV Getting Started with Machine Learning (10 Hours)

Getting Started with Machine Learning- Understanding How Machine Learning Can Help- Focus on the Business Problem- Machine Learning Requires Collaboration- Executing a Pilot Project- Determining the Best Learning Model.

UNIT V Learning Machine Skills (10 Hours)

Learning Machine Skills- Defining the Skills That You Need- Getting Educated- Using Machine Learning to Provide Solutions to Business Problems- Applying Machine Learning to Patient Health- Leveraging IoT to Create More Predictable Outcomes- Proactively Responding to IT Issues- Protecting Against Fraud- Ten Predictions on the Future of Machine Learning.

TEXT BOOK(S):

1.Judith Hurwitz and Daniel Kirsch, Machine Learning for dummies, IBM Limited Edition,2018

REFERENCE BOOK(S):

1.Ethem Alpaydin, Introduction to Machine Learning, Second Edition, The MIT Press Cambridge, Massachusetts London, England

WEB REFERENCES:

1. https://www.geeksforgeeks.org/introduction-machine-learning/
2. https://www.javatpoint.com/machine-learning-techniques
3. https://www.javatpoint.com/applications-of-machine-learning
4. https://www.geeksforgeeks.org/getting-started-machine-learning/
5. https://www.coursera.org/articles/machine-learning-skills

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XX OPEN ELECTIVE		ADVANCED EXCEL - PRACTICAL	48	2

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	40	60	100

Preamble

To provide skills and knowledge which will allow the attendee to Learn MS Excel tools and techniques

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Use a range of lookup and reference functions.	K1
CO2	Modify Excel options.	K2
CO3	Customise the formatting of charts in Excel.	K3
CO4	Create and use labels and names in a workbook.	K4
CO5	Group cells and use outlines to manipulate the worksheet	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	1
CO2	9	9	9	3	3	3	1
CO3	9	9	3	3	3	1	1
CO4	9	3	3	1	1	0	1
CO5	3	3	3	1	0	0	1
Total Contribution of COs to POs	39	33	27	17	10	7	5
Weighted Percentage of COs Contribution to POs	2.32	2.10	1.79	1.25	1.06	0.75	0.60

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

Microsoft Excel

1. Find out the Total, minimum , maximum and average values using the formula in the given table

First Name	Last Name	Hours	Rate	Gross Pay	Tax	Net Pay	Superannuation
Virginia	Bernard	16	25.90	414.40	82.88	331.52	33.15
Catherine	Harvest	24	16.40	393.60	78.72	314.88	31.49
Steve	Jones	40	28.50	1,140.00	228.00	912.00	91.20
Sam	McGregor	40	25.70	1,028.00	205.60	822.40	82.24
Sandra	O'Shea	35	29.60	1,036.00	207.20	828.80	82.88
Eddie	Smith	40	28.50	1,140.00	228.00	912.00	91.20

2. Prepare a bar chart using the below table

2	**Sales**				
3		**Week 1**	**Week 2**	**Week 3**	**Week 4**
4					
5	**Monday**	296,114	565,042	429,746	123,445
6	**Tuesday**	70,500	78,967	85,889	117,015
7	**Wednesday**	520,830	360,389	244,488	110,585
8	**Thursday**	83,296	520,242	82,467	112,728
9	**Friday**	520,140	83,333	87,611	119,158
10		**1,490,880**	**1,607,973**	**930,201**	**582,931**

3. Write down the formula to concatenate the data in two different cells into a single cell

Example:

4. Enter the student details as Reg.No, Name, Age, Marks for 3 subject and display the count of the students whose avg>=60

5. Find out the week No and day of the given table using date function

Current Date	Week No	Day of the year
5/3/2018		
5/23/2021		
2/23/2022		
5/23/2010		
5/23/2008		
12/27/2021		

6. Create a workbook with the following details

Emp. No	Name	Basic Salary	House Rent	Conv. Allowance	Medical Allowance	Gross	Tax	Net
1	ABC	8000						
2	XYZ	3500						
3	KLM	8900						
4	WXY	4500						
5	MNO	6500						
6	PQR	4000						
7	STU	7800						
Total Salary								

Find out the following details

i) Calculate House Rent (if Basic Salary is greater than 5000 then 45% otherwise 30%)
ii) Calculate Conv. Allowance (if Basic Salary is greater than 5000 then 30% otherwise 20%)
iii) Calculate Medical Allowance (if Basic Salary is greater than 5000 then 60% otherwise 45%)
iv) Calculate Gross Pay, Net Pay

7. From the above given table find

i) Calculate Tax (if Gross is greater than 15000 then 10% otherwise 0)
ii) Calculate total salary of those employees whose salary is less than 5000
iii) Count no. of employees who are not giving tax

8. Create a workbook with the following details

Reg. ID	Name	Quizes (10)	Mid-Terms		Mids (Total) (30)	Assignment (10)	Project + Pres (10)	Final (40)	Total (100)	Grade
			M1	M2						
101	ABC	10	13	8		9	10	35		
201	XYZ	9	12	12		8	9	32		
301	KLM	7	15	15		7	8	28		
401	WXY	8	13	13		9	7	31		
501	MNO	9	10	12		10	5	36		
601	PQR	8	7	2		9	9	30		
701	STU	6	2	12		8	7	21		
							No. of D's		No. of F's	

Find out the following

i) Calculate Mid-Total, Total
ii) Calculate Grade using If condition
iii) Calculate no. of D (below 60 and above 40) and F(below 40) grades

9. Find out the following details from the given table
   a) Find out the city, departure time and terminal of Flight No. LH 5842 using vlookup formula
   b) Find out the no. of flights coming on terminal 2 using formula.

flight-Nr	city	departure	terminal	gate
EW 730	Bremen	14:50	T1	164
6E 235	Dortmund	16:00	T1	170
KL 1874	Amsterdam	16:00	T2	146
AF 2009	Paris	16:15	T1	114
LH 299	Berlin	16:20	T2	162
LH 5860	Madrid	16:25	T1	164
LH 5842	Barcelona	16:30	T1	166
LH 1369	München	17:00	T2	131
LH 5966	London	17:10	T1	161

10. Create a google sheet with the following details
   i) Subtract both A and B series, then find the ABSOLUTE value in the next column.
   ii) Share the sheet with your friend

Series A	Series B
10	8
6	8
7	9
5	8

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-IV	SKILL ENHANCEMENT : II	23SEU02	LIFE SKILLS	36	2

Contact hours per week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	50	-	50

Preamble

To inculcate both personal and professional skills in the students in the areas of understanding of self and others, interpersonal skills, high performance teams, leadership potential, communication & presentation skills, techniques of problem solving, decision making, fostering creativity and innovation for personal and professional excellence, stress management, time management and conflict management and inculcation of human values.

Course Outcome:

After completion of the course, the learners will be able to:

CO	Course Outcome	Knowledge Level
CO1	Identify the common communication problems, what good communication skills are and what they can do to improve their abilities	K1
CO2	Demonstrate communication through the digital media	K2
CO3	Prepare themselves to situations as an individual and as a team.	K3
CO4	Analyse various leadership models, strengths and abilities to create their leadership vision	K4
CO5	Appraise their potential as human beings and conduct themselves properly in the ways of the world.	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	3	9	3	1	3	3	1
CO 2	1	9	3	1	3	9	1
CO 3	1	3	3	3	9	3	3
CO 4	1	3	3	3	9	9	3
CO 5	1	3	3	1	3	1	9
Total Contribution of COs to POs	7	27	15	9	27	25	17
Weighted Percentage of COs Contribution to POs	0.42	1.72	0.99	0.66	2.85	2.67	2.03

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT I **(7 Hours)**

Communication Skills**:** Listening, Speaking, Reading, Writing and different modes of writing

UNIT II **(7 Hours)**

Digital Communication and Presentation Skills**:** Digital Literacy, Effective use of Social Media, Non-verbal communication, Presentation Skills

UNIT III **(7 Hours)**

Team Skills: Trust and Collaboration, Listening as a Team Skill, Brainstorming, Social and Cultural Etiquettes, Internal Communication

UNIT IV **(7 Hours)**

Leadership and Management Skills**:** Leadership Skills, Managerial Skills, Entrepreneurial Skills, Innovative Leadership and Design Thinking

UNIT V **(8 Hours)**

Universal Human Values: Ethics and Integrity, Love & Compassion, Truth, Non-Violence, Righteousness, Peace, Service, Renunciation (Sacrifice)

TEXT BOOK(S):

1. Sen Madhucchanda (2010), An Introduction to Critical Thinking, Pearson, Delhi
2. Silvia P. J. (2007), How to Read a Lot, American Psychological Association, Washington DC
3. Sinek S. (2009). Start with Why: How Great Leaders Inspire Everyone to Take Action. Penguin
4. Kelly T., Kelly D. (2014). Creative Confidence: Unleashing the Creative Potential Within Us

REFERENCE BOOK(S):

1. Elkington, J., &Hartigan, P. (2008). The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World. Harvard Business Press

WEB REFERENCES:

1. Developing Soft Skills and Personality https://www.youtube.com/playlist?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
2. Course on Leadership - https://nptel.ac.in/courses/122105021/9

3. Martin, R. (2007). How Successful Leaders Think. *Harvard Business Review*, *85*(6): 60.
4. Fries, K. (2019). 8 Essential Qualities That Define Great Leadership. *Forbes*. Retrieved 2019-02-15
5. How to Build Your Creative Confidence, Ted Talk by David Kelly - https://www.ted.com/talks/david_kelley_how_to_build_your_creative_confidence

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-V	PROFICIENCY ENHANCEMENT	23PEAMU01	ETHICAL HACKING (Self Study)	-	2

Contact hours per week:-0

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	-	100	100

Preamble

To introduce the concepts of security and different kinds of attacks, system hacking and penetration testing.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the importance of security and various types of attacks	K1
CO2	Understand the concepts of scanning and system hacking	K2
CO3	Explain about penetration testing and its methodology	K3
CO4	To study the ethical hacking techniques	K4
CO5	Identify the various programming languages used by security professional	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**3**	**1**
CO2	**9**	**9**	**9**	**3**	**3**	**3**	**1**
CO3	**9**	**9**	**3**	**3**	**3**	**1**	**1**
CO4	**9**	**3**	**3**	**1**	**1**	**0**	**1**
CO5	**3**	**3**	**3**	**1**	**0**	**0**	**1**
Total Contribution of COs to POs	**39**	**33**	**27**	**17**	**10**	**7**	**5**
Weighted Percentage of COs Contribution to POs	2.32	2.10	1.79	1.25	1.06	0.75	0.60

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT:

UNIT I **Introduction to Hacking**

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

UNIT II **Scanning and Enumeration**

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

UNIT III **System Hacking**

Introduction–Cracking Passwords– Password Cracking Websites– Password Guessing– Password Cracking Tools– Password Cracking Counter measures– Escalating Privileges– Executing Applications– Key loggers and Spyware.

UNIT IV **Programming for Security Professionals**

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**

Introduction–Security Assessments–Types of Penetration Testing-Phases of Penetration Testing– Tools–Choosing Different Types of Pen-Test Tools–Penetration Testing Tools.

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 Back man, James E. Corley,‑Hands-On Ethical Hacking And Network Defense‖,Cengage Learning,2013.

REFERENCE BOOK(S):

1. PatrickEngebretson,‑TheBasicsof HackingandPenetration Testing –Ethical Hacking and PenetrationTesting MadeEasy‖,SecondEdition,Elsevier,2013.

2. RafayBoloch, ‑Ethical Hackingand Penetration TestingGuide‖, CRC Press,2014

1. **WEB REFERENCES:**

1. https://www.tutorialspoint.com/ethical_hacking/index.htm
2. https://www.edureka.co/blog/ethical-hacking-tutorial/
3. https://www.geeksforgeeks.org/ethical-hacking-tutorial/
4. https://www.eccouncil.org/cybersecurity-exchange/ethical-hacking/system-hacking-definition-types-processes/
5. https://youtu.be/PoFvCdmlibM

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XXI	**23AMU20**	NATURAL LANGUAGE PROCESSING	72	5

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	25	75	100

Preamble

To introduce the fundamental concepts and techniques of natural language processing(NLP).

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental concepts and techniques of Natural Language Processing (NLP).	K1
CO2	Understanding of the models and algorithms in the field of NLP.	K2
CO3	Demonstrate the computational properties of natural languages and the commonly used algorithms for processing linguistic information.	K3
CO4	Understanding semantics and pragmatics of languages for processing	K4
CO5	Determine the Knowledge of secure software installation and testing	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**3**	**2**
CO2	**9**	**9**	**9**	4	**3**	**3**	**2**
CO3	**9**	**9**	**3**	**4**	**3**	**1**	**2**
CO4	**9**	**3**	**3**	**4**	**1**	**0**	**2**
CO5	**3**	**3**	**3**	**4**	**1**	**0**	**2**
Total Contribution of COs to POs	**39**	**33**	**27**	**25**	**11**	**7**	**10**
Weighted Percentage of COs Contribution to POs	**2.32**	**2.10**	**1.79**	**1.83**	**1.16**	**0.75**	**1.20**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT I **Introduction to NLP** **(14 Hours)**

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

UNIT II **Lexical Level** **(14 Hours)**

Lexical level: error tolerant lexical processing (spelling error correction)-transducers for the design of morphologic analyzers features-towards syntax:part-of-speech tagging (BRILL,HMM)-efficient representations for linguistic resources (lexica, grammars,….)tries and finite state automata.

UNIT III **Syntactic Level** **(15 Hours)**

Syntacticlevel:grammars(eg.formal/Chomskyhierarchy,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 tree banks-efficient parsing for context-free grammars(CFGs)-statistical parsing and probabilistic CFGs(PCFGs)-lexicalized PCFGs.

UNIT IV **Semantic Level** **(15 Hours)**

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 sematic parsing

UNIT V **Pragmatic Level** **(14 Hours)**

Pragmatic level: knowledge representation-reasoning-plan/goalrecognition–speechacts/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 – name identity recognition and relation extraction – IE using sequence labeling-machine translation: basic issues in MT-statistical translation-word alignment-phrase-based translation and synchronous grammars.

TEXT BOOK(S):

1. Daniel Jand JamesH.Martin, ‖speech and language processing ‖an introduction to natural language processing, computational linguistics & speech recognition ‖prenticehall,2009.

REFERENCE BOOK(S):

1. Lan H Written and Elbef, MarkA. Hall, ‖data mining: practical machine learning tools and techniques,MorganKaufmann,2013

WEB REFERENCES:

1. **https://www.deeplearning.ai/resources/natural-language-processing/**
2. **https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP**
3. **https://en.wikipedia.org/wiki/Natural_language_processing**
4. **https://www.geeksforgeeks.org/understanding-semantic-analysis-nlp/**
5. **https://www.codingninjas.com/studio/library/pragmatics-in-nlp**

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XXII PRACTICAL : VII	**23AMU21**	NATURAL LANGUAGE PROCESSING-PRACTICAL	72	4

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	40	60	100

Preamble

To introduce the fundamental concepts and techniques of Natural Language Processing (NLP)

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understandthefundamentalconceptsandtechniquesofnaturallanguageprocessing (NLP)	**K1**
CO2	Understanding of the models and algorithms in the field of NLP.	**K2**
CO3	Demonstrate the computational properties of natural languages and the commonly used algorithms for processing linguistic information.	**K3**
CO4	Understanding semantics and pragmatics of languages for processing	**K4**
CO5	Understanding the Sentiment and Semantic Analysis	**K5**

K1 – Remember; K2 – Understand; K3 – Apply; K4 –Analyse; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**3**	**2**
CO2	**9**	**9**	**9**	4	**3**	**3**	**2**
CO3	**9**	**9**	**3**	**4**	**3**	**1**	**2**
CO4	**9**	**3**	**3**	**4**	**1**	**0**	**2**
CO5	**3**	**3**	**3**	**4**	**1**	**0**	**2**
Total Contribution of COs to POs	**39**	**33**	**27**	**25**	**11**	**7**	**10**
Weighted Percentage of COs Contribution to POs	2.32	2.10	1.79	1.83	1.16	0.75	1.20

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

PRACTICAL LIST

1. Implementing word similarity
2. Implementing simple problems related to word disambiguation
3. Simple demonstration of part of speech tagging
4. Lexical analyzer.
5. Semantic Analyzer
6. Sentiment Analysis

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE:XVIII	23AMU18	PROJECT WORK	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	20	80	100

Preamble

To expose the students to practice themselves and find solution the problems in the respective area.

Course Outcomes

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

CO NUMBER	CO Statement	Knowledge Level
CO1	Remember the thrust areas of project	K1
CO2	Demonstrate the problem pertaining to the domain	K2
CO3	Apply various algorithms in their relevant field	K3
CO4	Explore the real time applications	K4
CO5	Evaluate demographic variables and factors influencing software development	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyse; K5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	9	9	9	9	9	9	9
CO 2	9	9	9	9	9	9	9
CO 3	9	9	9	9	9	9	9
CO 4	9	9	9	9	9	9	9
CO 5	9	9	9	9	9	9	9
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**45**
Weighted Percentage of COs Contribution to POs	2.68	2.87	2.98	3.30	4.75	4.80	5.38

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs. As per UGC Notification

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XXIV ELECTIVE : II	23AMU22A	ARTIFICIAL NEURAL NETWORKS AND FUZZY SYSTEMS	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	25	75	100

Preamble

- To introduce the concepts of artificial neural networks and fuzzy systems'
- To explain the basic mathematical elements of the theory of fuzzy sets.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the concepts of neural networks and ,fuzzy logic	K1
CO2	Understanding of the basic mathematical elements of the theory of fuzzy sets.	K2
CO3	Understanding the differences and similarities between fuzzy sets and classical sets theories	K3
CO4	Solve problems that are appropriately solved by neural networks and fuzzy logic	K4
CO5	Determine the usage of Neural networks, Fuzzy logics, and Genetic algorithms	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	9
CO4	9	9	9	9	9	9	9
CO5	9	9	9	9	9	9	9
Total Contribution of COs to POs	45	45	45	45	45	45	45
Weighted Percentage of COs Contribution to POs	2.68	2.87	2.98	3.30	4.75	4.80	5.38

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT I Introduction (12 Hours)

Basic concepts-single layer perceptron-Multi layer perceptron-Adaline-Madaline-Learning rules-Supervised learning-Backpropagation networks-Training algorithm, Advanced algorithms-Adaptive network-Radial basis network modular network-Applications

UNIT II Learning (12 Hours)

Introduction-unsupervised learning-Competitive learning networks-Kohonen self organizing networks-Learning vector quantisation - Hebbian learning – Hopfield network-Content addressable nature, Binary Hopfield network, Continuous Hopfield network Travelling Salesperson problem-Adaptive resonance theory–Bidirectional Associative Memory-Principle component Analysis

UNIT III Fuzzy Sets (12 Hours)

Introduction–crisp sets an overview–the notion of fuzzy sets–Basicconceptsoffuzzysets–classicallogicanoverview–Fuzzylogic.Operationsonfuzzysets-fuzzycomplement–fuzzyunion–fuzzyintersection –combinations of operations–general aggregation operations

UNIT IV Relations (12 Hours)

Crisp and fuzzy relations–binary relations–binary relationsonasingleset–equivalenceandsimilarityrelations–Compatibility or tolerance relations–orderings–Membership functions–methods of generation – defuzzification methods

UNIT V Tree Learning (12 Hours)

Adaptive Neuro Fuzzy based inference systems – classification and regression trees: decision tress, 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.

TEXT BOOK(S):

1. Neuro Fuzzy and Soft computing‖, JangJ.S.R.,Sun C.T and Mizutani E–Pearson education,2004..
2. Fundamentals of Neural Networks‖, Laurene Fauseett,PrenticeHallIndia,NewDelhi,1994.

REFERENCE BOOK(S):

1. FuzzyLogicEngineeringApplications‖, TimothyJ.Ross,McGraw Hill,NewYork,1997.
2. Fuzzy Sets and Fuzzy Logic‖,GeorgeJ.KlirandBoYuan,Prentice HallInc.,New Jersey,1995
3. Neural networks, Fuzzy logics, and Genetic algorithms‖, S.Rajasekar anand G.A.Vijayalakshmi Pai Prentice Hall of India,2003

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1. https://en.wikipedia.org/wiki/Artificial_neural_network
2. https://www.geeksforgeeks.org/artificial-neural-networks-and-its-applications/
3. https://en.wikipedia.org/wiki/Fuzzy_set
4. https://codecrucks.com/fuzzy-relation-definition-types-and-operations/
5. https://en.wikipedia.org/wiki/Decision_tree_learning

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XXIV ELECTIVE : II	23AMU22B	WEB APPLICATION SECURITY	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	25	75	100

Preamble

- To introduce the concepts of security in web applications
- To explain about crime prevention and routine duties in a police station

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Illustrate about the concept to HTML, DHTML, CSS and Java Script.	K1
CO2	Explain the history, characteristics, technologies, concepts, usage in web2.0 and web3.0	K2
CO3	Apply the core concepts of web applications to create web pages	K3
CO4	Apply the concepts of server-side programming	K4
CO5	Evaluate the requirements of web2.0 in education, philanthropy, social work.	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	9
CO4	9	9	9	9	9	9	9
CO5	9	9	9	9	9	9	9
Total Contribution of COs to POs	45	45	45	45	45	45	45
Weighted Percentage of COs Contribution to POs	2.68	2.87	2.98	3.30	4.75	4.80	5.38

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I Introduction to Web (12 Hours)

Data with URL- HTML - DHTML: Cascading Style Sheets, Common Gateway Interface: Programming CG! Scripts-HTML Forms-:-Custom Database Query Scripts-Server Side Includes-Server _security issues.

UNIT II XHTML (12 Hours)

XHTML: Introduction, CSS-Scripting languages-Java Script: Control statements, Functions, Arrays, Objects-DOM- Aiax enable rich internet applications

UNIT III Server Side Programming (12 Hours)

ServersideProgramming-Activeserverpages-Javaserverpages-JavaServlets:Servletcontainer-Exceptions-SessionsandSessionTracking_-UsingServletcontext-DynamicContentGeneration-ServletChainingandCommunications.

UNIT IV HTML5 (12 Hours)

HTML review, Feature detection, TheHTML5new Elements, Canvas, Video and audio, Web storage, Geolocation, Offline Webpages, Microdata, HTML5APLS, Migrating from HTML4 to HTML5, CSS3

UNIT V WEB2.0 (12 Hours)

WEB 2.0-HISTORY, characteristics, technologies, concepts, usage, web2.0 in education, philanthropy, social work. Web3.0- 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)

TEXT BOOK(S):

1. Deitel, Deitel and Neita,-Internet and World Wide Web-How to programll, Pearson Education ,4th Edition, 2009..
2. Elliotte Rusty Herold, -Java Network ProgrammingII, O'Reilly Publications, 3rdEdition,2004.

REFERENCE BOOK(S):

1. Jeffy D wight, Michael Erwin and Robert Nikes-USINGCGIII, PH.I Publications,1997
2. Jason Hunter, William Crawford-Java Servlet Programming O'Reilly Publications,2nd Edition, 2001
3. EricLadd and JimO'Donnell,etal,-USING HTML4, XML, andJAVA1.2, Prentice Hall, 2003
4. Jeremy Keith,-Html5 for web designers

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1. **https://www.studytonight.com/servlet/introduction-to-web.php**
2. **https://en.wikipedia.org/wiki/XHTML**
3. **https://developer.mozilla.org/en-US/docs/Learn/Server-side/First_steps/Introduction**
4. **https://en.wikipedia.org/wiki/HTML5**
5. **https://www.investopedia.com/terms/w/web-20.asp**

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XXIV ELECTIVE : II	23AMU22C	FUNDAMENTALS OF ROBOTICS	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	25	75	100

Preamble

To introduce the basic concepts of robotics and its characteristics

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Describe the different physical forms of robot architectures.	K1
CO2	Explain about the actuators and characteristics of actuating system	K2
CO3	Demonstrate to mathematically describe a kinematic robot system.	K3
CO4	Analyze manipulation and navigation problems using knowledge of coordinate frames, kinematics, optimization, control, and uncertainty.	K4
CO5	To know the various applications of robots that used today and future	K5

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**9**	**9**	**9**
CO2	**9**	**9**	**9**	**9**	**9**	**9**	**9**
CO3	**9**	**9**	**9**	**9**	**9**	**9**	**9**
CO4	**9**	**9**	**9**	**9**	**9**	**9**	**9**
CO5	**9**	**9**	**9**	**9**	**9**	**9**	**9**
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**45**
Weighted Percentage of COs Contribution to POs	2.68	2.87	2.98	3.30	4.75	4.80	5.38

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT I Introduction to Robotics (12 Hours)

Introduction to Robotics: Classification, Components, Characteristics, Applications.

UNIT II Robotics Kinematics (12 Hours)

Robotics Kinematics: Position Analysis, Robots as Mechanisms, Matrix Representation, Transformation Matrices, Forward and Inverse Kinematics.

UNIT III Actuators (12 Hours)

Actuators: Characteristics of Actuating Systems, Actuating Devices and Control.

UNIT IV Sensors (12 Hours)

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 Applications of Robots (12Hours)

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

TEXTBOOK(S)

1. SaeedB. Niku, Introduction to Robotics Analysis, Application, Pearson EducationAsia,2001

REFERENCE BOOK(S)

1. S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education., 2009.
2. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012.
3. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning., 2009.

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Robotics
2. https://www.toptal.com/robotics/programming-a-robot-an-introductory-tutorial
3. https://www.brainkart.com/article/Fundamentals-of-Robot_5118/
4. https://en.wikipedia.org/wiki/Sensor
5. https://instrumentationtools.com/applications-of-robots-in-various-fields/

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XXV ELECTIVE : III	23AMU23A	EMBEDDED SYSTEMS	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	25	75	100

Preamble

To understand the secure software development life cycle
To explain about the secure coding techniques

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand hardware and software design requirements of embedded systems.	K1
CO2	Explain about the architecture of microprocessor and operating systems in embedded systems	K2
CO3	Apply the concept of Semaphores with Semaphore Problems	K3
CO4	Analyze the embedded systems' specification and develop software programs	K4
CO5	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

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**4**	**4**
CO2	**9**	**9**	**9**	**9**	**3**	**4**	**4**
CO3	**9**	**9**	**9**	**9**	**3**	**4**	**4**
CO4	**9**	**9**	**9**	**9**	**3**	**3**	**4**
CO5	**9**	**9**	**9**	**9**	**3**	**3**	**4**
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**15**	**18**	**20**
Weighted Percentage of COs Contribution to POs	**2.68**	**2.87**	**2.98**	**3.30**	**1.58**	**1.92**	**2.39**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT I Introduction to Embedded System (12 Hours)

Examples of Embedded Systems–Typical Hardware–Memory–Microprocessors–Busses–Direct Memory Access– Introduction to 8051Microcontroller–Architecture-Instruction set – Programming

UNIT II Microprocessor (12 Hours)

Microprocessor Architecture–Interrupt Basics–The Shared-Data problem–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 (12 Hours)

Tasks and Task States–Tasks and Data–Semaphores and Shared Data–Semaphore Problems–Semaphore variants.

UNIT IV Message Queues & RTOS (12 Hours)

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 (12 Hours)

Host and Target Machines–Linker/ Locator for Embedded Software-Getting Embedded Software in to the Target System. Testing on your Host Machine – Instruction Set Simulators–Laboratory Tools used for Debugging

TEXT BOOK(S):

1. The8051Microcontroller Architecture, Programming & Applications, KennethJ. Ayala,Penram International.
2. An Embedded Software Primer,DavidE.Simon,PearsonEducation,2005.

REFERENCE BOOK(S):

1. Embedded Systems: Architecture, Programming and Design, Raj Kamal, Tata McGraw-HillEducation,2008

WEB REFRENCES:

1. https://www.slac.stanford.edu/exp/npa/xilinx/est_rm.pdf
2. https://realtimelogic.com/articles/Embedded-Web-Server-Tutorials
3. https://en.wikipedia.org/wiki/Semaphore_(programming)
4. https://ptolemy.berkeley.edu/books/leeseshia/releases/LeeSeshia_DigitalV2_2.pdf
5.https://www.dauniv.ac.in/public/frontassets/coursematerial/embeddedsystems/Chap_15Lesson01Emsys3EIntegratedTestsAtHostsystem.pdf

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XXV ELECTIVE : III	23AMU23B	PRINCIPLES OF SECURE CODING	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	25	75	100

Preamble

To understand the secure software development life cycle and explain about the secure coding techniques

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Explain about the secure software development life cycle	K1
CO2	Understand the secure coding techniques	K2
CO3	Demonstrate the threat modeling process and benefits	K3
CO4	Explain about the database and web specific issues	K4
CO5	Understanding about the Security code overview, secure software installation	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**4**	**4**
CO2	**9**	**9**	**9**	**9**	**3**	**4**	**4**
CO3	**9**	**9**	**9**	**9**	**3**	**4**	**4**
CO4	**9**	**9**	**9**	**9**	**3**	**3**	**4**
CO5	**9**	**9**	**9**	**9**	**3**	**3**	**4**
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**15**	**18**	**20**
Weighted Percentage of COs Contribution to POs	**2.68**	**2.87**	**2.98**	**3.30**	**1.58**	**1.92**	**2.39**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT I **Introduction to Security** **(12 Hours)**

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-BestPracticesSD3(Secure by design, default and deployment), Security principles and Secure Product Development Timeline

UNIT II **Threat modeling process and its benefits** **(12 Hours)**

Threat modeling 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** **(12 Hours)**

Secure Coding Techniques: Protection against DoS attacks, Application Failure Attacks, CPU Starvation Attacks, Insecure Coding Practices in Java Technology. ARP 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 Pro police. Socket Security, Avoiding Server Hijacking, Securing RPC.

UNIT IV **Database and Web- specific issues** **(12 Hours)**

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 Inter process Communication, Securing Signal Handlers and File Operations. XSS scripting attack and its types-Persistent and Non persistent attack XSS Counter measures and By passing the XSS Filters.

UNIT V **Testing Secure Applications** **(12 Hours)**

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**.

TEXT BOOK(S):

1. Writing Secure Code, Michael Howard and David LeBlanc, Microsoft Press, 2nd Edition, 2004

REFERENCE BOOK(S):

1. Programming PHP, Rasmus Lerdorfand Levin Tatroe,O_Reilly,2002.
2. Core Python Programming, WesleyJ.Chun, PrenticeHall,2001
3. Perl: The Complete Reference,2nd Edn, MartinC. Brown,TMH, 2009
4. MySQL:The Complete Reference,2nd Edn,VikramVaswani,TMH,2009

WEB REFERENCES:

1. https://vulcan.io/blog/secure-sdlc-best-practices/
2. https://docs.oracle.com/en/operating-systems/oracle-linux/6/security/ol_desprinsc_sec.html
3. https://codesigningstore.com/secure-coding-practices-to-implement
4. https://www.cs.uct.ac.za/mit_notes/database/htmls/chp17.html
5. https://www.breachlock.com/resources/blog/types-of-application-security-testing/

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-III	CORE : XXV ELECTIVE : III	23AMU23C	OPEN SOURCE SOFTWARE	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	25	75	100

Preamble

To understand the Open Source Technology.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Remember the basics of Open Source Software & Linux	K1
CO2	Demonstrate the concepts of Android	K2
CO3	Utilize the syntax of PHP Language	K3
CO4	Analyze an insight on MYSQL Database	K4
CO5	Assess General introduction on Open Source Grid Computing	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze;K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	**9**	**3**	**4**	**4**
CO2	**9**	**9**	**9**	**9**	**3**	**4**	**4**
CO3	**9**	**9**	**9**	**9**	**3**	**4**	**4**
CO4	**9**	**9**	**9**	**9**	**3**	**3**	**4**
CO5	**9**	**9**	**9**	**9**	**3**	**3**	**4**
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**15**	**18**	**20**
Weighted Percentage of COs Contribution to POs	**2.68**	**2.87**	**2.98**	**3.30**	**1.58**	**1.92**	**2.39**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I **Introduction to OSS & Linux Basics** **(12 Hours)**

Introduction – Need for Open Source Applications – Advantages – Disadvantages – History – Free Software Foundation and Open Source Initiative Presentation – Security and Reliabiliy – Economical Aspects – Applications of Open Source Software. Linux Basics – Introduction – Kernel/User Mode- Process – Advanced Concepts Scheduling

UNITII **Android** **(12 Hours)**

Introduction – Open Source Android Platform – History-Android Architecture – Android Versions- Dalvik Virtual Machines - Characteristics –Installing Eclipse ADT Plug-in and Android DSK Packages – Android Virtual Device or Emulator – File System Hierarchy – Android sample apps.

UNIT III **PHP Basics** **(12 Hours)**

Introduction – Identifiers, Variables, Constants, Data Types, Operators – Statements, Loops – Advanced PHP – Get and Post Methods – Arrays in PHP –Object Oriented Concepts– Strings– File Handling and Data Storage

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UNIT IV **My SQL Database** **(12 Hours)**

Introduction – Setting up an Environment –Starting, Terminating and Writing Your Own SQL Programs – Record Selection Technology – Working with String Functions, Date and Time – Sorting Query Results – Using Sequences – PHP and MYSQL Database.

UNIT V **Open Source Grid Computing &Open Source Cloud** **(12 Hours)**

Introduction – Open Grid Service Architecture – Open Grid Service Infrastructure – Web Service Resource Framework – OGSA Basic Services – Security Issues. Introduction – FOSS Cloud Software Environments – Eucalyptus – Open Nebula – Open Stack.

TEXT BOOK(S):

1. M.N. Rao, Fundamentals of Open Source software, PHI Learning Private Limited,2015.

REFERENCE BOOK(S):

1. Dr. Dayanand Ambawade, Dr. Deven Shah & DT Editorial Services, Linux Labs and Open Source Tcchnologiesn, dreamtech press,2015

WEB RERERENCES:

1. **https://en.wikipedia.org/wiki/Open-source_software**
2. **https://web.stanford.edu/class/cs231m/lectures/lecture-2-android-dev.pdf**
3. **https://www.w3schools.com/php/php_mysql_intro.asp**
4. **https://www.tutorialspoint.com/php/php_and_mysql.htm**
5. **https://computingforgeeks.com/top-open-source-cloud-platforms-and-solutions/?expand_article=1**

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART-IV	Skill Enhancement: III	23SEAMU03	CAPSTONE PROJECT WORK (Based on AI & Machine Learning)	36	2

Contact hours per week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	50	-	50

Pre-requisite:

- Students should have a good understanding of software engineering
- Student should possess strong analytical skills
- Strong coding skills in any one programming paper

Preamble:

- 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.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Illustrate a real world problem and identify the list of project requirements	**K3**
CO2	Judge the features of the project including forms, databases and reports	**K5**
CO3	Based on the analysis and interpretation of the data collected, student will be able to arrive at logical conclusions and propose suitable recommendations on the project	**K6**
CO4	Designcodetomeettheinputrequirementsandtoachievetherequiredoutput	**K6**
CO5	Compose a project report incorporating the features of the project	**K6**

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**9**	**9**	**9**	9	**9**	**9**	**9**
CO2	**9**	**9**	**9**	9	**9**	**9**	**9**
CO3	**9**	**9**	**9**	9	**9**	**9**	**9**
CO4	**9**	**9**	**9**	9	**9**	**9**	**9**
CO5	**9**	**9**	**9**	9	**9**	**9**	**9**
Total Contribution of COs to POs	**45**	**45**	**45**	**45**	**45**	**45**	**45**
Weighted Percentage of COs Contribution to POs	**2.68**	**2.87**	**2.98**	**3.30**	**4.75**	**4.80**	**5.38**

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

Aim of the project work
1.The aim of the project work is to acquire practical knowledge on the implementation of the programming concepts studied. 2. Each student should carry out individually one project work and it may be a work using the software packages that they have learned or the implementation of concepts from the papers studied or implementation of any innovative idea focusing on application-oriented concepts. 3. The project work should be compulsorily done in the college only under the supervision of the department staff concerned. **Viva Voce** Viva-Voce will be conducted at the end of the semester only by the Internal Examiners, after duly verifying the Annexure Report available in the college, for a total of 50 marks.