

A.V.V.M. Sri Pushpam College (Autonomous), Poondi – 613 503

PG & Research Department of Computer Science

M.Sc. Computer Science

OUTCOME BASED EDUCATION - CHOICE BASED CREDIT SYSTEM

SCHEME OF PROGRAMME AND SYLLABUS

(For the candidates admitted from 2023-2024 onwards)

Vision and Mission of the college

Vision

To provide quality academic programmes and value oriented higher education to the rural community, equip them to encounter current regional, national and global demands upholding moral standards and intellectual competency.

Mission

- To provide conducive environment for quality teaching-learning process and innovative research.
- To bestow substantial educational experience that is intellectually, socially, and personally transformative.
- To strive to bring out the latent potentiality and core competency of the learners
- To foster the culture of research-based learning, independent academic inquiry by encouraging the students to involve in research activities ranging from hands on training, student projects, publications etc.,
- To nurture essential skills, competent minds and compassionate hearts.
- To impart a practical, demanding and overall development of the personality generated by love, consideration and care for the society.
- To serve the society by extending needful outreach programmes to the rural populace.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

- Make the learners realise the transformative power of education.
- Acquire profound disciplinary, applied, integrative knowledge and intellectual competency and domain specific and generic skills.
- Pursue lifelong learning and generate innovative solutions for the problems at individual and social level.
- Create a collaborative and inclusive environment, and serve the betterment of the society with moral integrity.
- Motivate to become a committed professional with necessary ethics as a leader as well as a team player.

PROGRAMME OUTCOMES AND PROGRAM SPECIFIC OUTCOMES for M.Sc Programme

TANSICHE REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR POSTGRADUATE EDUCATION	
Programme	M.Sc., Computer Science
Programme Code	
Duration	PG - Two Years
Programme Outcomes (Pos)	<p>PO1: Problem Solving Skill Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context.</p> <p>PO2: Decision Making Skill Foster analytical and critical thinking abilities for data-based decision-making.</p> <p>PO3: Ethical Value Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities.</p> <p>PO4: Communication Skill Ability to develop communication, managerial and interpersonal skills.</p> <p>PO5: Individual and Team Leadership Skill Capability to lead themselves and the team to achieve organizational goals.</p> <p>PO6: Employability Skill</p>

	<p>Inculcate contemporary business practices to enhance employability skills in the competitive environment.</p> <p>PO7: Entrepreneurial Skill Equip with skills and competencies to become an entrepreneur.</p> <p>PO8: Contribution to Society Succeed in career endeavors and contribute significantly to society.</p> <p>PO 9 Multicultural competence Possess knowledge of the values and beliefs of multiple cultures and a global perspective.</p> <p>PO 10: Moral and ethical awareness/reasoning Ability to embrace moral/ethical values in conducting one's life.</p>
<p>Programme Specific Outcomes (PSOs)</p>	<p>PSO1 – Placement To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.</p> <p>PSO 2 - Entrepreneur To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.</p> <p>PSO3 – Research and Development Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.</p> <p>PSO4 – Contribution to Business World To produce employable, ethical and innovative professionals to sustain in the dynamic business world.</p> <p>PSO 5 – Contribution to the Society To contribute to the development of the society by collaborating with stakeholders for mutual benefit.</p>

Curriculum Structure for PG Programmes (OBE- CBCS) – 2023

	Nature of Course	Total No. of Courses	Total marks	Total credits	Total credits for the Programme
Part – A	Core Course	13	1300	51	80 (CGPA)
	Core Industry Module (CIM)	01	100	3	
	Elective Course	05	500	15	
	Extra Disciplinary Course	01	100	3	
Part – B (i)	Skill Enhancement Course(SEC)	04	400	8	
Part – B (ii)	Ability Enhancement Compulsory Course (AECC) – Soft Skill	04	400	8	10 (Non CGPA)
	Internship / Industrial Activity	--	--	2	
	Total	28	2800	90	90
Extra Credit Course - MOOC / Field visit / Hands on Training		--	--	Max: 4	

Part A component and Part B (i) will be taken into account for CGPA calculation for the postgraduate programme and the other components Part B and Part C have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the PG degree

Course Structure: M.Sc. Computer Science (2023)

S. No.	Semester	Category	Course Code	Title of the Course	Maximum Marks			Minimum Marks for Pass			Hours/Week	Credits
					CIA	EE	Total	CIA	EE	Total		
SEMESTER - I												
1	I	Core - I	23P1CSC1	Analysis and Design of Algorithms	25	75	100	10	30	50	5	3
2		Core - II	23P1CSC2	Object Oriented Analysis and Design and C++	25	75	100	10	30	50	5	4
3		Core - III	23P1CSC3	Python Programming	25	75	100	10	30	50	6	4
4		Elective - I	23P1CSEL1A/ 23P1CSEL1B	Advanced Software Engineering/ Data Engineering and Management	25	75	100	10	30	50	5	3
5		Elective - II	23P1CSEL2PA/ 23P1CSEL2PB	Algorithm and OOPS Lab/ Data Engineering and Management Lab	25	75	100	10	30	50	5	3
6		SEC - I	23P1CSSEC1	Ubiquitous Computing	25	75	100	10	30	50	2	2
7		AECC - I	23P1CSAECC1	Soft Skill – I : Communicative Skill and Personality Development	25	75	100	10	30	50	2	2
SEMESTER - II												
8	II	Core -IV	23P2CSC4	Data Mining and Warehousing	25	75	100	10	30	50	6	4
9		Core - V	23P2CSC5	Advanced Operating Systems	25	75	100	10	30	50	6	4
10		Core - VI	23P2CSC6	Advanced Java Programming	25	75	100	10	30	50	6	4
11		Elective-III	23P2CSEL3A/ 23P2CSEL3B	Artificial Intelligence & Machine Learning/ Big Data Analytics	25	75	100	10	30	50	5	4
12		Elective-IV	23P2CSEL4PA/ 23P2CSEL4PB	High Performance Computing Lab/ Software Development Technologies Lab	25	75	100	10	30	50	3	3
13		SEC- II	23P2CSSEC2	Embedded System Lab	40	60	100	12	24	35	2	2
14		AECC -II	23P2CSAECC2	Language Lab	25	75	100	10	30	50	2	2

Internship/ Industrial Activity:

Students must complete in-plant training in any industry or organization where a programme-related procedure is being used, and this training must be done during the summer vacation at the end of I Year. A minimum of 30 hours should be spent on training. Students must submit a report on their training together with a certificate from the relevant industry or organization authority.

Ability Enhancement Compulsory Course (AECC): (Communicative Skill and Personality Development, Language Lab, Research Methodology and Comprehensive Knowledge)

Mode of Assessment for these courses is Viva-Voce examination.

Components of Evaluation:

Internal Marks : 25

External Marks : 75

Total : 100

Field visit / Hands on Training:

In order to achieve experiential learning, these programmes with a minimum of 15 hours of contact time are offered as Extra Credit Courses in the I Semester.

Evaluation of visit report will be held at the end of II Semester.

Components of Evaluation:

Internal Marks : 25

External Marks : 75

Total : 100

MOOC:

Massive Open Online Course is offered in the III and IV Semester as an Extra Credit Course. Students can avail any one or more of the courses available in MOOC to equip their skill and knowledge themselves. To receive the extra credit, students must provide their MOOC course completion certificate at the end of the second year.

Skill Enhancement courses (SEC) offered by the Computer Science Department

1. Ubiquitous Computing
2. Embedded System Lab
3. Mini Project
4. Social Network Lab

Extra Disciplinary Course (EDC) offered by the Computer Science Department

Digital Marketing

M.Sc. Computer Science

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I	23P1CSC1	ANALYSIS DESIGN OF ALGORITHMS	5	3

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

<ol style="list-style-type: none"> 1. Enable the students to learn the Elementary Data Structures and algorithms. 2. Presents an introduction to the algorithms, their analysis and design. 3. Discuss various methods like Basic Traversal and Search Techniques, divide and conquer. method, Dynamic programming, backtracking. 4. Understood the various design and analysis of the algorithms.
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SYLLABUS

Unit	Content	No. of Hours
I	Introduction: Algorithm Definition and Specification – Space complexity-Time Complexity- Asymptotic Notations - Elementary Data Structure: Stacks and Queues – Binary Tree - Binary Search Tree - Heap – Heapsort- Graph.	14
II	Basic Traversal And Search Techniques: Techniques for Binary Trees- Techniques for Graphs -Divide and Conquer: - General Method – Binary Search – Merge Sort – Quick Sort.	14
III	The Greedy Method: General Method– Knapsack Problem– Minimum Cost Spanning Tree– Single Source Shortest Path	14
IV	Dynamic Programming-General Method–Multistage Graphs–All Pair Shortest Path–Optimal Binary Search Trees – 0/1 Knapsacks – Traveling Salesman Problem – Flow Shop Scheduling.	14
V	Backtracking: General Method–8-QueensProblem–Sum Of Subsets– Graph Coloring– Hamiltonian Cycles – Branch And Bound: - The Method – Traveling Salesperson.	14

M.Sc. Computer Science

***Note:** Questions may be asked from the *Self-Study* content for only CIA test (Mid and End semesters) and **NOT** for the external (Semester Examinations)

Textbook:

- 1 Ellis Horowitz, "Computer Algorithms", Galgotia Publications.
- 2 Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms".

Reference Books:

- 1 Goodrich, "Data Structures & Algorithms in Java", Wiley 3rd edition.
- 2 Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008
- 3 Anany Levith, "Introduction to the Design and Analysis of algorithm", Pearson Education Asia, 2003.
- 4 Robert Sedgewick, Phillippe Flajolet, "An Introduction to the Analysis of Algorithms", Addison-Wesley Publishing Company, 1996.

Web resources:

<https://nptel.ac.in/courses/106/106/106106131/>

https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm

<https://www.javatpoint.com/daa-tutorial>

Pedagogy: Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar. Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course Outcomes :

On the successful completion of the course, student will be able to:		
1	Get knowledge about algorithms and determines their time complexity. Demonstrate specific search and sort algorithms using divide and conquer technique.	K1,K2
2	Gain good understanding of Greedy method and its algorithm.	K2,K3
3	Able to describe about graphs using dynamic programming technique.	K3,K4
4	Demonstrate the concept of backtracking & branch and bound technique.	K5,K6
5	Explore the traversal and searching technique and apply it for trees and graphs.	K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Mapping with Programming Outcomes:

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

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

M.Sc. Computer Science

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I	23P1CSC2	OBJECT ORIENTED ANALYSIS AND DESIGN AND C++	5	4

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

1. Present the object model, classes and objects, object orientation, machine view and model management view.
2. Enables the students to learn the basic functions, principles and concept so object oriented analysis and design.
3. Enable the student understand C++ language with respect to OOAD

SYLLABUS

Unit	Content	No. of Hours
I	The Object Model: The Evolution of the Object Model – Elements of the Object Model – Applying the Object Model. Classes and Objects: The Nature of an Object – Relationship among Objects.	14
II	Classes and Object: Nature of Class – Relationship Among classes – The Interplay of classes and Objects. Classification: The importance of Proper Classification –identifying classes and objects –Key Abstractions and Mechanism.	14
III	Introduction: to C++ - Input and output statements in C++ - Declarations-control structures– Functions in C++.	14
IV	Classes and Objects–Constructors and Destructors–operators overloading– Type Conversion- Inheritance – Pointers and Arrays.	14
V	Memory Management Operators – Polymorphism – Virtual functions – Files – Exception Handling – String Handling -Templates.	14

***Note:** Questions may be asked from the *Self-Study* content for only CIA test (Mid and End semesters) and **NOT** for the external (Semester Examinations)

Textbook:

1. “Object Oriented Analysis and Design with Applications”, Grady Booch , Second Edition, Pearson Education.
2. “Object-Oriented Programming with ANSI & TurboC++”,Ashok N.Kamthane, First Indian Print -2003, Pearson Education.

Reference Books:

1. Balagurusamy “Object Oriented Programming with C++”, TMH, Second Edition, 2003.

Web resources:

- https://onlinecourses.nptel.ac.in/noc19_cs48/preview
<https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/>
https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.html

Pedagogy: Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar. Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course Outcomes:

On the successful completion of the course, student will be able to:		
1.	Understand the concept of Object-Oriented development and modeling techniques	K1,K2
2.	Gain knowledge about the various steps performed during object design	K2,K3
3.	Abstract object-based views for generic software systems	K3
4.	Link OOAD with C++ language	K4,K5
5.	Apply the basic concept of OOPs and familiarize to write C++ program	K5,K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Mapping with Programming Outcomes:

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

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

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I	23P1CSC3	PYTHON PROGRAMMING	6	4

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

<ol style="list-style-type: none"> 1. Presents an introduction to Python, creation of web applications, network applications and working in the clouds 2. Use functions for structuring Python programs 3. Understand different Data Structures of Python 4. Represent compound data using Python lists, tuples, and dictionaries

SYLLABUS

Unit	Content	No. of Hours
I	Python: Introduction–Numbers–Strings–Variables–Lists–Tuples–Dictionaries–Sets– Comparison.	17
II	Code Structures: if, else-if, and else – Repeat with while – Iterate with for – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – User Exceptions.	17
III	Modules, Packages, and Programs: Standalone Programs – Command-Line Arguments – Modules and the import Statement – The Python Standard Library. Objects and Classes: Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super–Inself Defense –Get and Set Attribute Values with Properties –Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition.	17
IV	Data Types: Text Strings–Binary Data– Storing and Retrieving Data: File Input / Output– Structured Text Files – Structured Binary Files - Relational Databases – NoSQL Data Stores. Web: Web Clients –Web Servers–Web Services and Automation.	17
V	Systems: Files–Directories–Programs and Processes–Calendars and Clocks. Concurrency: Queues–Processes–Threads–GreenThreadsandgevent–twisted–Redis.	16

	Networks: Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – ZeroMQ –Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and MapReduce – Working in the Clouds.	
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***Note:** Questions may be asked from the *Self-Study* content for only CIA test (Mid and End semesters) and **NOT** for the external (Semester Examinations)

Textbook:

- 1 Bill Lubanovic, “Introducing Python”,O’Reilly,FirstEdition-SecondRelease,2014.
- 2 MarkLutz,“Learning Python”, O’Reilly, Fifth Edition, 2013.

Reference Books:

1. Software Engineering (Sixth Edition) by ROGER S. PRESSMAN, McGraw-Hill International Edition, 2005.
2. Richard E.Fairley, “Software Engineering Concepts”, McGraw-Hill B
<https://www.programiz.com/python-programming/>
<https://www.tutorialspoint.com/python/index.htm>
https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

Pedagogy: Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar. Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course Outcomes :

On the successful completion of the course, student will be able to:		
1.	Understand the basic concepts of Python Programming	K1,K2
2.	Understand File operations, Classes and Objects	K2,K3
3.	Acquire Object Oriented Skills in Python	K3,K4
4.	Develop web applications using Python	K5
5.	Develop Client Server Networking applications	K5,K6
K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create		

Mapping with Programming Outcomes:

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

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

M.Sc. Computer Science

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I	23P1CSEL1A	ELECTIVE – I ADVANCED SOFTWARE ENGINEERING	5	3

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

<ol style="list-style-type: none"> 1. Introduce to Software Engineering, Design, Testing and Maintenance. 2. Enable the students to learn the concepts of Software Engineering. 3. Learn about Software Project Management, Software Design & Testing.

SYLLABUS

Unit	Content	No. of Hours
I	A Generic view of Process: Layered Technology-Process Framework-Capability Maturity Model Integration-Process Patterns-Process Assessment-Personal and Team Process Models-Process Technology-Product and Process. Process Models: Waterfall Models-Incremental Process Model-Evolutionary Process Model-Specialized Process Model Unified Process.	14
II	Requirement Engineering: Tasks-Initiating Requirement Engineering Process Eliciting Requirements-Developing Use case-Building Analysis Model-Negotiating Requirements-Validating Requirements. Building Analysis Model: Requirement Analysis – Analysis Modeling Approaches-Data Modeling Concepts-Object Oriented Analysis-Scenario Based Modeling-Flow Oriented-Class Based –Behavioral Model.	14
III	Design Engineering: Context of Software Engineering –Design Process and Design Quality-Design Concepts-Design model-Pattern Based Design. Architectural Design: Software Architecture-Data Design-Architectural Styles and Pattern-Architectural Design Alternate Architectural Design-Mapping Data Flow. User Interface Design: Golden Rules User Interface Analysis and Design-Interface Analysis-Interface Design- Design Evaluation	14

IV	Testing Strategies: Strategic Approach-Strategic Issues-Strategic for Conventional Software-Strategic for Object Oriented Software-Validation Testing-System Testing-Art of Debugging. Testing Tactics: Testing fundamentals-Black box Testing-White Box Testing Basis Path Testing-Control Structure Testing-Object Oriented Testing-Testing Methods Applicable-Interclass Test Case Design-Testing for Specialized Environments-Testing Patterns.	14
V	Project Management: Management Spectrum – People –Product-Process-ProjectW5HH Principle-Critical Practices. Quality Management: Quality Concepts-Software quality Assurance-Software Reviews-Technical Reviews – Statistical SQA-Software Reliability-ISO 9000 Quality Standards-SQA Plan. Change Management: Software Configuration management-SCM Repository-SCM Process-Configuration Management for Web E ngineering. .	14

***Note:** Questions may be asked from the *Self-Study* content for only CIA test (Mid and End semesters) and **NOT** for the external (Semester Examinations)

Textbook:

1. Software Engineering Practitioners Approach-Roger.S.Pressman,McGraw Hill.
2. An Integrated Approach to Software Engineering–PankajJalote, Narosa Publishing House, Delhi, 3rd Edition.

Reference Books:

1. Software Engineering–K.K.Aggarwal and Yogesh Singh,New Age International Publishers, 3rd edition.
2. Fundamentals of Software Engineering - Carlo Ghezzi, M. Jarayeri, D. Manodrioli, PHI Publication.

Web resources:

- <https://www.javatpoint.com/software-engineering-tutorial>
- https://onlinecourses.swayam2.ac.in/cec20_cs07/preview
- https://onlinecourses.nptel.ac.in/noc19_cs69/preview

Pedagogy:Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar.Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

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Course Outcomes :

On the successful completion of the course, student will be able to:		
1	Understand about Software Engineering process	K1,K2
2	Understand about Software project management skills, design and quality management	K2,K3
3	Analyze on Software Requirements and Specification	K3,K4
4	Analyze on Software Testing, Maintenance and Software Re-Engineering	K4,K5
5	Design and conduct various types and level software quality for a software project	K5,K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Mapping with Programming Outcomes :

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

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

M.Sc. Computer Science

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I	23P1CSEL1B	Elective – I Data Engineering and Management	5	3

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

<ol style="list-style-type: none"> 1. To understand Data Management concepts 2. To get brief knowledge on Data Modelling 3. To analyse the techniques used in Distributed Databases 4. To assess Distributed database and Business Modeling 5. To get familiar with CRM tools
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Unit	Content	No. of Hours
I	DATABASE DEVELOPMENT: Database architecture of an information system-Overview of the database development process-Conceptual data modeling-Relational data analysis-Roles of a data model-Physical database design. DATA MANAGEMENT: Problems encountered without data management-Data management responsibilities-Data management activities-Roles within data management-Benefits of data management-Relationship between data management and enterprise	14
II	CORPORATE DATA MODELLING: Need for a corporate data model- Nature of a corporate data model- Develop a corporate data model - Corporate data model principles. DATA DEFINITION AND NAMING: Elements of a data definition-Data naming conventions. DATA QUALITY: Issues associated with poor data quality-Causes of poor data quality-Dimensions of data quality-Data model quality-Improving data quality. DATA ACCESSIBILITY: Data security-Data integrity-Data recovery	15
III	USE OF PACKAGED APPLICATION SOFTWARE: Application software packages-Impact on data management. DISTRIBUTED DATA AND DATABASES: Rationale for distributing data-Perfect distributed database system-Top down fragmentation and partitioning. Bottom up integration-The management of replication. BUSINESS INTELLIGENCE: Data warehousing-Multidimensional model of data-Standard reporting tools-Online analytical processing OLAP-Relational schema for a data warehouse.	

IV	CRM: Three main pillars of CRM. GETTING TO KNOW YOUR CUSTOMER: 360-degree client view. UTILIZING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN YOUR CRM STRATEGY: Evolution of AI-Current state of AI-Teaming up AI with people-Applying AI to your CRM solution-ethical aspects of AI-An example of AI in CRM processes	15
V	CLOUD VERSUS ON PREMISE VERSUS HYBRID: Factors influencing vendor selection-Hybrid deployment-what are your options. CRM DIFFERENTIATORS: It's not about the feature list; it's about the ecosystem-Fourth industrial revolution and CRM-AI and smart cloud-To cloud or not to cloud-Leveraging smart cloud into CRM-Big data-Social selling and advertising-Implementation tools-Sustainable CRM platform.	15

***Note:** Questions may be asked from the *Self-Study* content for only CIA test (Mid and End semesters) and **NOT** for the external (Semester Examinations)

Textbook:

- 1.Keith Gordon, “Principles of Data Management Facilitating Information Sharing”, BCS Learning, 2013. (Chapters:1-5, 7,8,12,13,14)
2. Max Fatouretchi, “The Art of CRM”, Packt Publishing, 2019.(Chapters: 1,2,5,8,9)

Reference Books:

1. Peter Ghavami, “Big Data Management_ Data Governance Principles for Big Data Analytics”, De Gruyter, 2020.
2. Francis Buttle, Stan Maklan, Customer Relationship Management Concepts and Technologies, Routledge, 2019.

Pedagogy:Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar.Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course Outcomes :

On the successful completion of the course, student will be able to:		
1	Comprehend the Data Management concepts and analyse the relationship with the enterprise	K1,K2
2	Analyze Data Modelling concepts and assess its quality	K2,K3
3	Understand and implement business modelling techniques	K3,K4
4	Evaluate the use of Artificial Intelligence and Machine Learning in CRM	K4,K5
5	Develop CRM applications in cloud	K5,K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Mapping with Programming Outcomes

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

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I	23P1CSEL2A	Elective – II ALGORITHM AND OOPS LAB	5	3

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability
Skill development Oriented	√	Relevant to national need		Addresses Human Values
		Relevant to Global development need	√	Addresses Professional Ethics

Course Objectives

The main objectives of this course are:

<ol style="list-style-type: none"> 1. This course covers the basic data structures like Stack, Queue, Tree, List. 2. This course enables the students to learn the applications of the datastructures using various techniques 3. It also enable the students to understand C++ language with respect to OOAD concepts 4. Application of OOPS concepts
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LIST OF PROGRAMS	75 hours
<ol style="list-style-type: none"> 1) Write a program to solve the tower of Hanoi using recursion. 2) Write a program to traverse through binary search tree using traversals. 3) Write a program to perform various operations on stack using linked list. 4) Write a program to perform various operation in circular queue. 5) Write a program to sort an array of an elements using quick sort. 6) Write a program to solve number of elements in ascending order using heap sort. 7) Write a program to solve the knapsack problem using greedy method 8) Write a program to search for an element in a tree using divide& conquer strategy. 9) Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. 10) Write a C++ program to perform Virtual Function 11) Write a C++ program to perform Parameterized constructor 12) Write a C++ program to perform Friend Function 13) Write a C++ program to perform Function Overloading 14) Write a C++ program to perform Single Inheritance 15) Write a C++ program to perform Employee Details using files 	

***Note:** Questions may be asked from the *Self-Study* content for only CIA test (Mid and End

semesters) and **NOT** for the external (Semester Examinations)

Textbook:

1. Goodrich, "Data Structures & Algorithms in Java", Wiley 3rd edition.
2. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008

Reference Books:

1. Anany Levith, "Introduction to the Design and Analysis of algorithm", Pearson Education Asia, 2003.
2. Robert Sedgewick, Phillippe Flajolet, "An Introduction to the Analysis of Algorithms", Addison-Wesley Publishing Company, 1996.

Web resources:

- https://onlinecourses.nptel.ac.in/noc19_cs48/preview
<https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/>
https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.html

Pedagogy: Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar, Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course Outcomes :

On the successful completion of the course, student will be able to:		
1	Understand the concepts of object oriented with respect to C++	K1,K2
2	Able to understand and implement OOPS concepts	K3,K4
3	Implementation of data structures like Stack, Queue, Tree, List using C++	K4,K5
4	Application of the data structures for Sorting, Searching using different techniques.	K5,K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Mapping with Programming Outcomes:

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

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

M.Sc. Computer Science

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I	23P1CSEL2B	ELECTIVE - II Data Engineering and Management Lab	5	3

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

1. To acquire basic scripting knowledge in MongoDB
2. To learn CRUD Operation on MongoDB database
3. To realize MongoDB using DbVisualizer
4. To be familiar with Zoho CRM features
5. To customize your application using Zoho CRM

LIST OF PROGRAMS	75 hours
<ol style="list-style-type: none"> 1) Write a script to create a MongoDB database and perform insert operation 2) Write a MongoDB script to perform query operations 3) Write a MongoDB Script to perform update operations 4) Write a MongoDB Script to update documents with aggregation pipeline 5) Write a MongoDB script to delete single and multiple documents 6) Write a MongoDB script to perform string aggregation operations 7) Design a Data Model for MongoDB using DbVisualizer 8) Perform CRUD operations using DbVisualizer 9) Create a Zoho CRM account and organize your Tasks, Meetings and Deals 10) Create and maintain a project using Zoho CRM features 	

***Note:** Questions may be asked from the *Self-Study* content for only CIA test (Mid and End semesters) and **NOT** for the external (Semester Examinations)

Course Outcomes :

On the successful completion of the course, student will be able to:		
1	Comprehend the scripting knowledge in MongoDB and perform basic operation in shell prompt	K1,K2
2	Implement, Create, Read, Update and Delete Operations on MongoDB database	K3,K4
3	Analyze MongoDB using DbVisualizer	K4,K5
4	Assess Zoho CRM features for managing the customer relationships	K5,K6
5	Create a customized application in Zoho CRM	K5,k6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Mapping with Programming Outcomes:

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

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

M.Sc. Computer Science

Semester	Subject code	Title of the course	Hours of Teaching / Week	No. of Credits
I	23P1CSSEC1	Skill Enhancement Course- UBIQUITOUS COMPUTING	2	2

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

- To understand the advances in pervasive computing.
- The basic goal of ubiquitous computing is to create smart, linked products that make communication and data sharing easier and less intrusive.

SYLLABUS

Content	No. of Hours
<p>UNIT - 1</p> <p>Ubiquitous Computing Systems: UbiComp Systems Topics and Challenges - Creating UbiComp Systems-Implementing UbiComp Systems-Evaluating and Documenting UbiComp Systems-Privacy in Ubiquitous Computing: Understanding Privacy - Technical Solutions for UbiComp Privacy - Address Privacy. Ubiquitous Computing Field Studies : Three Common Types of Field Studies - Study Design - Participants- Data Analysis - Steps to a Successful Study.</p>	1
<p>Unit-II</p> <p>Ethnography in Ubiquitous Computing - From Ethnography to Design - Design- Oriented Ethnography in Practice. From GUI to UUI: Interfaces for Ubiquitous Computing: Interaction Design-Classes of User Interface-Input Technologies-Location in Ubiquitous Computing: Characterizing Location Technologies - Location Systems. Context-Aware Computing: Context-Aware Applications - Designing and Implementing Context-Aware Applications - Issues to Consider when Building Context-Aware Applications- Challenges in Writing Academic Papers on Context Awareness.</p>	1

Text book

1. Ubiquitous Computing Fundamentals - Edited by John Krumm Microsoft Corporation Redmond, Washington, U.S.A.

Web Resource:

1. <https://www.geeksforgeeks.org/introduction-to-pervasive-computing/>
2. <https://www.sciencedirect.com/topics/computer-science/ubiquitous-computing>

Pedagogy: Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar. Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course Outcomes :

On the successful completion of the course, student will be able to:		
1	Demonstrate an appreciation of the growing significance of ubiquitous or pervasive computing and the concomitant technological and social issues	K1,K2
2	Demonstrate knowledge of current issues in ubiquitous computing, and show ability to research an area in depth.	K2,K3
3	Select and justify appropriate technologies, development lifecycles and standards for mobile and pervasive applications	K3,K4
4	Be cognisant of the major mobile computing standards currently in use, their purpose and scope and their role in supporting access to platform and location independent applications	K5,K6
5	Communicate effectively in both written and oral work and in group situations	K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Mapping with Programming Outcomes:

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

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

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I	23P1CSAECC1	Ability Enhancement Compulsory Course - COMMUNICATIVE SKILL AND PERSONALITY DEVELOPMENT	2	2

Nature of the course

Employability Oriented	√	Relevant to Local need	√	Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to national need	√	Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to regional need	√	Addresses Human Values	√
		Relevant to Global development need	√	Addresses Professional Ethics	√

Course Objectives

The main objectives of this course are to:

1. cultivate positive personality traits for successful life.
2. groom Winning Attitude among the learners.
3. assist the learners to identify their own potential and realize their aspirations.
4. enable a holistic development.
5. facilitate optimum means of improving personal performance.

SYLLABUS

Unit	Content
I	<ol style="list-style-type: none"> 1. Personality- Definition. 2. Determinants of Personality. 3. Perceptual Process. 4. Personality Traits. 5. Developing Effective Habits. 6. Self Esteem (Freud and Erikson). 7. Self Appraisal and Self Development. 8. Dos and Don'ts to develop positive self esteem. 9. Interpersonal Relationship. 10. Difference between Aggressive, Submissive and Assertive behaviour. 11. Mind Mapping, Competency Mapping, 360 degree assessment. 12. Presentation Skills – Opening, ending, Handling nerves, Handling audience, Power Storytelling, Visual aids, Question and answer session

II	<ol style="list-style-type: none">1. Projecting Positive Body Language.2. Conflict Management.3. Change Management.4. Stress Management.5. Time Management.6. Goal Setting.7. Assertiveness and Negotiating Skill.8. Problem Solving Skill.9. Decision Making Skills.10. Leadership Qualities of a Successful Leader.11. Attitudes – Positive Attitudes.12. Public Speaking – Engaging, Connecting, and Influencing the audiences.13. Employability Skill – Group Discussion, Interview Questions, Psychometric analysis.
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Textbook:

1. Andrews, Sudhir. *How to Succeed at Interviews*. 21st (rep) New Delhi:Tata McGraw Hill 1988.
2. Hurlock.E.B (2006) :*Personality Development*, 28th Reprint. New Delhi: Tata McCraw Hill.
3. Kumar, Pravesh. *All about Self Motivation*. New Delhi:Goodwill Publication House. 2005.
4. Preston,David Lawrence.*365 Steps to Self-Confidence*. Mumbai: Jaico Publishers, 2007
5. Stephen.P.Robbins and Timothy. A.Judge: *Organisation Behaviour*. 16thEdition.Prentice Hall. 2014

References:

1. Grellet ,Françoise. *Developing Reading Skills*. Cambridge: Cambridge University Press, 2007.
2. Kristine, Brown and Susan Hood.*Academic Encounters Life in Society Reading, Study Skills, Writing*. , New Delhi:Cambridge University Press,2010.
3. Little ,Graham R .*Operations Team Leadership*. Mumbai :Jaico Publishers, 2006 .
4. Nurnberg ,Maxwell and Morris Rosenblum *How to Build a Better Vocabulary*. New York :Warner Books, 1989.
5. O' Connell ,Sue with LousieHashemi.*Cambridge First Certificate: Listening and Speaking –*, Cambridge University Press, Cambridge, 2000.
6. Pfeifer , William Sanborn and T.V.S.Padmaja*Technical Communication : A Practical Approach*, (Sixth edition) New Delhi: Pearson, 2006.
7. Withrow, Jean, Gay Brookers and Martha Cumings .*Inspired to Write*.New York:Cambridge University Press, 2004.

Web resources:

- <https://www.managementstudyguide.com/personality-development.htm>
- <https://www.artofliving.org/in-en/personality-development>
- <https://study.com/academy/lesson/what-is-conflict-management-definition-styles-strategies.html>
- <https://www.hays.com.au/career-advice/upskilling/soft-skills>
- <https://www.skillsyouneed.com/presentation-skills.html>

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Pedagogy: Teaching / Learning methods

Lecture, Tutorial, Assignment, PPT presentation, Group Discussion, e-content, Seminar, Tasks, Role play, Debate, Group Activities etc.

Course Outcomes

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

CO Number	CO Statement	Cognitive Level
CO1	understand the significance of developing progressive and positive personality	K1,K2
CO2	gain self confidence and broaden perception of life.	K3
CO3	maximize their potential and steer that into their career choice.	K4
CO4	enhance one's self image and self esteem.	K3, K5
CO5	find a means to achieve excellence and derive fulfilment.	K6

Cognitive Level: **K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Mapping of Course Outcomes with Programme Outcomes and Programme Specific Outcomes

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	3	3	3	3
CO2	2	2	3	2	3	3	3	2	3
CO3	1	2	3	3	3	2	3	3	2
CO4	3	2	3	2	2	3	2	3	3
CO5	2	1	3	3	3	3	3	3	1

3 - Strongly Correlated; 2 - Moderately Correlated; 1 - Weakly Correlated; 0 - No correlation

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
II	23P2CSC4	DATA MINING AND WAREHOUSING	6	4

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

<ol style="list-style-type: none"> 1. Enable the students to learn the concepts of Mining tasks, classification, clustering and Data Warehousing. 2. Develop skill so fusing recent data mining software for solving practical problems. 3. Develop and apply critical thinking, problem-solving, and decision-making skills.
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SYLLABUS

Unit	Content	No. of Hours
I	<p>BASICS AND TECHNIQUES: Basic data mining tasks – data mining versus knowledge discovery in databases – data mining issues – data mining metrics – social implications of data mining – data mining from a database perspective. Data mining techniques: Introduction – a statistical perspective on data mining – similarity measures – decision trees – neural networks – genetic algorithms.</p>	15
II	<p>ALGORITHMS: Classification: Introduction – Statistical – base algorithms – distance – based algorithms – decision tree – based algorithms – neural network – CLUSTERING AND ASSOCIATION : based algorithms – rule – based algorithms – combining techniques.</p>	15
III	<p>CLUSTERING AND ASSOCIATION : Clustering: Introduction – Similarity and Distance Measures – Outliers – Hierarchical Algorithms – Partitional Algorithms. Association rules:</p>	15

	Introduction - large item sets - basic algorithms – parallel & distributed algorithms – comparing approaches- incremental rules – advanced association rules techniques – measuring the quality of rules.	
IV	DATAWARE HOUSING AND MODELING : Data warehousing: introduction-characteristics of a data warehouse–datamarts–other aspects of datamart. Online analytical processing: introduction –OLTP & OLAP systems - Data modeling –star schema for multidimensional view – data modeling – multifact star schema or snow flake schema – OLAP TOOLS – State of the market – OLAP TOOLS and the internet.	15
V	APPLICATIONS OF DATA WAREHOUSE : Developing a data WAREHOUSE: why and how to build a data warehouse – data warehouse architectural strategies and organization issues - design consideration – data content – metadata distribution of data – tools for data warehousing – performance considerations – crucial decisions in designing a data warehouse. Applications of data warehousing and data mining in government: Introduction - national data warehouses – other areas for data warehousing and data mining.	15

***Note:** Questions may be asked from the *Self-Study* content for only CIA test (Mid and End semesters) and **NOT** for the external (Semester Examinations)

Text Books

- 1 Margaret H. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson education, 2003.
- 2 C.S.R. Prabhu, “Data Warehousing Concepts, Techniques, Products and Applications”, PHI, Second Edition.

Reference Books

- 1 Arun K. Pujari, “Data Mining Techniques”, Universities Press (India) Pvt. Ltd., 2003.
- 2 Alex Berson, Stephen J. Smith, “Data Warehousing, Data Mining and OLAP”, TMCH, 2001.
- 3 Jiawei Han & Micheline Kamber, “Data Mining Concepts & Techniques”, 2001, mic press.

Web resource

- <https://www.javatpoint.com/data-warehouse>
- <https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/>
- <https://www.btechguru.com/training--it--database-management-systems--file-structures--introduction-to-data-warehousing-and-olap-2-video-lecture--12054--26--151.html>

Pedagogy: Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar. Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software

Course Outcomes:

On the successful completion of the course, student will be able to:		
1	Understand the basic data mining techniques and algorithms	K1,K2
2	Understand the Association rules, Clustering techniques and Data warehousing contents	K2,K3
3	Compare and evaluate different data mining techniques like classification, prediction, Clustering and association rule mining	K4,K5
4	Design data warehouse with dimensional modeling and apply OLAP operations	K5,K6
5	Identify appropriate data mining algorithms to solve real world problems	K6
K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create		

Mapping with Programming Outcomes:

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

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

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
II	23P2CSC5	ADVANCED OPERATING SYSTEMS	6	4

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

1. Enable the students to learn the different types of operating systems and their functioning.
2. Gain knowledge on Distributed Operating Systems
3. Gain insight in to the components and management aspects of real-time and mobile operating system.
4. Learn case studies in Linux Operating Systems

SYLLABUS		
Unit	Content	No. of Hours
I	BASICS OF OPERATING SYSTEMS: in databases – data mining issues – Basics of Operating Systems: What is an Operating System? – Main frame Systems –Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems –Real-Time Systems – Handheld Systems – Feature Migration – Computing Environments -Process Scheduling – Cooperating Processes – Inter Process Communication- Deadlocks –Prevention – Avoidance – Detection – Recovery.	15
II	DISTRIBUTED OPERATING SYSTEMS: Distributed Operating Systems: Issues – Communication Primitives – Lamport's Logical Clocks – Deadlock handling strategies – Issues in deadlock detection and resolution-distributed file systems –design issues – Case studies – The Sun Network File System-Coda.	15

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III	REALTIME OPERATING SYSTEM: Real-time Operating Systems : Introduction – Applications of Real Time Systems – Basic Model of Real Time System – Characteristics – Safety and Reliability - Real Time Task Scheduling	14
IV	HANDHELD SYSTEM: Operating Systems for Handheld Systems: Requirements – Technology Overview – Handheld Operating Systems – Palm OS – Symbian Operating System – Android – Architecture of android Securing handheld systems	14
V	CASE STUDIES Case Studies : Linux System: Introduction – Memory Management – Process Scheduling – Scheduling Policy - Managing I/O devices – Accessing Files- iOS Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.	14

Note: Questions may be asked from the *Self-Study* content for only CIA test (Mid and End semesters) and **NOT** for the external (Semester Examinations)

Text Books

1. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts”, Seventh Edition, John Wiley & Sons, 2004.
2. Mukesh Singhal and Niranjana G. Shivaratri, “Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2001.

Reference Books

1. Rajib Mall, “Real-Time Systems: Theory and Practice”, Pearson Education India, 2006.
2. Pramod Chandra P. Bhatt, An introduction to operating systems, concept and practice, PHI, Third edition, 2010.
3. Daniel P. Bovet & Marco Cesati, “Understanding the Linux kernel”, 3rd edition, O’Reilly, 2005
4. Neil Smyth, “iPhone/iOS 4 Development Essentials – Xcode”, Fourth Edition, Payload media, 2011.

Web resource

- https://onlinecourses.nptel.ac.in/noc20_cs04/preview
- <https://www.udacity.com/course/advanced-operating-systems--ud189>
- <https://minnie.tuhs.org/CompArch/Resources/os-notes.pdf>

Pedagogy: Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial Assignment, Seminar. Library, Net Surfing, NPTEL Course Materials, Use of Mathematica software

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Course Outcomes:

On the successful completion of the course, student will be able to:		
1	Understand the design issues associated with operating systems	K1,K2
2	Master various process management concepts including scheduling deadlocks and distributed file system	K3,K4
3	Prepare Real Time Task Scheduling	K4,K5
4	Analyze Operating Systems for Handheld Systems	K5
5	Analyze Operating Systems like LINUX and iOS	K5,K6

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

Mapping with Programming Outcome:

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

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

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
II	23P2CSC6	ADVANCED JAVA PROGRAMMING	6	4

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

<ol style="list-style-type: none"> 1. Enable the students to learn the basic functions, principles and concepts of advanced java programming. 2. Provide knowledge on concepts needed for distributed Application Architecture. 3. Learn JDBC, Servlet packages, J Query, Java Server Pages and JAR file format
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SYLLABUS

Unit	Content	No. of Hours
I	BASICS OF JAVA: Java Basics Review : Components and event handling–Threading concepts–Networking features – Media techniques.	12
II	REMOTE METHOD INVOCATION: Remote Method Invocation- Distributed Application Architecture- Creating stubs and skeletons- Defining Remote objects- Remote Object Activation-Object Serialization- Java Spaces.	12
III	DATABASE: Java in Databases- JDBC principles –database access - Interacting-database search–Creating multimedia databases – Database support in web applications	10
IV	SERVLETS: Java Servlets: Java Servlet and CGI programming- A simple java Servlet-Anatomy of a java Servlet-Reading data from a client-Reading http request header-sending data to a client and writing the http response header-working with cookies Java Server Pages: JSP Overview-Installation- JSP tags-Components of a JSP page-Expressions- Script lets-Directives- Declarations-A complete example.	12
V	ADVANCED TECHNIQUES: JAR file format creation–Internationalization–Swing Programming– Advanced java techniques	12

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Text Books

1. Jamie Jaworski, "Java Unleashed", SAMSTechmedia Publications, 1999.
2. Campione, Walrath and Huml, "The Java Tutorial", Addison Wesley, 1999.

Reference Books

1. Jim Keogh, "The Complete Reference J2EE", Tata McGraw Hill Publishing Company Ltd, 2010.
2. David Sawyer McFarland, "JavaScript And JQuery - The Missing Manual", O'Reilly Publications, 3rd Edition, 2011
3. Deitel and Deitel, "Java How to Program", Third Edition, PHI/Pearson Education Asia.

Websource

<https://www.javatpoint.com/servlet-tutorial>

<https://www.tutorialspoint.com/java/index.htm>

https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Pedagogy: Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar. Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software

Course Outcomes:

On the successful completion of the course, students will be able to:		
1	Understand and the advanced concepts of Java Programming	K1,K2
2	Understand JDBC and RMI concepts	K2,K3
3	Apply and analyze Java in Database	K3,K4
4	Handle different event in java using the delegation event model, event listener and class	K5
5	Design interactive applications using Java Servlet, JSP and JDBC	K5,K6

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

Mapping with Programming Outcomes:

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

*S-Strong :-Medium -Low

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Semester	Course Code	Course Title	Hours of Teachin	No. of Credits
II	23P2CSEL3A	ELECTIVE-III ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	5	4

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability
Skill development Oriented	√	Relevant to national need		Addresses Human Values
		Relevant to Global development need	√	Addresses Professional Ethics

Course Objectives

The main objectives of this course are to:

1. Enable the students to learn the basic functions of AI ,Heuristic Search Techniques.
2. ProvideknowledgeonconceptsofRepresentationsandMappingsandPredicate Logic.
3. Introduce Machine Learning with respect Data Mining,BigData and Cloud.
4. Study about Applications & Impact of ML.

SYLLABUS

Unit	Content	No. of Hours
I	INTRODUCTION: Introduction: AI Problems - AI techniques - Criteria for success. Problems, Problem Spaces, Search: State space search - Production Systems - Problem Characteristics - Issues in design of Search.	12
II	SEARCH TECHNIQUES: Heuristic Search techniques: Generate and Test - Hill Climbing- Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis. Knowledge representation issues : Representations and mappings -Approaches to Knowledge representations -Issues in Knowledge representations - Frame Problem.	12
III	PREDICATE LOGIC : Using Predicate logic : Representing simple facts in logic - Representing Instance and Isa relationships - Computable functions and predicates – Resolution Natural deduction. Representing knowledge using rules : Procedural Vs Declarative knowledge- Logic programming Forward Vs Backward reasoning -Matching-Control knowledge	12
IV	MACHINE LEARNING: Understanding Machine Learning : What Is Machine Learning?-Defining Big Data-Big Data in Context with Machine Learning –The Importance	12

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	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	
V	APPLICATIONS OF MACHINE LEARNING: Looking Inside Machine Learning: The Impact of Machine Learning on Applications-Data Preparation-The Machine Learning Cycle.	10

Text Books

1. ElaineRichardKevinKnight,"ArtificialIntelligence",TataMcGrawHillPublishers company Pvt Ltd, Second Edition, 1991.
2. GeorgeFLuger,"ArtificialIntelligence",4thEdition,PearsonEducation Publ,2002.

Reference Books

Machine Learning For Dummies®, IBM Limited Edition by Judith Hurwitz, Daniel Kirsch.

Web resource

- <https://www.ibm.com/downloads/cas/GB8ZMQZ3>
<https://www.javatpoint.com/artificial-intelligence-tutorial>
<https://nptel.ac.in/courses/106/105/106105077/>

Pedagogy:

Teaching / Learning methods: Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar. Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course Outcomes :

On the successful completion of the course, student will be able to:		
1	Demonstrate AI problems and techniques	K1,K2
2	Understand machine learning concepts	K2,K3
3	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning	K3,K4
4	Analyze the impact of machine learning on applications	K4,K5
5	Analyze and design a real world problem for implementation and understand the dynamic behavior of a system	K5,K6

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

Mapping with Programming Outcomes:

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

*S-Strong ; M –Medium ; L-Low

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
II	23P2CSEL3B	Elective – III BIG DATA ANALYTICS	5	4

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are to:

1. To provide an overview of an exciting growing field of big data analytics.
2. To introduce the tools required to manage and analyze big data like Hadoop, NoSql Map- Reduce.
3. To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
4. To enable students to have skills that will help them to solve complex real-world problems in for decision support.

SYLLABUS

UNITS	CONTENTS	No Of Hours
I	<p>Getting Ready to Use R and Hadoop: Installing R – Installing R Studio – Understanding the features of R language – Installing Hadoop – Understanding Hadoop features – Learning the HDFS and Map Reduce architecture – Understanding Hadoop subprojects.</p> <p>Writing Hadoop Map Reduce Programs: Introducing Hadoop Map Reduce – Understanding the Hadoop Map Reduce scenario – Understanding the Hadoop Map Reduce fundamentals – Learning the different ways to write Hadoop Map Reduce in R.</p>	15
II	<p>Integrating R and Hadoop : Introducing RHIPE – Understanding the architecture of RHIPE – Understanding the RHIPE function – Introducing R Hadoop.</p> <p>Using Hadoop Streaming with R : Understanding the basics of Hadoop streaming - Understanding how to run Hadoop streaming with R - Exploring the Hadoop Streaming R package</p>	15

III	Learning Data Analytics with R and Hadoop : Understanding the data analytics project life cycle - Understanding data analytics problems - Computing the frequency of stock market change – Predicting the sale price of blue book for bulldozers – case study	13
IV	Understanding Big Data Analysis with Machine Learning : Introduction to machine learning – Supervised machine-learning algorithms – Unsupervised machine learning algorithm – Recommendation algorithms – Steps to generate recommendations in R – Generating recommendations with R and Hadoop.	15
V	Importing and Exporting Data from Various DBs: Learning about data files as database – Understanding MySQL– Understanding Excel– Understanding Mongo DB – Understanding SQLite – Understanding PostgreSQL - Understanding Hive - Understanding HBase	15

Text Book:

Vignesh Prajapat , ” Big Data Analytics with R and Hadoop”– Packet Publishing Pvt. Ltd,2013.

Web resource

- 1.<https://www.ibm.com/downloads/cas/GB8ZMQZ3>
- 2.<https://www.javatpoint.com/artificial-intelligence-tutorial>
- 3<https://nptel.ac.in/courses/106/105/106105077/>

Pedagogy:

Teaching / Learning methods: Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar. Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course Outcomes:

Upon completion of the subject, students will be able to :		
CO Number	CO Statement	Cognitive Level
CO1	Work with big data tools and its analysis techniques	K1,K2
CO2	Design efficient algorithms for mining the data from large volumes	K2,K3
CO3	Design an efficient recommendation system	K3,K4
CO4	Design the tools for visualization	K4,K5
CO5	Learn No SQL databases and management	K5,K6

Cognitive Level : K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze;

K5 – Evaluate; K6 – Create

Mapping with Programming Outcomes :

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

*S-Strong ;M –Medium ; L-Low

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
II	23P2CSEL4A	Elective - IV High Performance Computing LAB	3	3

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

1. To understand concepts of High Performance Computing.
2. To get brief knowledge about PB and Slurm.
3. To understand techniques of OpenMP and OpenMPI.
4. To understand Parallel computing concepts.
5. To get familiar with CUDA.

LIST OF PROGRAMS	75 hours
<ol style="list-style-type: none"> 1) Demo: - Access and best practices on HPC 2) Matrix multiplication with Job scheduling (PB or Slurm) 3) Vectors add with malloc shared 4) Vector add program with MPI 5) Hello world task for Multithreading with openMP 6) openMP shared memory on Host and Device 7) openMP Matrix Multiplication with parallelism and Barrier 8) openMP with Reduction on operands and aggregate functionality 9) Vector and Matrix multiplication on CUDA 10) Feed forward computing on CUDA 	

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***Note:** Questions may be asked from the *Self-Study* content for only CIA test (Mid and End semesters) and **NOT** for the external (Semester Examinations)

Pedagogy:Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar.Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course Outcomes :

On the successful completion of the course, student will be able to:		
1.	Apply and Evaluate the HPC Programs	K1,K2
2.	Design and Develop a MPI Programs	K3,K4
3.	Design and Develop a different programming concepts of OpenMP	K4,K5
4.	Develop an efficient PB and Slurm programming	K5,K6
5.	Evaluate an efficient CUDA programming	
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Mapping with Programming Outcomes

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

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
II	23P2CSEL4B	Elective - IV SOFTWARE DEVELOPMENT TECHNOLOGIES LAB	3	3

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

1. To understand the concept of DevOps with associated technologies and methodologies.
2. To be familiarized with Jenkins, which is used to build & test software Applications
3. To understand Continuous integration in Devops environment.
4. To understand Docker to build, ship and run containerized images
5. To use Docker to deploy and manage Software applications running on Container.

LIST OF PROGRAMS	75 hours
<ol style="list-style-type: none"> 1. Deploy Version Control System / Source Code Management, install git and create a GitHub account. 2. Perform various GIT operations on local and Remote repositories using GIT Cheat-Sheet 3. Continuous Integration: install and configure Jenkins with Maven/Ant/Gradle to setup a build Job. 4. Build the pipeline of jobs using Maven / Gradle / Ant in Jenkins, create a pipeline script to Test and deploy an application over the tomcat server. 5. Implement Jenkins Master-Slave Architecture and scale your Jenkins standalone implementation by implementing slave nodes. 6. Setup and Run Selenium Tests in Jenkins Using Maven. 7. Implement Docker Architecture and Container Life Cycle, install Docker and execute 	

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- docker commands to manage images and interact with containers.
8. Implement Dockerfile instructions, build an image for a sample web application using Dockerfile.
 9. Install and Configure Pull based Software Configuration Management and provisioning tools using Puppet.
 10. Implement LAMP/MEAN Stack using Puppet Manifest.

***Note:** Questions may be asked from the *Self-Study* content for only CIA test (Mid and End semesters) and **NOT** for the external (Semester Examinations)

Pedagogy:Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar.Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course Outcomes :

On the successful completion of the course, student will be able to:		
1.	To Understand and analyse the importance of Jenkins to Build, Deploy and Test Software Applications	K1,K2
2.	To synthesis and summarize the importance of Software Configuration Management in DevOps	K3,K4
3.	To identify, analyze and illustrate the Containerization of OS images and deployment of applications over Docker	K4,K5
4.	To design, analyze and develop the Pull based Software Configuration Management	K5,K6
5.	To design, analyze and develop Puppet Manifest	
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Mapping with Programming Outcomes

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

M-moderate, S-strong

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Semester	Subject code	Title of the course	Hours of Teaching/Week	No.of Credits
II	23P2CSSEC2	Skill Enhancement Course - Embedded System Lab	2	2

Objective

- ❖ To gain knowledge of the PIC processor
-

1. Arithmetic Program Using Two Operands
2. Arithmetic Operations Using Multiple Operands
3. I/O Port Programming-Led Blinking
4. Lcd Interfacing
5. Stepper Motor Interfacing
6. Study Of Analog To Digital Converter Programming
7. Keypad Interfacing
8. Traffic Controller
9. Adc – Temperature Measurement Using Lm35
10. Object Counting Using IR Sensor

Course Outcomes:

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

- Understand of the role and impact of microcontroller.
- Develop pic programming in c.
- Analyze and resolve function of risc architecture.
- Understand and develop the pic18 serial port and interrupt programming.
- Develop the chips and work in a dynamic embedded environment.

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CO1:	To perform the arithmetic operations using PIC processors.		
CO2:	To design the LED blinking and LCD interfacing with the help of PIC Processor.	K1- K6	
CO3:	To design the stepper motor and functioning it with Programming Interface Controller.		
CO4:	To design the Traffic Controller and Temperature Measurement using PIC Processor.		
CO5:	To understand and count the object using IR sensors.		

K1-Remember,K2-Understand,K3-Apply,K4-Analyze,K5-Evaluate, K6- Create

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	S	S	M	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	M	S
CO3	S	S	M	S	S	S	M	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	S

M-Moderate, S-Strong

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
II	23P2ENAECC2	Ability Enhancement Compulsory Course - Language Lab	2	2

Course Objectives

The main objectives of this course are to:

1. To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
2. To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm
3. To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
4. To improve the fluency of students in spoken English and neutralize their mother tongue influence
5. To train students to use language appropriately for public speaking and Interviews

Unit – I LSRW

Listening Skills: Introduction to Phonetics – Speech Sounds – Vowels and Consonants, Listen to News, poem, songs, Motivational speech, stories, movies, interesting facts, sign of zodiac, dialogues, idioms, dictation – Common errors

Speaking Skills: Stress, Intonation, Homophone, Silent Letters, Greetings, Small Talk, Telephone English, Role Play, Tongue Twisters, Welcome Speech & Vote of Thanks, Compering, Declamation, Sing Along, Brain Storming, JAM (Just A Minute)

Reading Skills: Reading test, Skit, Proof Reading, Oral Reading Fluency, Reading Stories,

Writing Skills: learn English Grammar through Tamil Translation, Reading Comprehension-short stories, informational passages, Advanced Critical reading – Intelligence Augmentation, Dialogues, Sentence Completion, Word Definition, Classic Analogy Bridges, Sentence Analogies, Same Sound, Divided Syllables, Finish the Story, Answering the questions, Practical Writing, Making a formal Argument, Free Writing, Using Precise Language

Unit – II Career and Soft Skills

Career Skills: Body Language (BL) : BL Interview, BL Model, BL Tips, Business English, Communication skills, GD, Interview Skills

Soft Skills: Assertiveness, Creativity, Critical Thinking and Problem Solving, Empathy, Enthusiasm and attitude, Goal Setting, Great interviews, Negotiation Skills, Personality Development, Professionalism, Self Esteem, Stress Management, Team Building, Time Management, Motivation and Attitude, Interpersonal relationship and skills, Networking,

Reference:

1. Materials prepared by the Department of English for Writing skills
2. Soft Skills – Know Yourself and know the world, Dr.K.Alex, Chand Publications, 3rd revised edition 2014
3. Software : Express Pro Lite

The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Learning Outcomes:

Students will be able to attain

1. Better understanding of nuances of English language through audio- visual experience and group activities
2. Neutralization of accent for intelligibility
3. Speaking skills with clarity and confidence which in turn enhances their employability skills

Minimum Requirement of infrastructural facilities for Language Lab:

1. Computer Assisted Language Learning (CALL) Lab:

The **Computer Assisted Language Learning Lab** has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

- i) Computers with Suitable Configuration
- ii) High Fidelity Headphones

2. Interactive Communication Skills (ICS) Lab:

The **Interactive Communication Skills Lab:** A Spacious room with movable chairs and audio-visual aids with a Public-Address System, a LCD and a projector etc

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
III	23P3CSC7	INTERNET OF THINGS	5	4

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives:

- To get familiar with the evolution of IOT with its design principles
- To outline the functionalities and protocols of internet communication
- To analyze the hardware and software components needed to construct IOT applications
- To identify the appropriate protocol for API construction and writing embedded code
- To realize various business models and ethics in Internet of Things

SYLLABUS		
Units	CONTENTS	No Of Hours
I	FUNDAMENTALS OF IOT Evolution of Internet of Things – Enabling Technologies – IOT Architectures: oneM2M, IOT World Forum (IOTWF) and Alternative IOT models – Simplified IOT Architecture and Core IOT Functional Stack – Fog, Edge and Cloud in IOT – Functional blocks of an IOT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects.	14
II	IOT PROTOCOLS IOT Access Technologies: Physical and MAC layers, topology and Security of IEEE802.15.4,802.15.4g,802.15.4e,1901.2a,802.11ahandLoRaWAN– Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IOT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT.	14

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III	DESIGN AND DEVELOPMENT Prototyping Embedded Devices: Electronics - Embedded Computing Basics – Arduino - Raspberry Pi - Beagle Bone Black - Electric Imp. Prototyping the Physical Design: Non digital Methods - Laser Cutting - 3D printing - CNC Milling - Repurposing/Recycling.	14
IV	Prototyping Online Components: Getting started with an API - Writing a New API-Real-Time Reactions-Other Protocols. Techniques for Writing Embedded Code: Memory Management - Performance and Battery Life – Libraries - Debugging.	14
V	Business Models: History of Business Models – Model – Internet of Starting up – Lean Startups. Moving to Manufacture: Designing Kits - Designing Printed circuit boards – Certification – Costs - Scaling Up Software. Ethics: Privacy – Control – Environment – Solutions.	14

Text Books:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017(UNIT I and II)
2. Adrian McEwen and Hakim Cassimally, “Designing the Internet of Things”, Wiley, 2014. (UNIT III, IV and V)

Web Source :

- 1.<https://www.ibm.com/downloads/cas/GB8ZMQZ3>
- 2.<https://www.javatpoint.com/artificial-intelligence-tutorial>
- 3.<https://nptel.ac.in/courses/106/105/106105077/>

Reference Books:

1. OvidiuVermesan and Peter Friess, “InternetofThings–FromResearch and Innovation to Market Deployment” , River Publishers, 2014.
2. Peter Waher, “Learning Internet of Things” ,Packt Publishing, 2015.
3. Donald Norris, “The Internet of Things: Do-It-Yourself at HomeProjects for Arduino, Raspberry Pi and BeagleBoneBlack”,McGraw Hill, 2015

Pedagogy:

Teaching / Learning methods: Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar. Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

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Course Outcomes :

On the successful completion of the course, student will be able to:		
1	Demonstrate AI problems and techniques	K1,K2
2	Understand machine learning concepts	K2,K3
3	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning	K3,K4
4	Analyze the impact of machine learning on applications	K4,K5
5	Analyze and design a real world problem for implementation and understand the dynamic behavior of a system	K5,K6

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

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	M	S	S	M	S
CO3	S	M	S	S	S	S	M	S	S	M	S	S
CO4	S	S	S	S	S	S	S	S	S	S	M	S
CO5	S	S	S	S	M	S	S	S	S	M	M	S

S- Strong; M-Medium; L-Low

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
III	23P3CSC8	SOFT COMPUTING	4	4

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

COURSE OBJECTIVES:

- Develop the skill stoga in a basic under standing of neural net work theory and fuzzy logic theory.
- To understand supervised and unsupervised learning algorithms
- To enable the students to gain a basic understanding of neural networks.
- Toknow about fuzzy logic, fuzzy inference systems, and their functions.
- Toimpart basic knowledge on Genetic algorithms and their applications.

SYLLABUS		
UNITS	CONTENTS	No Of Hours
I	INTRODUCTION TO SOFT COMPUTING: Artificial Neural Networks- Biological Neurons- Basic Models of Artificial Neural Networks- Connections- Learning-Activation Functions- Important Terminologies of ANNs- Muculloch and Pitts Neuron-Linear Separability- Hebb Network- Flowchart of Training Process-Training Algorithm.	11
II	SUPERVISED LEARNING NETWORK : Perceptron Networks– Perceptron Learning Rule-Architecture-Flowchart for Training Process- Perceptron Training Algorithms for Single Output Classes-Perceptron Training Algorithm for Multiple Output Classes-Perceptron Network Testing Algorithm - Adaptive Linear Neuron-Delta Rule for Single Output Unit-Flowchart for training algorithm-Training Algorithm – Testing Algorithm - Multiple Adaptive Linear Neurons-Architecture-Flowchart of Training Process-Training Algorithm-Back Propagation Network-Architecture-	11

	Flowchart for Training Process-Training Algorithm-Learning Factors of Back-Propagation Network-Radial Basis Function Network- Architecture-Flowchart for Training Process-Training Algorithm.	
III	UNSUPERVISED LEARNING NETWORK: Associative Memory Networks - Auto Associative Memory Network-Architecture-Flowchart for Training Process-Training Algorithm-Testing Algorithm- Bidirectional Associative Memory- Architecture-Discrete Bidirectional Associative Memory-Iterative Auto Associative Memory Networks - Linear AutoAssociative Memory- Kohonen Self-Organizing Feature Map- Architecture-Flowchart for Training Process-Training Algorithm.	11
IV	INTRODUCTION TO FUZZY LOGIC: Classical Sets –Operations on Classical Sets-Fuzzy sets - Fuzzy Sets- Properties of Fuzzy Sets- Fuzzy Relations –Membership Functions: Fuzzification- Methods of Membership Value Assignments – Defuzzification – Lambda-Cuts for Fuzzy sets and Fuzzy Relations – Defuzzification Methods–Max-Membership Principle-Centroid Method-Weighted Average Method-Mean Max Membership-Center of Sums- Center of Largest Area-First of Maxima - Fuzzy Set Theory - Fuzzy Arithmetic And Fuzzy Measures: Fuzzy Measures – Belief and Plausibility Measures- Probability Measures-Possibility and Necessity Measures-Formation of Rules –Fuzzy Inference Systems (FIS) – Fuzzy Decision Making – Fuzzy Logic Control Systems.	12
V	GENETIC ALGORITHM: Introduction - Biological Background - Traditional Optimization and Search Techniques -Gradient Based Local Optimization Method-Random Search-Stochastic Hill Climbing-Simulated Annealing- Symbolic Artificial Intelligence-Operators in Genetic Algorithm - Encoding- Selection-Crossover-Mutation - Stopping Conditions for Genetic Algorithm Flow-Genetic Programming-Working of Genetic Programming-Characteristics of Genetic Programming-Data Representation.	11

TEXT BOOKS

1. Principles of Soft Computing, S.N. Sivanandam, S.N.Deepa, Wiley, Third Edition, 2019.
UNIT I:Chapter 1: 2.1,2.3,2.4,2.5,2.6,2.7
UNITII:Chapter 2: 3.2,3.3,3.4,3.5,3.6
UNIT III:Chapter 3:4.3,4.4,4.7,5.3
UNITIV:Chapter4: 7.2,7.3,8.4,9.3,9.4,10,10.2,10.3,10.4,11.4,12.8,14
UNIT V:Chapter 5: 15,15.2,15.3,15.4,15.9,15.10

Web Source :-

- 1.<https://www.ibm.com/downloads/cas/GB8ZMQZ3>
- 2.<https://www.javatpoint.com/artificial-intelligence-tutorial>
- 3.<https://nptel.ac.in/courses/106/105/106105077/>

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REFERENCE BOOKS

1. Das, A. (2018). Artificial Intelligence and Soft Computing for Beginners.
2. Amit, K. (2018). Artificial intelligence and soft computing: behavioral and cognitive modeling of the human brain. CRC press.
3. Rajasekaran, S., &Pai, G. V. (2011).Neural networks, fuzzy logic and genetic algorithm: synthesis and applications (with cd). PHI Learning Pvt. Ltd.
4. Jang, J. S. R., Sun, C. T., &Mizutani, E. (2004). Neuro-fuzzy and soft computing-a computational approach to learning and machine intelligence [BookReview].IEEETransactionsonautomaticcontrol,42(10),1482-1484Gupta, M. M. (2004).Soft computing and intelligent systems: theory and applications. Elsevier.
5. Jang, J. S. R., Sun, C. T., &Mizutani, E. (1997). Neuro-fuzzy and soft computing-a computational approach to learning and machine intelligence [Book Review].IEEE Transactions on automatic control,42(10), 1482- 1484.

Pedagogy:

Teaching / Learning methods: Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar. Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course outcomes:

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

CO1	To providean introduction to the basic principles, techniques, and applications of soft computing	K-1 K2	LO
CO2	To get familiar with Neural network architectures and supervised learning algorithms	K3	IO
CO3	To understand the architectures and algorithms of Unsupervised Learning techniques	K3- K4	HO
CO4	Develop the skills to gain a basic understanding of fuzzy logic theory and fuzzy inference systems	K4	IO
CO5	Ability to learn traditional optimization and search techniques and genetic programming	K5	HO

Mapping With Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	S	M	S	S	S	M	S	M	S	S
CO2	M	S	M	S	M	M	M	S	M	S	S	M
CO3	M	M	S	S	S	M	M	S	S	S	S	S
CO4	S	S	M	M	M	S	S	S	S	M	M	M
CO5	S	S	S	S	S	M	S	M	M	S	S	M

S- STRONG; M-MEDIUM; L-LOW

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
III	23P3CSC9	NETWORK SECURITY AND CRYPTOGRAPHY	5	4

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course objectives

<p>The main objectives of this course are to:</p> <ol style="list-style-type: none"> 1. Enable students to learn the Introduction to Cryptography, Web Security and Case studies in Cryptography. 2. To gain knowledge on classical encryption techniques and concepts of modular arithmetic and number theory. 3. To explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms. 4. To explore the design issues and working principles of various authentication Applications and various secure communication standards including Kerberos, IP sec, and SSL/TLS and email.

SYLLABUS		
UNITS	CONTENT	No Of Hours
I	<p>INTRODUCTION: Introduction to Cryptography – Security Attacks – Security Services – Security Algorithm- Stream cipher and Block cipher - Symmetric and Asymmetric-key Cryptosystem Symmetric Key Algorithms: Introduction – DES – Triple DES – AES – IDEA – Blowfish – RC5.</p>	14
II	<p>CRYPTOSYSTEM: Public-key Cryptosystem: Introduction to Number Theory-RSA Algorithm– Key Management -Diffie-Hellman Key exchange–Elliptic Curve Cryptography Message Authentication and Hash functions – Hash and Mac Algorithm – Digital Signatures and Authentication Protocol.</p>	14
III	<p>NETWORK SECURITY : Network Security Practice: Authentication Applications–Kerberos–X.509 Authentication services and Encryption Techniques. E-mail Security – PGP – S / MIME – IP Security.</p>	14

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IV	WEB SECURITY : Web Security-Secure Socket Layer–Secure Electronic Transaction. System Security-Intruders and Viruses – Firewalls– Password Security.	14
V	CASE STUDY : Implementation of Cryptographic Algorithms–RSA–DSA–ECC(C/JAVA Programming). Network Forensic – Security Audit - Other Security Mechanism: Introduction to: Stenography –Quantum Cryptography – Water Marking – DNA Cryptography	14

Text Books

1. William Stallings,“Cryptography and Network Security”, PHI/Pearson Education.
2. Bruce Schneir,“Applied Cryptography”, CRC Press.

Reference Books

1. A.Menezes, P Van Oorschot and S.Vanstone, “Hand Book of Applied Cryptography”, CRC Press, 1997
2. Ankit Fadia, ”Network Security”, Mac Millan.

Web resource

- <https://nptel.ac.in/courses/106/105/106105031/>
<http://www.nptelvideos.in/2012/11/cryptography-and-network-security.html>
<https://www.tutorialspoint.com/cryptography/index.htm>

Pedagogy: Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar. Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software

Course Outcomes:

On the successful completion of the course, student will be able to:		
1	Understand the process of the cryptographical algorithms	K1,K2
2	Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication	K2,K3
3	Apply and analyze appropriate security techniques to solve network security problem	K3,K4
4	Explore suitable crypto graphical algorithms	K4,K5
5	Analyze different digital signature algorithms to achieve authentication and design secure applications	K5,K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Mapping with Programming Outcomes :

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

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

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
III	23P3CSC10	BLOCK CHAIN TECHNOLOGIES	5	4

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

COURSE OBJECTIVES

- To understand about Blockchain is an emerging technology platform for developing decentralized applications and data storage.
- To comprehend fundamentals of Public Key Cryptography technology and Consensus Algorithms.
- To familiarize with Bitcoin Network, Bitcoin Clients, APIs and Payment technology of blockchain operations.
- To engage with Components of the Ethereum ecosystem.
- To grasp about Development Tools and Frameworks.

SYLLABUS

UNITS	CONTENTS	No Of Hours
I	Unit I: Blockchain, Decentralization Blockchain : The growth of blockchain technology - Distributed systems - The history of blockchain and Bitcoin - Blockchain - Consensus - CAP theorem and blockchain. Decentralization: Decentralization using blockchain - Methods of decentralization -Routes to decentralization - Blockchain and full ecosystem decentralization - Pertinent terminology - Platforms for decentralization - Innovative trends.	14
II	Unit II: Public Key Cryptography, Consensus Algorithms and Smart Contracts Public Key Cryptography: Asymmetric cryptography - Cryptographic constructs and blockchain technology. Consensus Algorithms: Introducing the consensus problem -Analysis and design - Classification - Algorithms - Choosing an algorithm. Smart Contracts: History - Definition - Ricardian contracts - Smart contract templates – Oracles - Deploying smart contracts – DAO.	14

III	<p>Unit III: Bitcoin Bitcoin: Bitcoin—an overview - Cryptographic keys - Transactions - Blockchain–Mining.Bitcoin Network and Payments:TheBitcoinnetwork - Wallets - Bitcoin payments -Innovation in Bitcoin - Advanced protocols - Bitcoin investment and buying and sellingBitcoin.Bitcoin Clients and APIs: Bitcoin client installation - Experimenting further with bitcoin-cli - Bitcoin programming.</p>	14
IV	<p>Unit IV: Alternative Coins Alternative Coins: Theoretical foundations - Difficulty adjustment and retargeting algorithms - Bitcoin limitations - Extended protocols on top of Bitcoin -Development of altcoins.Ethereum: Ethereum – an overview - Ethereum network - Components of the Ethereum ecosystem – EthereumVirtual Machine(EVM)-Smart contracts.-Blocksand blockchain-Wallets and client - Nodes and miners - APIs, tools, and DApps - Supporting protocols - Programming languages.</p>	14
V	<p>Unit V: Development Tools and Frameworks, Use Cases &Security Development Tools and Frameworks :Languages - Compilers - Tools and libraries - Frameworks - Contract development and deployment - Layout of a Soliditysourcecodefile-Soliditylanguage.UseCases:IoT–Government - Health -Finance – Media. Scalability and Other Challenges: Scalability - Privacy - Security - Other challenges.</p>	14

TEXT BOOKS

1. Imran Bashil, “Mastering Blockchain”, Second Edition Packet Publisher ISBN-968-1-7883-904-4
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder. Bitcoin and Cryptocurrency Technologies. Princeton University Press, 2016. ISBN 978-0691171692

REFERENCES

Andreas Antonopoulos. Mastering Bitcoin: Programming the open blockchain. O'Reilly Publishers, 2017. ISBN 978-9352135745

Web resource

1. <https://www.ibm.com/downloads/cas/GB8ZMQZ3>
2. <https://www.javatpoint.com/artificial-intelligence-tutorial>
3. <https://nptel.ac.in/courses/106/105/106105077/>

Pedagogy: Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar. Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software

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Course Outcomes

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

CO1:	Understand, apply and examine the characteristics of blockchain, bitcoin and consensus algorithm in centralized and decentralized methods.	K1-K6
CO2:	Comprehend and demonstrate the application of hashing and public key cryptography in protecting the blockchain.	K1-K6
CO3:	Understand and analyse the element soft rust in a Blockchain: validation, verification, and consensus.	K1-K6
CO4	Comprehend and evaluate the alternate coin, Ethereum and smart contract.	K1-K6
CO5	Grasp and apply the knowledge of Tools and languages for applications	K1-K6

K1-Remember,K2-Understand,K3-Apply,K4-Analyze,K5-Evaluate,K6- Create

Mapping Course outcomes with Programme outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	-	-	-	-	L	-	-	-	-	-	-
CO2	S	-	M	-	M	L	-	-	-	-	-	-
CO3	S	-	S	-	S	L	-	-	-	S	S	S
CO4	S	-	S	-	S	L	-	-	-	S	S	S
CO5	S	-	S	-	S	L	-	-	-	S	S	S

S- Strong; M-Medium; L-Low

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Semester	Course Code	Course Title	Hours of Teaching/ cycle	No.of. credits
III	23P3CSCIM	Industry Module - Data Visualization Lab	3	3

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

COURSE OBJECTIVES

- To learn the basic functions and operations of Excel and tableau
- To explore todesign, build, and deploy various charts for applications,
- To comprehend, design and deploy the label and heat map
- To understand and deploy dashboard
- To understand the functions of tableau for data process.

List of Programs

Note: Use the following Dataset

http://www.tableau.com/sites/default/files/training/global_superstore.zip

Implement the following using Excel

1. Create Piechart for Sales and Sales % by Country(sortedin descending order)
2. Create Barchart for Sales by Country by Year(rounded to nearest thousand and sorted by Grand Total)
3. Create Line char for Sales by Ship Mode(First Class, Same Day, Second Class and Standard Class)
4. Create Scatter chart for Sales by Ship Mode by Country (rounded to the nearest dollar and sorted by First Class)
5. Create heat map for Sales by Category by Sub-Category (in thousands and sorted by sales value in descending order)
6. Design and create the label for vendor list

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7. Design and create the dash board
Implement the following using Tableau
8. Sales by Ship Mode(FirstClass, SameDay, Second Class and Standard Class)
9. Sales by Ship Mode by Country (rounded to the nearest dollar and sorted by First Class)
10. Sales by Category by Sub-Category (in thousands and sorted by sales value in descending order)

Course Outcomes

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

CO1:	Enable to create and apply Spreadsheet and Tableau for various data processing	K1-K6
CO2:	Gains knowledge to create and design various visualization tools in Excel and Tableau.	K1-K6
CO3:	Comprehend, create and deploy labels and heat map.	K1-K6
CO4:	Enable to create and apply dashboard for various data processing	K1-K6
CO5:	Illustrate and apply data visualization tool for any data set	K1-K6

K1-Remember,K2-Understand,K3-Apply,K4-Analyze,K5- evaluate and K6- Create

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	L	M	S	-	-	-	-	-	-
CO2	S	M	S	S	S	M	-	-	-	-	-	-
CO3	S	S	S	S	S	S	-	-	-	-	-	-
CO4	S	M	M	S	M	L	-	-	-	-	-	-
CO5	M	S	M	L	S	M	-	-	-	-	-	-

S – Strong, M – Medium, L – Low

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
III	23P3CSEDC	Extra Disciplinary Course - DIGITAL MARKETING	4	3

Nature of the course

Relevant to Local need	√	Employability Oriented	√	Addresses Professional Ethics	√
Relevant to national need	√	Entrepreneurship Oriented	√	Addresses Gender Sensitization	
Relevant to regional need	√	Skill development Oriented	√	Addresses Environment and Sustainability	
Relevant to Global need	√			Addresses Human Values	√

Course Objectives

The main objectives of this course are:

To assess the evolution of digital marketing
To appraise the dimensions of online marketing mix
To infer the techniques of digital marketing
To analyse online consumer behaviour
To interpret data from social media and to evaluate game based marketing

SYLLABUS		
Unit	Content	No. of Hours
I	Introduction to Digital Marketing Digital Marketing – Transition from traditional to digital marketing – Rise of internet – Growth of e-concepts – Growth of e-business to advanced e-commerce – Emergence of digital marketing as a tool – Digital marketing channels – Digital marketing applications, benefits and limitations – Factors for success of digital marketing – Emerging opportunities for digital marketing professionals.	11
II	Online marketing mix Online marketing mix – E-product – E-promotion – E-price – E-place – Consumer segmentation – Targeting – Positioning – Consumers and online shopping issues – Website characteristics affecting online purchase decisions – Distribution and implication on online marketing mix decisions.	11

III	<p>Digital media channels Digital media channels – Search engine marketing – ePR – Affiliate marketing – Interactive display advertising – Opt-in-email marketing and mobile text messaging, Invasive marketing – Campaign management using – Facebook, Twitter, Corporate Blogs – Advantages and disadvantages of digital media channels – Metaverse marketing</p>	11
IV	<p>Online consumer behavior Online consumer behavior – Cultural implications of key website characteristics – Dynamics of online consumer visit – Models of website visits – Web and consumer decision making process – Data base marketing – Electronic consumer relationship management – Goals – Process – Benefits – Role – Next generation CRM.</p>	11
V	<p>Analytics and Gamification Digital Analytics – Concept – Measurement framework – Demystifying web data - Owned social metrics – Measurement metrics for Facebook, Twitter, YouTube, Slide Share, Pinterest, Instagram, Snapchat and LinkedIn – Earned social media metrics - Digital brand analysis – Meaning – Benefits – Components – Brand share dimensions – Brand audience dimensions – Market influence analytics – Consumer generated media and opinion leaders – Peer review – Word of mouth – Influence analytics – Mining consumer generated media – Gamification and game based marketing – Benefits – Consumer motivation for playing online games.</p>	12

Text Books:

1. Puneet Singh Bhatia, (2019) “Fundamentals of Digital Marketing”, 2nd Edition, Pearson Education Pvt Ltd, Noida.
2. Dave Chaffey, Fiona Ellis-Chadwick, (2019) “Digital Marketing”, Pearson Education Pvt Ltd, Noida.
3. Chuck Hemann & Ken Burbary, (2019) “Digital Marketing Analytics”, Pearson Education Pvt Ltd, Noida.
4. Seema Gupta, (2022) “Digital Marketing” 3rd Edition, McGraw Hill Publications Noida.
5. Kailash Chandra Upadhyay, (2021) “Digital Marketing: Complete Digital Marketing Tutorial”, Notion Press, Chennai.
6. Michael Branding, (2021) “Digital Marketing”, Empire Publications India Private Ltd, New Delhi.

Reference Books:

1. Vandana Ahuja, (2016) “Digital Marketing”, Oxford University Press. London.
2. Ryan Deiss & Russ Henneberry, (2017) “Digital Marketing”, John Wiley and Sons Inc. Hoboken.

Web references:

- <https://www.digitalmarketer.com/digital-marketing/assets/pdf/ultimate-guide-to-digital-marketing.pdf>
1. <https://uwaterloo.ca/centre-for-teaching-excellence/teaching-resources/teaching-tips/educational-technologies/all/gamification-and-game-based-learning>

Pedagogy: Teaching / Learning methods

Chalk and Talk, Lecture, Tutorial, Assignment, Quiz, Group Discussion, Seminar.

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Course Outcomes

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

CO Number	CO Statement	Cognitive Level
CO1	Explain the dynamics of digital marketing	K1, K2, K4
CO2	Examine online marketing mix	K2, K3
CO3	Compare digital media channels	K2, K4, K5
CO4	Interpret online consumer behavior	K6
CO5	Analyse social media data	K4,K6

Cognitive Level: K1 - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate; **K6** – Create

Mapping of Course Outcomes with Programme Outcomes and Programme Specific Outcomes.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CO1	3	3	2	3	3	3	3	3	3
CO2	3	3	2	3	3	3	3	3	3
CO3	3	3	2	2	3	2	3	3	2
CO4	3	3	2	2	3	3	3	3	3
CO5	3	3	1	3	3	2	3	3	2

3 - Strongly Correlated; 2 - Moderately Correlated;
1 - Weakly Correlated; 0 – No correlation

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
III	23P3CSAECC3	Ability Enhancement Compulsory Course - RESEARCH METHODOLOGY	4	3

Nature of the course

Employability Oriented	√	Relevant to Local need	√	Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to national need	√	Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to regional need	√	Addresses Human Values	√
		Relevant to Global development need	√	Addresses Professional Ethics	√

Course Objectives:

1. To understand the Research Methodology Concepts

SYLLABUS		
UNITS	CONTENT	No Of Hours
I	Use of complex theory in research –use of significance test for research – Measures of central tendency in research – use of Measure of dispersion in research – use of correlation in research. Use of regression analysis in research – use of significance test in research-use of t research.	1
II	Algorithmic Research : Algorithm Research Problems-Types: Polynomial Algorithm for Polynomial Problem-Exponential Algorithm for combinational /NP Hard Problem – Types of Solution Procedure- Algorithm: Complete Enumeration method –Branch and bound method-Heuristic- steps of development of algorithms – steps of Algorithmic Research- Design of Experiments and Comparison of Algorithm- Meta Heuristic for combinational problem : simulated Annealing-Genetics Algorithms – Table search.	1

Text Book:

Unit I : Hand Book of RESEARCH Methodology, Modern of New Techniques, By M.N.Brose, Shree, Niwas, Publication, Jaipur 2005. For

Unit II : Research Methodology, R.Panneer Selvam, Prentice Hall of India-2005.

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Web Services:

1. https://books.google.co.in/books/about/Research_Methodology.
2. https://www.researchgate.net/publication/376396540_Textbook_of_Research_Methodology

Course Outcomes :

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

CO1:	Identify a suitable research approach for your intended research.	K1-K6
CO2:	Identify and define the research problems, purpose and objectives of the Research	K1-K6
CO3:	Conduct a literature review on the research topic.	K1-K6
CO4:	Demonstrate knowledge, skills and applied competencies in scientific research and the nature, methods and process of conducting quantitative and qualitative research.	K1-K6
CO5:	Develop a research proposal.	K1-K6

Mapping Course outcomes with Programme outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M	S	M	M	S	M	M	M	M	M
CO2	M	S	M	M	S	M	S	M	M	M	M	M
CO3	M	M	M	M	M	M	M	M	M	M	M	M
CO4	M	S	S	S	S	M	M	M	M	M	M	M
CO5	M	M	M	M	M	M	M	M	M	M	M	M

S- Strong; M-Medium; L-Low

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
IV	23P4CSCP2	PRACTICAL: PYTHON PROGRAMMING LAB	4	3

Nature of the course

Relevant to Local need	√	Employability Oriented	√	Addresses Professional Ethics	√
Relevant to national need	√	Entrepreneurship Oriented	√	Addresses Gender Sensitization	
Relevant to regional need	√	Skill development Oriented	√	Addresses Environment and Sustainability	
Relevant to Global need	√			Addresses Human Values	√

Course Objectives:

The main objectives of this course are to:

1. This course presents an overview of elementary data items ,lists, dictionaries, sets and tuples
2. To understand and writesimple Pythonprograms
3. To Understand the OOPS concepts of Python
4. To develop web applications using Python

LIST OF PROGRAMS	75hours
<p>Implement the following in Python:</p> <ol style="list-style-type: none"> 1. Programs using elementary data items, lists, dictionaries and tuples 2. Programs using conditional branches, 3. Programs using loops. 4. Programs using functions 5. Programs using exception handling 6. Programs using in heritage 7. Programs using polymorphism 8. Programs to implement file operations. 9. Programs using modules. 10. Programs for creating dynamic and interactive WebPages using forms. 	

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Text Books

- 1 Bill Lubanovic, "Introducing Python", O' Reilly, First Edition-Second Release, 2014.
- 2 Mark Lutz, "Learning Python", O' Reilly, Fifth Edition, 2013.

Reference Books

- 1 David M. Beazley, "Python Essential Reference", Developer's Library, Fourth Edition, 2009.
- 2 Sheetal Taneja, Naveen Kumar, "Python Programming-A Modular Approach", Pearson Publications.

Web resource

<https://www.programiz.com/python-programming/>
<https://www.tutorialspoint.com/python/index.htm>
https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

Course outcomes

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

1	Able to write programs in Python using OOPS concepts	K1,K2
2	To understand the concepts of File operations and Modules in Python	K2,K3
3	Implementation of lists, dictionaries, sets and tuples as programs	K3,K4
4	To develop web applications using Python	K5,K6

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

Mapping with Programming Outcomes

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

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

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
IV	23P4CSCP3	PRACTICAL: WEB APPLICATION DEVELOPMENT AND HOSTING	3	2

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

LISTOF PROGRAMS	36 hours
<ol style="list-style-type: none"> 1. Develop a website for your college using advanced tags of HTML. 2. Write names of several countries in a paragraph and store it as an HTML document, world.html. Each country name must be a hot text. When you click India (for example), it must open india.html and it should provide a brief introduction about India. 3. Develop a HTML document to i)display Text with Bullets / Numbers - Using Lists ii) to display the Table Format Data 4. Develop a Complete Web Page using Frames and Framesets which gives the Information about a Hospital using HTML. 5. Write a HTMLdocumenttoprintyourBio-Datainaneatformatusingseveralcomponents. 6. Develop a HTML document to display a Registration Form foraninter-collegiate function. 7. Using HTML form accept Customer details like Name, City, Pin code, Phone number and Email address and validate the data and display appropriate messages for violations using PHP (Eg.Name is Mandatory field; Pin code must be 6digits, etc.). 8. Write a program to accept two numbers n1 and n2 using HTML form and display the Prime 	

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Text Books

- 1 Ivan Bayross, "Web Enabled Commercial Applications Development Using HTML, JavaScript, DHTML and PHP", BPB Publications, 4th Revised Edition, 2010.

Reference Books

- 2 A.K. Saini and Sumint Tuli, "Mastering XML", First Edition, New Delhi, 2002.

Web resource

- 1 <https://www.tutorialspoint.com/xml/index.htm>
- 2 https://www.tutorialspoint.com/internet_technologies/websites_development.htm
- 3 <https://www.youtube.com/watch?v=PlxWf493en4>

Course outcomes

On the successful completion of the course, student will be able to:		
1	Understand & implement the basic HTML tags to create static web pages	K1, K2
2	Capable of using hyperlinks, frames, images, tables, in a webpage	K2, K3
3	Able to write dynamic web applications using HTML forms	K4, K5
4	Must be able to write dynamic web applications in PHP & HTML tags using XAMPP.	K5, K6
K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create		

Mapping with Programming Outcomes:

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

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

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
IV	23P4CSEL5A	Elective - V PRACTICAL : INTERNET OF THINGS LAB	2	2

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives:

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

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***Note:** Questions may be asked from the *Self-Study* content for only CIA test (Mid and End semesters) and **NOT** for the external (Semester Examinations)

Pedagogy:Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar.Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course Outcomes

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

CO1	Implement IoT programs to turn ON/OFF LED	K1 - K6
CO2	Develop IoT programs for object detection	
CO3	Create IoT programs for agricultural purpose	
CO4	Implement web server program for local hosting	
CO5	Design IoT application for health monitoring	

K1-Remember,K2-Understand,K3-Apply,K4-Analyze,K5-Evaluate, K6-Create

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	S	S	M	S	S	M	S
CO3	S	M	S	S	S	S	M	S	S	M	S	S
CO4	S	S	S	S	S	S	S	S	S	L	M	S
CO5	S	S	S	S	M	S	L	S	S	M	M	S

S- Strong; M-Medium; L-Low

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
IV	23P4CSEL5B	Elective - V SOFT COMPUTING LAB	2	2

Nature of the course

Employability Oriented	√	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented	√	Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

<ol style="list-style-type: none"> 1. To implement various Supervised Neural Network-based approaches 2. To apply the fuzzy-based logical operations and arithmetic operations 3. To implement unsupervised neural network approaches 4. To solve a problem using a simple genetic algorithm 5. To implement logic gates.
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LIST OF PROGRAMS	75 hours
<ol style="list-style-type: none"> 1. Implementation of Logic gates using Artificial Neural Network. 2. Implementation of Perception Algorithm. 3. Implementation of Back Propagation Algorithm. 4. Implementation of Self Organizing Maps. 5. Implementation of Radial Basis Function Network. 6. Implementation of De-Morgan's Law. 7. Implementation of McCulloch Pits Artificial Neuron model 8. Implementation of Simple genetic algorithm 9. Implementation of fuzzy based Logical operations 10. Implementation of fuzzy based arithmetic operations 	

***Note:** Questions may be asked from the *Self-Study* content for only CIA test (Mid and End semesters) and **NOT** for the external (Semester Examinations)

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Pedagogy:Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar.Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course Outcomes :

On the successful completion of the course, student will be able to:		
1.	To apply supervised learning algorithms for real datasets	K1,K2
2.	To implement Unsupervised Learning techniques	K3,K4
3.	To apply fuzzy based arithmetic and logical operations	K4,K5
4.	To find solutions for problems using Genetic algorithm	K5,K6
5.	To implement DeMorgan's Law	
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Mapping with Programming Outcomes

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

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Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
IV	23P4CSSEC4	Skill Enhancement Course - Social Networking Lab	2	2

Course Objectives

- To familiarize the tools required to manage social network applications
- To analyze social networks like Facebook, LinkedIn, Google+, GitHub
- To teach the fundamental techniques and principles in achieving social networking environment.
- To enable students to have skills that will help them to solve real time applications.
- To get explore in the Github API.

List of Programs

1. Creating and Exploring Twitter's API
2. To analyzing and visualizing tweets and tweet entities with frequency analysis
3. Creating and Exploring Facebook's Social Graph API
4. To analyzing the Facebook's Social Graph connections
5. Creating and Exploring LinkedIn API
6. To downloading LinkedIn connections as a CSV file
7. Creating and Exploring Google+ API
8. To create and querying Human Language Data with TF-IDF
9. Creating and Exploring GitHub's API
10. To analyzing GitHub interest graph

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Course Outcomes

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

CO1:	To understand, implement and review the fundamental techniques and principles for social networks.	K1-K6
CO2:	To design and develop the programs using the tools required to develop and manage social network like Facebook, LinkedIn, Google+, GitHub	K1-K6
CO3:	To create and explore the functionality of social networking tools such as GitHub	K1-K6
CO4	To understand, implement and review the fundamental principles for social network graph.	K1-K6
CO5	To comprehend and critically analyse the existing API for social networks	K1-K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6- Create

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M		M	S	-	-	-	S	-	-
CO2	S	M	S	S	S	M	-	-	-	S	-	-
CO3	S	S	S	S	S	S	-	-	-	S	S	S
CO4	S	M	S	S	S	M	-	-	-	S	-	-
CO5	S	S	S	S	S	S	-	-	-	S	S	S

S- Strong; M-Medium; L-Low