

SENGUNTHAR ARTS AND SCIENCE COLLEGE

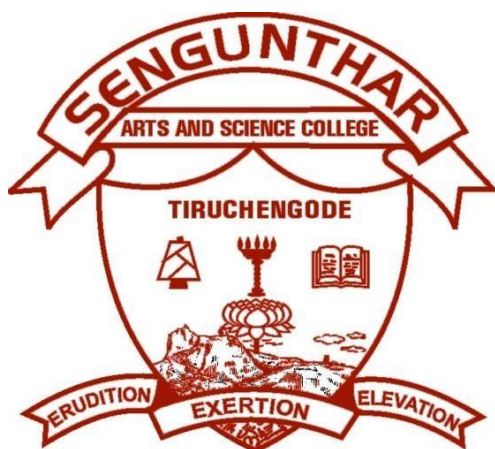
(Autonomous)

(Affiliated to Periyar University, Salem and Approved by AICTE, New Delhi)

An ISO 9001:2015 Certified Institution. Recognised under section 2(f) and 12(B) of the UGC Act 1956 and Accredited by NAAC with A⁺

TIRUCHENGODE – 637 205, NAMAKKAL DT., TAMILNADU

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SYLLABUS

B.Sc., COMPUTER SCIENCE
(ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)

(CBCS – LOCF)

(With effect from the Academic Year 2024-25 onwards)

Chairman

CDC

Principal

Correspondent

INTRODUCTION

B.Sc Computer Science (Artificial Intelligence and Data Science) is an undergraduate degree program that focuses on the study of computer science, artificial intelligence, and data science. It aims to provide students with a strong foundation in computer science principles, programming languages, software development, and artificial intelligence and data science applications.

The course structure is designed with Foundation courses in computer science, mathematics, and programming in the First Year, Intermediate courses in artificial intelligence and data science, including machine learning, data structures, and algorithms in the Second Year, Advanced courses in artificial intelligence and data science, including deep learning, natural language processing, data analytics project learning and industry internships in the Third Year.

The course focuses on industry-ready skills in artificial intelligence and data science, providing a strong foundation for further studies or careers in Artificial Intelligence/Machine Learning Engineer, Data Scientist, Data Analyst, Business Intelligence Developer, Natural Language Processing Specialist, Computer Vision Engineer, Robotics Engineer, and Data Architect.

AIM

The syllabus of this program is aimed at preparing the students with the latest developments and put them on the right track to fulfil the present requirements.

ELIGIBILITY FOR ADMISSION

Higher Secondary pass with Mathematics as one of the Subject. or Higher Secondary pass with Computer Science / Computer Applications / Information Technology / Computer Technology / Business Mathematics/ Statistics as one of the courses and have not studied Mathematics should undergo a bridge course on Mathematics for a minimum duration of 15 days.

PROGRAMME OUTCOMES

REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (CBCS) FOR UNDER GRADUATE	
Programme	B.Sc., COMPUTER SCIENCE (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)
Programme Code	24SUAD
Duration	UG-Three Years
Programme Outcomes (POs)	PO1: Disciplinary Knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study. PO2: Critical Thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; PO3: Problem Solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. PO4: Analytical Reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints. PO5: Scientific Reasoning: Ability to analyse, interpret and draw conclusions from quantitative / qualitative data; and critically evaluate ideas, evidence, and experiences from an open minded and reasoned perspective.

	PO6: Self-directed & Lifelong Learning: Ability to work independently, identify and manage a project. Ability to acquire knowledge and skills, including “learning how to learn”, through self-placed and self-directed learning aimed at personal development, meeting economic, social and cultural objectives. PO7: Reflective Thing: Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society. PO8: Reading & Projects: Document their reading and interpretive practices in assignments, translation works, and independent projects. PO9: Confidence & Effectiveness: Confidently and effectively articulate their literary and textual experiences. PO 10: Social Skills & Empathetic Approach: Reorganize a professional and reflective approach to leadership, responsibility, personal integrity, empathy, care and respect for others, accountability and self-regulation.
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Programme Specific Outcomes (PSO)

Programme Specific Outcomes (PSOs)	PSO-1. Graduates should be able to evolve AI based efficient domain specific processes for effective decision making in several domains such as business and governance domains for Artificial Intelligence and Data Science. PSO-2. Familiarize the students with suitable software tools of computer science and industrial applications to handle issues and solve. Problems in mathematics or statistics and real time application related sciences. PSO-3. Demonstrate the ability to create innovative solutions from idea to product, applying Scientific methods and tools. PSO-4. Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer Science and Industrial statistics. PSO-5. Apply the technical and critical thinking skills in the discipline of artificial Intelligence and Data Science to find solutions for complex problems.
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	Pos										PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CLO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CLO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CLO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CLO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Level of Correlation between POs and PSOs (*Suggested by UGC as per Six Sigma Tool – Cause and Effect Matrix*);

1 – Low, 2 – Medium, 3 – High, 0 – No Correlation

First Year
Semester – I

S.No	Course Category	Course Code	Title of the Course	Hrs/Week			Credit Points	Max Marks		
				L	T	P		CIA	ESE	Total
1	Part – I Language I	24S1UFTA01	பொதுத்தமிழ்-I	6	-	-	3	25	75	100
2	Part – II English Language I	24S1UFEN01	English-I	6	-	-	3	25	75	100
3	Part -III Core I	24S1UAD01	Data Structures	5	-	-	5	25	75	100
4	Part - III Core Practical I	24S1UADP01	Practical: Data Structures using C Lab	-	-	3	3	25	75	100
5	Part - III Generic Elective I		Choose from Annexure - I	4	-	-	3	25	75	100
6	Part - III Generic Elective Practical I		Choose from Annexure - I	-	-	2	2	40	60	100
7	Part – IV NME I	24S1UCSN01	Fundamentals of Information Technology	2	-	-	2	25	75	100
		24S1UCSN02	PC Hardware and Troubleshooting							
8	Part - IV Foundation Course I	24S1UADF01	FC – Programming in C and Word Processing	2	-	-	2	25	75	100
Total				25	-	05	23	215	585	800

Semester – II

S. No	Course Category	Course Code	Title of the Course	Hrs / Week			Credit Points	Max Marks		
				L	T	P		CIA	ESE	Total
1	Part - I Language II	24S2UFTA02	பொதுத்தமிழ்-II	6	-	-	3	25	75	100
2	Part - II English Language II	24S2UFEN02	English-II	6	-	-	3	25	75	100
3	Part - III Core II	24S2UAD02	Python Programming for Data Science	5	-	-	5	25	75	100
4	Part - III Core Practical II	24S2UADP02	Practical: Python Programming Lab	-	-	3	3	25	75	100
5	Part - III Generic Elective II		Choose from Annexure - I	4	-	-	3	25	75	100
6	Part - III Generic Elective Practical II		Choose from Annexure - I	-	-	2	2	40	60	100
7	Part – IV NME II	24S2UCSN03	Office Automation	2	-	-	2	25	75	100
		24S2UCSN04	Fundamentals of E-Commerce							
8	Part - IV SEC I		Choose from Annexure - II	2	-		2	25	75	100
Total				25	-	5	23	215	585	800

Second Year

Semester – III

S.No	Course Category	Course Code	Title of the Course	Hrs/Week			Credit Points	Max Marks		
				L	T	P		CIA	ESE	Total
1	Part – I Language III	24S3UFTA03	பொதுத்தமிழ்-III	6	-	-	3	25	75	100
2	Part - II English Language III	24S3UFEN03	English-III	6	-	-	3	25	75	100
3	Part - III Core III	24S3UAD03	Foundation of Artificial Intelligence	5	-	-	5	25	75	100
4	Part - III Core Practical III	24S3UADP03	Practical: Internet Programming Lab	-	-	3	3	25	75	100
5	Part - III Generic Elective III		Choose from Annexure – I	6	-	-	5	25	75	100
6	Part – IV SEC II		Choose from Annexure – II	2	-	-	2	25	75	100
7	Part – IV SEC III		Choose from Annexure – II	-	-	1	1	25	75	100
8	Part – IV EVS		Environmental Studies	1	-	-	-	-	-	-
Total				26		04	22	175	525	700

Semester – IV

S.No	Course Category	Course Code	Title of the Course	Hrs / Week			Credit Points	Max Marks		
				L	T	P		CIA	ESE	Total
1	Part – I Language IV	24S4UFTA04	பொதுத்தமிழ்-IV	6	-	-	3	25	75	100
2	Part - II English Language IV	24S4UFEN04	English-IV	6	-	-	3	25	75	100
3	Part - III Core IV	24S4UAD04	Fundamentals of Data Science	4	-	-	4	25	75	100
4	Part - III Core Practical IV	24S4UADP04	Practical: Database Programming Lab	-	-	3	3	25	75	100
5	Part - III Generic Elective IV		Choose from Annexure – I	4	-	-	4	25	75	100
6	Part - III Generic Elective Practical II		Choose from Annexure – I	-	-	2	2	40	60	100
7	Part – IV SEC IV		Choose from Annexure – II	2	-	-	2	25	75	100
8	Part – IV SEC V		Choose from Annexure – II	-	-	2	2	25	75	100
9	Part – IV EVS	24S4UES01	Environmental Studies	1	-	-	2	25	75	100
Total				23		07	25	240	660	900

Third Year
Semester – V

S.No	Course Category	Course Code	Title of the Course	Hrs/Week			Credit Points	Max Marks		
				L	T	P		CIA	ESE	Total
1	Part - III Core V	24S5UAD05	Ethics of Artificial intelligence	5	-	-	4	25	75	100
2	Part - III Core VI	24S5UAD06	Database Design and management	5	-	-	4	25	75	100
3	Part - III Core Practical V	24S5UADP05	Practical: Data Science Lab	-	-	5	4	25	75	100
4	Part - III Discipline Elective V		Elective Course - EC5 (Discipline Specific) Choose from Annexure I	4	-	-	3	25	75	100
5	Part - III Discipline Elective VI		Elective Course – EC6 (Discipline Specific) Choose from Annexure I	4	-	-	3	25	75	100
6	Part – III	24S5UADPR1	Project with Viva voce	-	-	5	4	25	75	100
7	Part – IV	24S5UVE01	Value Education	2	-	-	2	25	75	100
8	Part – IV	24S5UIT01	Internship / Industrial Training (Summer vacation at the end of IV semester activity)	-	-	-	2	-	-	-
Total				20		10	26	175	525	700

Semester – VI

S.No	Course Category	Course Code	Title of the Course	Hrs / Week			Credit Points	Max Marks		
				L	T	P		CIA	ESE	Total
1	Part - III Core VII	24S6UAD07	Robotic Process Automation	6	-	-	4	25	75	100
2	Part - III Core VIII	24S6UAD08	Natural Language Processing	6	-	-	4	25	75	100
3	Part - III Core Practical VI	24S6UADP06	Practical: Programming in UI Path Automation Lab	-	-	6	4	25	75	100
4	Part - III Discipline Elective VII		Elective Course – EC7 (Discipline Specific) Choose from Annexure I	5	-	-	3	25	75	100
5	Part - III Discipline Elective VIII		Elective Course – EC8 (Discipline Specific) Choose from Annexure I	5	-	-	3	25	75	100
6	Part – IV SEC VI		Skill Enhancement Course – SEC6 Choose from Annexure II	2	-	-	2	25	75	100
7	Part – IV		Extension Activity	-	-	-	1	-	-	-
Total				24		06	21	150	450	600
Cumulative Total (From Semester - I To Semester – VI)							140			4500

Annexure– I
Elective Course (EC1- EC8)(Generic /Discipline Specific)
Generic Specific Elective Course (EC1 – EC4)
Semester – I – EC1

S. No	Paper code	Paper Title
1	24S1UPHA01	Allied Physics-I
2	24S1UPHAP01	Allied Physics Practical-I
3		Numerical Methods-I
4		Digital Logic Fundamentals
5		Statistical Methods and its Application-I

Semester – II – EC2

S. No	Paper code	Paper Title
1	24S2UPHA02	Allied Physics-II
2	24S2UPHAP02	Allied Physics Practical-II
3		Numerical Methods-II
4		Nano Technology
5		Statistical Methods and its Application-II

Semester – III – EC3

S. No	Paper code	Paper Title
1	24S3UMAEG01	Introduction to Linear Algebra
2		Mathematics-I
3		Graph Theory and its Application
4		Nano Technology
5		Resource Management Techniques
6		Discrete Mathematics-I

Semester – IV – EC4

S. No	Paper code	Paper Title
1	24S4UMAEG04	Optimization Techniques
2	24S4UMAEGP01	Practical - Optimization Techniques
3		Mathematics-II
4		Statistical Practical
5		Discrete Mathematics-II

Discipline Specific Elective Course (EC5 – EC8)
Semester – V – EC5

S.No	Paper Code	Paper Title
1	24S5UADE01	Agile Project Management
2	24S5UADE02	Analytics For Service Industry
3	24S5UADE03	Artificial Intelligence
4	24S5UADE04	Artificial Neural Networks
5	24S5UADE05	Image Processing

Semester – V – EC6

S.No	Paper Code	Paper Title
1	24S5UADE06	Big Data Analytics
2	24S5UADE07	Robotics and Its Applications
3	24S5UADE08	Computing Intelligence
4	24S5UADE09	Cryptography
5	24S5UADE10	Software Project Management

Semester – VI – EC7

S.No	Paper Code	Paper Title
1	24S6UADE11	Fuzzy Logic
2	24S6UADE12	Grid Computing
3	24S6UADE13	Human Computer Interaction
4	24S6UADE14	Introduction to Data Science
5	24S6UADE15	Data Visualization

Semester – VI – EC8

S.No	Paper Code	Paper Title
1	24S6UADE16	Internet of Things And its Applications
2	24S6UADE17	Data Analytics
3	24S6UADE18	Cloud Computing
4	24S6UADE19	Virtual Reality
5	24S6UADE20	Cognitive Science and Analytics

Annexure-II
Skill Enhancement Course
Semester - II

S.No	Paper Code	Paper Title
1	24S2UADS01	Fundamentals of Information Technology
2	24S2UADS02	Introduction to HTML
3	24S2UADS03	Web Designing
4	24S2UADS04	Multimedia Systems

Semester - III

S.No	Paper Code	Paper Title
1	24S3UADS05	Data Analytics using R
2	24S3UADSP01	Data Analytics using R Lab
3	24S3UADS06	Data Analytics using Advanced Excel
4	24S3UADSP02	Data Analytics Using Advanced Excel Lab

Semester - IV

S.No	Paper Code	Paper Title
1	24S4UADS07	Machine Learning
2	24S4UADSP03	Practical: Machine Learning Lab
3	24S4UADS08	PHP Programming
4	24S4UADSP04	PHP Programming Lab

Semester - VI

S.No	Paper Code	Paper Title
1	24S6UADS09	Quantitative Aptitude
2	24S6UADS10	Cyber Forensics
3	24S6UADS11	Pattern Recognition
4	24S6UADS12	Enterprise Resource Planning

SEMESTER – I

FIRST YEAR - FIRST SEMESTER

CORE – DATA STRUCTURES

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1UAD01	CORE	Theory	Y	Y	-	5	5

Learning Objectives

- ❖ To understand the concept of abstract data types.
- ❖ To analyze linear data structures, such as lists, queues, and stacks, according to the needs of different applications.
- ❖ To demonstrate the concept of trees and its applications.
- ❖ To design, implement and analyze efficient tree structures to meet requirements such as searching, indexing, and sorting.
- ❖ To enhance the knowledge to solve problems as graph problems and implement efficient graph algorithms to solve them.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Analyze linear data structures, such as lists, queues, and stacks, according to the needs of different applications.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Demonstrate the concept of trees and its applications.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Learn the concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Design, implement and analyze efficient tree structures to meet requirements such as searching, indexing, and sorting.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Enhance the knowledge to solve problems as graph problems and implement efficient graph algorithms to solve them.	PO1, PO2, PO3, PO4, PO5, PO6

CORE – DATA STRUCTURES

Unit	Details	No. of Hours
I	Abstract Data Types (ADTs) – ADTs and classes – introduction to OOP – classes in Python – inheritance – namespaces – shallow and deep copying. Introduction to analysis of algorithms – asymptotic notations – recursion – analyzing recursive algorithms.	15
II	Linear Structures - List ADT – array-based implementations – linked list implementations – singly linked lists – circularly linked lists – doubly linked lists – applications of lists – Stack ADT – Queue ADT – double ended queues - Evaluation of expression Infix to Postfix Conversion-Multiple stack and Queue. Model Construction: Application of stack-Towers of Hanoi.	15
III	Sorting and Searching - Bubble sort – selection sort – insertion sort – merge sort - K-way Merging – quick sort – linear search – binary search – hashing – hash functions – collision handling – load factors, rehashing, and efficiency. Model Development: Sorting a list of names using Selection sort.	15
IV	Tree Structures - Tree ADT – Binary Tree ADT - Counting Binary Tree – tree traversals – binary search trees – AVL trees – heaps – multi-way search trees. Model Development: Shortest distance between two nodes in BST.	15
V	Graph Structures - Graph ADT – representations of graph – graph traversals – DAG – topological ordering – shortest paths – minimum spanning trees - Advanced Graph Algorithms. Model Development: Shortest Path using Dijkstra algorithm.	15
	Total	75
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Text books

- ❖ Ellis Horowitz, Sartaj Shani, “Data Structures”, Galgotia Publication, 2007.
- ❖ Ellis Horowitz, Sartaj Shani, Sanguthevar Rajasekaran, “Computer Algorithms”, Silicon Press, 2008.
- ❖ Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, “Data Structures & Algorithms in Python”, John Wiley & Sons Inc., 2013
- ❖ Lee, Kent D., Hubbard, Steve, “Data Structures and Algorithms with Python”, Springer Edition, 2015.

Reference books

- ❖ Jean-Paul, Tremblay & Paul G. Sorenson, “An Introduction to Data structures with Applications”, 2nd Edition, Tata McGraw Hill Company, 2008.
- ❖ Samanta.D, “Classic Data Structure”, 9th Edition, Prentice Hall of India Pvt Ltd, 2007.
- ❖ Seymour Lipschutz, “Data Structures”, 1st Edition, McGraw Hill Publications, 2014.
- ❖ Rance D. Necaie, “Data Structures and Algorithms Using Python”, John Wiley & Sons, 2011.
- ❖ Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, “Introduction to Algorithms”, Second Edition, McGraw Hill, 2002.

Web Resources

- ❖ <https://www.geeksforgeeks.org/data-structures/>

Mapping with Programme Outcomes: 3 - Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	3	3	2	2	3
CO3	3	3	2	2	3
CO4	3	3	2	3	2
CO5	3	3	2	3	2
Weightage	15	15	11	12	13
Weighted percentage of Course Contribution to POs	3.0	3.0	2.2	2.4	2.6

Course Coordinator

BOS Chairman

PRACTICAL: DATA STRUCTURES USING C LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1UADP01	CORE	Practical	-	-	Y	3	3

Learning Objectives

- ❖ To understand the concepts of ADTs
- ❖ To learn linear data structures-lists, stacks, queues
- ❖ To learn Tree structures and application of trees
- ❖ To learn graph structures and application of graphs
- ❖ To understand various sorting and searching

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the concept of Dynamic memory management, data types, and algorithms.	PO1
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues.	PO1, PO2
CO3	Describe the hash function and concepts of collision and its resolution methods.	PO4, PO6
CO4	Solve problem involving graphs, trees and heaps.	PO4, PO5, PO6
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data.	PO3, PO6

PRACTICAL: DATA STRUCTURES USING C LAB

Program List	No. of Hours
1. To compute the total of the digits in a specified positive integer. 2. To determine if the given number is an Armstrong number. 3. To compute the greatest common divisor of two integers utilizing a recursive algorithm. 4. To arrange the elements of the array in ascending sequence. 5. To execute matrix multiplication for two matrices. 6. To transfer the contents from one file to another. 7. To realize a stack data structure utilizing an array. 8. To realize a queue data structure utilizing an array. 9. To execute tree traversal techniques. 10. To construct the quick sort algorithm with an array-based implementation.	45
Total	45

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	3	3	2	1	1	2	1
CO2	3	2	2	3	1	3	1	2	1	1
CO3	3	1	3	2	2	3	1	1	2	2
CO4	2	1	3	3	2	1	1	2	2	1
CO5	3	2	2	1	3	3	2	1	1	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	1	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	3	2	3	3	3
Weightage	15	14	13	15	12
Weighted percentage of Course Contribution to POs	3.0	2.8	2.6	3.0	2.4

Course Coordinator

BOS Chairman

NME – I: FUNDAMENTALS OF INFORMATION TECHNOLOGY

Subject Code	Subject	Category	L	T	P	Hours	Credit
24SIUCSN01	NME	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ To understand basic concepts and terminology of information technology.
- ❖ To have a basic understanding of personal computers and their operation.
- ❖ To be able to identify data storage and its usage.
- ❖ To get great knowledge of software and its functionalities.
- ❖ To understand about operating system and their uses.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Learn the basics of computer, Construct the structure of the required things in computer, learn how to use it.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop organizational structure using for the devices present currently under input or output unit.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Learn the concept of storing data in computer using two headers namely RAM and ROM with different types of ROM with advancement in storage basis.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Work with different software, Write program in the software and applications of software.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Usage of Operating system in information technology which really acts as a interpreter between software and hardware.	PO1, PO2, PO3, PO4, PO5, PO6

NME – I: FUNDAMENTALS OF INFORMATION TECHNOLOGY

Unit	Details	No. of Hours
I	Introduction to Computers: Introduction, Definition, Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Types of Computers, Processor and Memory.	6
II	Basic Computer Organization: Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, and Touch Screen. Output Units: Monitors and its types. Printers: Impact Printers and its types. Non-Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers.	6
III	Storage Fundamentals: Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives. Model Presentation: Storage Devices	6
IV	Data Communication and Computer Networks: Basic Elements of a Communication System – Data Transmission Modes – Data Transmission Speed – Data Transmission Media – Digital and Analog Data Transmission.	6
V	Operating System: Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi-tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux. Hands on Training: Installation of Operating System	6
	Total	30
• Model Presentation and Hands on Training – related to the above topic are to be considered for Internal Exam only		

Text books

- ❖ NeeharikaAdabala , V. Rajaraman, “Fundamentals of Computers”, 6th Edition, PHI Learning, 2014.
- ❖ Alexis Leon, Mathews Leon, “Fundamental of Information Technology”, 2nd Edition, Vikas Publishing House Pvt Limited, 2009.
- ❖ S.K Bansal, “Fundamental of Information Technology”, APH Publishing Corporation, 2004.

Reference books

- ❖ E.Balagurusamy, “Fundamentals of Computers”, McGraw Hill Education, 2009.
- ❖ ReemaThareja, “Fundamentals of Computers”, 2nd Edition, Oxford University Press, 2019.
- ❖ Rajaraman, “Fundamentals of Computers”, 6th Edition, PHI Learning, 2014.

Web Resources

- ❖ <https://testbook.com/learn/computer-fundamentals>
- ❖ <https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html>
- ❖ <https://www.javatpoint.com/computer-fundamentals-tutorial>
- ❖ https://www.tutorialspoint.com/computer_fundamentals/index.htm
- ❖ <https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	2
CO5	3	3	2	3	3
Weightage	15	15	14	15	14
Weighted percentage of Course Contribution to POs	3.0	3.0	2.8	3.0	2.8

Course Coordinator

BOS Chairman

NME – I: PC HARDWARE AND TROUBLE SHOOTING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1UCSN02	NME	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ To understand the components on the motherboard.
- ❖ To perform system administration tasks.
- ❖ To understand different storage media.
- ❖ To understand system related problems.
- ❖ To learn about methods of troubleshooting.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Learn the basics of computer, Construct the structure of the required things in computer, learn how to use it.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop organizational structure using for the devices present currently under input or output unit.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Concept of storing data in computer using two headers namely RAM and ROM with different types of ROM with advancement in storage basis.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Work with different software, Write program in the software and applications of software.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Learn the usage of Operating System in information technology which really acts as interpreter between software and hardware.	PO1, PO2, PO3, PO4, PO5, PO6

NME – I: PC HARDWARE AND TROUBLE SHOOTING

Unit	Details	No. of Hours
I	BASIC HARDWARE CPU Essentials: The Buses -Processor Modes - Modern CPU concepts: CISC vs. RISC CPUs - Circuit Size and Die Size - Processor Speed - Processor Cooling - System Clocks - Processor Packages - Architectural Performance Features.	6
II	Memory: Essential memory concepts: Memory Organizational - Logical memory organization: Memory package - modules: Memory considerations -speed and wait – states – memory types - memory techniques - selection and installation of memory - getting the right amount - filling banks –Troubleshooting.	6
III	Motherboard: Components of Motherboards: Sockets and slots, Expansion slots-Memory slots - Chipsets - North bridge -South bridge - Form factor - Motherboard up-gradation - Considerations-Performing the Upgrade -Troubleshooting: Steps to identify whether repair or replace the motherboard.	6
IV	Power supplies and power management: Switching regulation - Potential power problems: Recognizing the problems -Dealing with the power problems –Up gradation; Power management in windows O.S - Troubleshooting: switching power supplies - power management.	6
V	Storage devices: The hard drive: Construction - IDE drive standard and features - Troubleshooting: The CD-ROM drive - Basics of CD-ROM drive -Construction- Trouble shooting; The DVD drive: DVD media - The DVD drive and decoder -Troubleshooting; Blue-Ray disc drive: Physical Media - Software standards - Troubleshooting; Flash Memory drive: Essential components of flash drive - Size and style of packaging – Troubleshooting.	6
	Total	30

Text books

- ❖ B. Ram, “Computers Fundamentals and Architecture”, 5th edition, New Age International Pvt Ltd, 2018.
- ❖ William Stallings, “Operating System”, 29th Edition, Pearson Education, 2018.

Reference books

- ❖ Craig Zacker & John Rourke, “The complete reference: PC hardware”, Tata McGraw Hill, New Delhi, 2001.
- ❖ Mike Meyers, “Introduction to PC Hardware and Troubleshooting”, Tata McGrawHill, New Delhi, 2003.
- ❖ B.Govindarajulu, “IBM PC and Clones hardware trouble shooting and maintenance”, Tata McGraw-Hill, New Delhi, 2002.

Web Resources

- ❖ <https://edu.gcfglobal.org/en/computerbasics/basic-troubleshooting-techniques/1/>
- ❖ <https://www.pluralsight.com/blog/tutorials/troubleshooting-hardware>
- ❖ <https://www.dummies.com/article/technology/computers/pcs/troubleshooting-maintaining-your-pc-all-in-one-for-dummies-cheat-sheet-208602/>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	2
CO5	3	3	2	3	3
Weightage	15	15	14	15	14
Weighted percentage of Course Contribution to POs	3.0	3.0	2.8	3.0	2.8

Course Coordinator

BOS Chairman

FC – PROGRAMMING IN C AND WORD PROCESSING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1UADF01	FOUNDATION COURSE	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ To impart knowledge about Computer fundamentals.
- ❖ To understand the concepts and techniques in C Programming.
- ❖ To equip and indulge themselves in problem solving using C.
- ❖ To introduce the concepts of Object-Oriented Programming Paradigm in C++.
- ❖ To understand about operating system and their uses.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Learn about the Computer fundamentals and the Problem solving and understand the basic concepts of C and C++ programming.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Demonstrate the various basic programming constructs like decision making statements. Looping statements and functions.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Analyze the object-oriented concepts like overloading, inheritance, polymorphism, Virtual functions, constructors and destructors.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Compare the various file stream classes; file types, usage of templates and exception Handling mechanisms, pros and cons of procedure-oriented language with the concepts of programming language.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop programs incorporating the programming constructs of object-oriented Programming concepts.	PO1, PO2, PO3, PO4, PO5, PO6

FC – PROGRAMMING IN C AND WORD PROCESSING

Unit	Details	No. of Hours
I	Overview of C: Introduction - Character set - C tokens - keyword & Identifiers - Constants - Variables - Data types - Declaration of variables - Assigning values to variables - Defining Symbolic Constants - Arithmetic, Relational, Logical, Assignment, Conditional, Bitwise, Special, Increment and Decrement operators - Arithmetic Expressions - Evaluation of expression - precedence of arithmetic operators - Type conversion in expression – operator precedence & associativity - Mathematical functions - Reading & Writing a character - Formatted input and output.	6
II	Decision Making, Looping and Arrays: Decision Making and Branching: Introduction – if, if...else, nesting of if...else statements else if ladder – The switch statement, The ?: Operator – The go to Statement. Decision Making and Looping: Introduction- The while statement- the do statement – the for statement-jumps in loops. Arrays – Character Arrays and Strings. Model Development: Matrix manipulation	6
III	Functions, Pointers and Files: Function Types: Built-in, User defined, Recursive and calling mechanism. Pointers: Definition, types, dynamic memory allocation. File: Basic file operations, file input/output functions. Model Development: Student data maintenance using file.	6
IV	Word Processing: Open, Save and close word document; Editing text – tools, formatting, bullets and numbering; Spell Checker - Document formatting – Paragraph alignment, indentation, headers and footers. Model Development: Design News paper content related to Sports article.	6
V	Page Layout: Margins, Orientation, Size, Page breaks and line numbers. Table creation: Insert, Delete, Merge: Hyperlinks: Internal and External. Mail merge: Composing and finalizing. Model Development: Prepare a seminar invitation and send it to various colleges using mail merge.	6
	Total	30
Model Presentation and Hands on Training – related to the above topic are to be considered for Internal Exam only		

Text books

- ❖ E. Balagurusamy, Programming in ANSI C, McGraw Hill Education (India), 2017.
- ❖ Scott Basham, “Microsoft Word in easy steps”, In Easy Steps Limited, 2021.

Reference books

- ❖ Yashavant Kanetkar, “Let Us C”, Bpb Publications, 2020.
- ❖ Joan Lambert, Curtis Frye, “Microsoft Office 2019 Step by Step”, Pearson Education, 2018.

Web Resources

- ❖ https://www.tutorialspoint.com/computer_programming/computer_programming_basic.htm
- ❖ <https://www.udemy.com/course/office-automation-certificate-course/>
- ❖ <https://www.javatpoint.com/automation-tools>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	1	1	2	1
CO2	3	3	3	3	2	3	1	2	1	1
CO3	3	3	3	3	3	3	2	1	1	2
CO4	3	3	3	3	3	3	2	2	1	1
CO5	3	3	3	3	3	3	1	1	2	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	1	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	3	3	3	3	3
Weightage	15	15	13	15	12
Weighted percentage of Course Contribution to POs	3.0	3.0	2.6	3.0	2.4

Course Coordinator

BOS Chairman

SEMESTER – II

FIRST YEAR - SEMESTER II
CORE – PYTHON PROGRAMMING FOR DATA SCIENCE

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2UAD02	CORE	Theory	Y	Y	-	4	4

Learning Objectives

- ❖ To know the basics of Python programming
- ❖ To develop Python programs with conditionals and loops
- ❖ To define Python functions and call them
- ❖ To use file and data sets for data analyzing.
- ❖ To visualize data in graphical format.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcome
CO1	Read, write, execute by hand simple Python programs. Structure simple Python programs for solving problems.	PO1, PO6
CO2	Decompose a Python program into functions.	PO2
CO3	Describe the hash function and concepts of collision and its resolution methods.	PO2, PO4
CO4	To use Python data structures - lists, tuple, dictionaries and fix input/output with files in Python.	PO4, PO6
CO5	Visualize the Data in different graphical format.	PO5, PO6

CORE – PYTHON PROGRAMMING FOR DATA SCIENCE

Unit	Details	No. of Hours
I	Introduction to Python: What is Data Science and why Data Science? Applications and Components of data Science, Why Python for Data Science? Introduction to Python, Types of IDE (Anaconda/PyCharm) Identifiers, Variables, Operators, Data Types, Conditions, Loops.	12
II	Introduction to Data Structures using Python: Strings: Introduction, functions, and operations on Strings, Application Programs on Strings. List: Introduction, functions and operations on List, Application Programs on Lists. Tuple: Introduction, functions, and operations on Tuple. Dictionaries: Introduction, functions and operations on Dictionaries, Application Programs on Dictionaries. Sets: Introduction, functions, and operations on Sets, Applications on Sets.	12
III	Functions, Modules and Collections: Functions Defining and Invoking functions, Scope, Parameter types Recursive functions, Built in Functions such as enumeration, zip, sorted, map, filter and Applications Modules in Python, creating custom modules and calling them Lambda functions, Collections, Iterators, Generators.	12
IV	Working with Databases and Text: File I/O operations: Reading and Writing data from various formats, Regular Expressions, Identifiers, Quantifiers. Application Programs on Regular Expressions. Working with Databases: Databases and Data Science, SQLite database and Insert, Update, Delete, Retrieve operations. Exception Handling: Need for Exception handling, Raising exceptions.	12
V	Object Oriented Programming using Python: Need for Static, Static members, Static functions Need for Encapsulation and Abstraction, Private Attributes, Getter, and Setter Methods– Python Implementation Inheritance: Need for Inheritance, Kinds of Inheritance Polymorphism Abstract methods, Overloading and Overriding. Exploratory Data Analysis: Statistics and Probability using Numpy Data Manipulation and Exploratory Data Analysis with Pandas - Matplotlib and Seaborn libraries for Visualization.	12
	Total	60
Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Text books

- ❖ Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016.
- ❖ Jake VanderPlas, “Python Data Science Handbook, Essential Tools for Working with Data”, O’Reilly Media, 2016.

Reference books

- ❖ John V Guttag, “Introduction to Computation and Programming Using Python”, Revised and expanded Edition, MIT Press, 2013
- ❖ Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, Pearson India Education Services Pvt. Ltd., 2016

Web Resources

- ❖ <https://www.python.org/about/gettingstarted/>
- ❖ <https://www.programiz.com/python-programming>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	2	1	3	3
CO3	3	3	3	2	3
CO4	3	3	3	2	3
CO5	3	3	3	3	3
Weightage	15	14	13	13	15
Weighted percentage of Course Contribution to POs	3.0	2.8	2.6	2.6	3.0

Course Coordinator

BOS Chairman

PRACTICAL: PYTHON PROGRAMMING LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2UADP02	CORE	Practical	-	-	Y	3	3

Learning Objectives

- ❖ To write, test, and debug simple Python programs
- ❖ To implement Python programs with conditionals and loops.
- ❖ To use functions for structuring Python programs.
- ❖ To represent compound data using Python lists, tuples and dictionaries.
- ❖ To read and write data from/to files/datasets in Python.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcome
CO1	Implement Python programs with conditionals and loops	PO1, PO4, PO5
CO2	Develop Python programs step-wise by defining functions and calling them.	PO1, PO4, PO6
CO3	Describe the hash function and concepts of collision and its resolution methods	PO1, PO3, PO6
CO4	Use Python lists, tuples, dictionaries for representing compound data	PO3, PO4
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO1, PO5, PO6

PRACTICAL: PYTHON PROGRAMMING LAB

List of Programs	No. of Hours
1. To construct the Fibonacci series. 2. To check the input value is Palindrome or not using function. 3. To compose the factorial for a given number using recursive function. 4. To find sum of the numbers for the elements of the array, list and directories. 5. To integrate error handling mechanism. 6. To integrate file management tasks. 7. To determine pass or fail status using classes and objects. 8. To load a CSV file with the Pandas library and display the first and last five rows of the dataset. 9. To interact with a database using SQL Queries. 10. To visualize a dataset using Matplotlib or Seaborn.	45
Total	45

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2
CO2	3	2	2	2	3
CO3	3	3	3	3	2
CO4	3	2	2	2	2
CO5	3	3	2	2	3
Weightage	15	12	11	11	12
Weighted percentage of Course Contribution to POs	3.0	2.4	2.2	2.2	3.4

Course Coordinator

BOS Chairman

NME – II: OFFICE AUTOMATION

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2UCSN03	NME	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ To understand the basics of computer systems and its components
- ❖ To understand and apply the basic concepts of a word processing package
- ❖ To understand and apply the basic concepts of electronic spread sheet software.
- ❖ To understand and apply the basic concepts of database management system.
- ❖ To understand and create a presentation using Power Point tool.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcome
CO1	Possess the knowledge on the basics of computers and its components	PO1, PO2, PO3, PO6
CO2	Gain knowledge on Creating Documents, spreadsheet and presentation.	PO1, PO2, PO3, PO6
CO3	Learn the concepts of Database and implement the Query in Database.	PO3, PO5
CO4	Demonstrate the understanding of different automation tools.	PO3, PO4, PO5
CO5	Utilize the automation tools for documentation, Calculation and presentation purpose.	PO4, PO6

NME – II: OFFICE AUTOMATION

Unit	Details	No. of Hours
I	Introductory concepts: Memory unit– CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems & its features: DOS– UNIX– Windows. Introduction to Programming Languages.	6
II	Word Processing: Open, Save and close word document; Editing text–tools, formatting, bullets; Spell Checker-Documents formatting– Paragraph alignment, indentation, headers and footers, numbering; printing–Preview, options, merge.	6
III	Spreadsheets: Excel – opening, entering text and data, formatting, navigating; Formulas– entering, handling and copying; Charts– creating, formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics.	6
IV	Database Concepts: The concept of data base management system; Data field, records, and files, Sorting and indexing data; Searching records. Designing queries, and reports; Linking of data files; Understanding Programming environment in DBMS; Developing menu drive applications in query language (MS–Access).	6
V	Power point: Introduction to Power point - Features –Understanding slide typecasting & viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition– Animation effects, audio inclusion, timers.	6
	Total	30

Text books

- ❖ Peter Norton, “Introduction to Computers”, Tata McGraw-Hill, 6th edition, 2008.

Reference books

- ❖ Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, “Microsoft 2003”, Tata McGraw Hill, 2003.

Web Resources

- ❖ <https://www.udemy.com/course/office-automation-certificate-course/>
- ❖ <https://www.javatpoint.com/automation-tools><https://www.python.org/about/gettingstarted/>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	1	2	3	1	3	1	2
CO2	3	3	3	1	1	3	2	1	1	1
CO3	2	2	3	1	3	2	3	1	2	1
CO4	2	1	3	3	3	2	3	2	1	2
CO5	2	2	1	3	2	3	3	3	1	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	14	14	15	15
Weighted percentage of Course Contribution to POs	3.0	2.8	2.8	3.0	3.0

Course Coordinator**BOS Chairman**

NME – II: FUNDAMENTALS OF E-COMMERCE

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2UCSN04	NME	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ To understand the basics of E-Commerce
- ❖ To understand the basic concepts of EDI
- ❖ To learn the importance and functionalities of Security tools.
- ❖ To understand the basic concepts of Consumer oriented applications.
- ❖ To understand the payment system in various modes.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcome
CO1	Possess the knowledge on the basics of commerce in different platforms.	PO1, PO2, PO3, PO6
CO2	Gain knowledge regarding Electronic Data Interchange.	PO1, PO2, PO3, PO6
CO3	Learn the different security tools like Firewall.	PO3, PO5
CO4	Demonstrate the understanding of different consumer-oriented applications.	PO3, PO4, PO5
CO5	Utilize the different payment modes on different platforms.	PO4, PO6

NME – II: FUNDAMENTALS OF E-COMMERCE

Unit	Details	No. of Hours
I	E-Commerce – meaning - Evolution in India – Traditional commerce Vs E-Commerce – Factors driving the growth of E-Commerce – benefits and limitations – business models for E-Commerce – E-Commerce opportunities in India and challenges.	6
II	Electronic Data Interchange – Benefits – EDI Legal, Security and Privacy issues – EDI software implementation – Value Added Network – Internal Information Systems – Work flow automization and Coordination – Customization and internal commerce.	6
III	Network security and firewalls – Client Server Network Security – Emerging client server security threats – Firewalls and network security – Data and message security – Encrypted documents and electronic mail – Hypertext publishing – Technology behind the web – Security and the web.	6
IV	Consumer Oriented Electronic Commerce: Consumer Oriented Applications – Mercantile Process Models – Mercantile Models from the Consumers Perspective – Mercantile Models from the Merchants Perspective. Web advertisement: Online advertising methods – advertising strategies and promotions.	6
V	Electronic Payment Systems – Types – Digital Token Based Electronic Payment System – Smart Card & Credit Card Electronic Payment Systems – Risk – Designing Electronic Payment System. Mobile Commerce – benefits – products and service of M-Commerce.	6
	Total	30

Text books

- ❖ P.T.Joseph, S.J., E-Commerce - An Indian Perspectivel, 5th Edition, PHI, 2023.

Reference books

- ❖ David Whiteley, E-Commerce Strategy, “Technologies and Applications”, Tata McGraw Hill, 2001.
- ❖ Ravi Kalakota, Andrew B Whinston, “Frontiers of Electronic Commerce”, 12th Impression, Pearson, 2006.

Web Resources

- ❖ <https://www.docsity.com/en/e-commerce-notes-pdf-lecture-notes-universitylevel/2484734/>
- ❖ <https://magnetoitsolutions.com/blog/advantages-and-disadvantages-of-ecommerce>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	1	1	2	1
CO2	3	3	3	3	3	3	1	2	1	1
CO3	3	3	3	3	3	3	2	1	1	2
CO4	3	3	3	3	3	3	2	2	1	1
CO5	3	3	3	3	3	3	1	1	2	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	14	14	15	15
Weighted percentage of Course Contribution to POs	3.0	2.8	2.8	3.0	3.0

Course Coordinator

BOS Chairman

SEMESTER – III

SECOND YEAR - THIRD SEMESTER
CORE– FOUNDATION OF ARTIFICIAL INTELLIGENCE

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3UAD03	CORE	Theory	Y	Y	-	5	5

Learning Objectives

- ❖ To understand the basic concepts of intelligent agents
- ❖ To develop general-purpose problem-solving agents, logical reasoning agents and agents that reason under uncertainty.
- ❖ To employ AI techniques to solve some of today's real-world problems.
- ❖ To analyze the implications of applying AI systems to organizations and future of work.
- ❖ To explain how to develop AI systems to meet business, organizational, and technology requirements.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand autonomous agents that make effective decisions in fully informed, partially observable and adversarial settings.	PO1
CO2	Choose appropriate algorithms for solving given AI problems	PO1, PO2
CO3	Design and implement logical reasoning agents.	PO4, PO5
CO4	Demonstrate agents that can reason under uncertainty	PO4, PO5
CO5	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.	PO3, PO4

CORE– FOUNDATION OF ARTIFICIAL INTELLIGENCE

Unit	Details	No. of Hours
I	Introduction to AI –Agents and Environments –Concept of rationality – Nature of environments –Structure of agents Problem solving agents – search algorithms –uninformed search strategies.	15
II	Heuristic search strategies –heuristic functions. Local search and optimization problems –local search in continuous space –search with non-deterministic actions –search in partially observable environments –online search agents and unknown environments.	15
III	Game theory – Optimal decisions in games –alpha-beta search – Montecarlo Tree Search – Stochastic games –Partially Observable games. Constraint satisfaction problems –constraint propagation – backtracking search for CSP –local search for CSP –structure of CSP. Model Development: Search using Backtracking	15
IV	Knowledge-based Agents –Propositional Logic –Propositional Theorem Proving – Propositional Model Checking –agents based on propositional logic. First-order logic –syntax and semantics – knowledge representation and engineering –inferences in first-order logic –forward chaining –backward chaining –resolution.	15
V	Ontological engineering –categories and objects –events –mental objects and modal logic – reasoning systems for categories – reasoning with default information. Classical planning – algorithms for classical planning –heuristics for planning – hierarchical planning – Planning and Acting in Nondeterministic domains –time, schedule, and resources –analysis. Quantifying uncertainty – Bayes rule and its use – Naïve Bayes models. Model Development: Text Classification with Naïve Bayes.	15
	Total	75
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Stuart Russel and Peter Norvig, —Artificial Intelligence: A Modern Approach, Fourth Edition, Pearson Education, 2020.
- ❖ Dan W. Patterson, —Introduction to AI and ESL, Pearson Education, 2007.
- ❖ Kevin Night, Elaine Rich, and Nair B., —Artificial Intelligencel, McGraw Hill, 2008.

Reference books

- ❖ Patrick H. Winston, "Artificial Intelligence", Third edition, Pearson Edition, 2006.
- ❖ Deepak Khemani, —Artificial Intelligence, Tata McGraw Hill Education, 2013.
- ❖ Artificial Intelligence by Example: Develop machine intelligence from scratch using real artificial intelligence use cases -by Dennis Rothman, 2018.

Web Resources

- ❖ https://www.tutorialspoint.com/artificial_intelligence/index.htm
- ❖ <https://www.javatpoint.com/artificial-intelligence-ai>

Mapping with Programme Outcomes: 3 - Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2
CO2	3	3	3	2	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	2	3
Weightage	15	15	14	12	14
Weighted percentage of Course Contribution to POs	3.0	3.0	2.4	2.4	2.8

Course Coordinator

BOS Chairman

PRACTICAL: INTERNET PROGRAMMING LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3UADP03	CORE	Practical	-	-	Y	3	3

Learning Objectives

- ❖ To introduce the concepts of Object-Oriented Programming Paradigm and the Programming constructs of JAVA
- ❖ To use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.
- ❖ To read and make elementary modifications to Java programs that solve real-world problems.
- ❖ To validate input in a Java program.
- ❖ To document a Java program using Javadoc.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Apply the various basic programming constructs of JAVA like decision making statements.	PO1
CO2	Looping statements, overloading, inheritance, polymorphism, constructors And destructors.	PO1, PO2
CO3	Illustrate the concepts of the reading and multi-threading.	PO4, PO6
CO4	Design programs using various file stream classes; file types and frames.	PO4, PO5, PO6
CO5	An exposure to create real time applications using JAVA.	PO3, PO5

PRACTICAL: INTERNET PROGRAMMING LAB

Program List	No. of Hours
1. To develop a Java Applications to extract a portion of a character string and print the extracted string. 2. To implement a Java Program for sorts the elements, find the minimum and maximum value in the array. 3. To develop a Java Program to implement the concept of multiple inheritance using Interfaces. 4. To develop a Java Program to handle an Exception. 5. To develop a Java Program to implement the concept of multi-threading with the use of any three multiplication tables and assign three different priorities to them. 6. To develop a Java Program to draw several shapes in the created windows 7. To demonstrate the Multiple Selection List-box. 8. To create a simple arithmetic calculator with text field, buttons. 9. To create frames which respond to the mouse clicks. 10. To draw circle, square, ellipse and rectangle at the mouse click positions	45
Total	45

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	3	3	2	1	1	2	1
CO2	3	2	2	3	1	3	1	2	1	1
CO3	3	1	3	2	2	3	1	1	2	2
CO4	2	1	3	3	2	1	1	2	2	1
CO5	3	2	2	1	3	3	2	1	1	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3
Weightage	15	14	11	15	15
Weighted percentage of Course Contribution to POs	3.0	2.8	2.2	3.0	3.0

Course Coordinator**BOS Chairman**

SEMESTER – IV

SECOND YEAR - FOURTH SEMESTER
CORE – FUNDAMENTALS OF DATA SCIENCE

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4UAD04	CORE	Theory	Y	Y	-	4	4

Learning Objectives

- ❖ To acquire skills in data preparatory and preprocessing steps
- ❖ To understand the mathematical skills in statistics
- ❖ To learn the tools and packages in Python for data science
- ❖ To gain understanding in classification and Regression Model
- ❖ To acquire knowledge in data interpretation and visualization techniques

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Apply the skills of data inspecting and cleaning.	PO1, PO2, PO6
CO2	Determine the relationship between data dependencies using statistics	PO2, PO3, PO5
CO3	Understand the can handle data using primary tools used for data science	PO1, PO3, PO5
CO4	Represent the useful information using mathematical skills.	PO2, PO6
CO5	Apply the knowledge for data describing and visualization using tools	PO1, PO3, PO6

CORE– FUNDAMENTALS OF DATA SCIENCE

Unit	Details	No. of Hours
I	Need for data science –benefits and uses –facets of data – data science process –setting the research goal – retrieving data – cleansing, integrating and transforming data –exploratory data analysis –build the models – presenting and building applications.	12
II	Frequency distributions –Outliers –relative frequency distributions –cumulative frequency distributions – frequency distributions for nominal data –interpreting distributions –graphs – averages –mode –median –mean–averages for qualitative and ranked data. Model Construction: Frequency Distributions.	12
III	Normal distributions –z scores –normal curve problems – finding proportions –finding scores – more about z scores –correlation – scatter plots –correlation coefficient for quantitative data – computational formula for correlation coefficient.	12
IV	Basics of Numpy arrays, aggregations, computations on arrays, comparisons, structured arrays, Data manipulation, data indexing and selection, operating on data, missing data, hierarchical indexing, combining datasets –aggregation and grouping, pivot tables.	12
V	Visualization with matplotlib, line plots, scatter plots, visualizing errors, density and contour plots, histograms, binnings, and density, three-dimensional plotting, geographic data, Visualization with Seaborn.	12
	Total	60
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

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

Reference books

- ❖ Allen B. Downey, —Think Stats: Exploratory Data Analysis in Python®, Green Tea Press, 2014.

Web Resources

- ❖ <https://www.geeksforgeeks.org/data-science-tutorial/>
- ❖ <https://www.w3schools.com/datascience>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	2
CO2	3	3	3	2	3
CO3	2	2	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	14	14	14	14	14
Weighted percentage of Course Contribution to POs	2.8	2.8	2.8	2.8	2.8

Course Coordinator

BOS Chairman

PRACTICAL: DATABASE PROGRAMMING LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4UADP04	CORE	Practical	-	-	Y	3	3

Learning Objectives

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

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the database development life cycle.	PO1
CO2	Design relational database using conceptual-to-relational mapping, Normalization.	PO1, PO2
CO3	Apply SQL for creation, manipulation and retrieval of data.	PO4, PO6
CO4	Develop database applications for real-time problems.	PO4, PO5, PO6
CO5	Query object-relational databases.	PO3, PO5

PRACTICAL: DATABASE PROGRAMMING LAB

Program List	No. of Hours
1. Database Development Life cycle: Problem definition and Requirement analysis Scope and Constraints 2. Database design using Conceptual modeling (ER-EER) –top-down approach. Mapping conceptual to relational database and validate using Normalization 3. To implement the database using SQL Data definition with constraints, Views. 4. To query the database using SQL Manipulation 5. To querying/managing the database using SQL Programming: Stored Procedures/Functions -Constraints and security using Triggers 6. Database design using Normalization –bottom-up approach 7. Develop database applications. 8. Create a table for Employee details with Employee Number as primary key and following fields: Name, Designation, Gender, Age, Date of Joining and Salary. Insert at least ten rows and perform various queries using any one Comparison, Logical, Set, Sorting and Grouping operators. 9. Write a PL/SQL to update the rate field by 20% more than the current rate in inventory table which has the following fields: Product_No, Product_Name and Rate. After updating the table a new field (Alter) called for Number of item and place for values for the new field without using PL/SQL block. 10. Querying the Object-relational database using Object Query language.	45
Total	45

Mapping with Programme Outcomes: 3-Strong, 2–Medium,1–Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	3	3	2	1	1	2	1
CO2	3	2	2	3	1	3	1	2	1	1
CO3	3	1	3	2	2	3	1	1	2	2
CO4	2	1	3	3	2	1	1	2	2	1
CO5	3	2	2	1	3	3	2	1	1	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3
Weightage	15	14	11	15	15
Weighted percentage of Course Contribution to POs	3.0	2.8	2.2	3.0	3.0

Course Coordinator**BOS Chairman**

SEMESTER – V

THIRD YEAR - FIFTH SEMESTER
CORE– ETHICS OF ARTIFICIAL INTELLIGENCE

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S5UAD05	CORE	Theory	Y	Y	-	5	4

Learning Objectives

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

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the ethical issues in the development of AI agents	PO1
CO2	Learn the ethical considerations of AI with perspectives on ethical values	PO1, PO2
CO3	Apply the ethical policies in AI based applications and Robot development	PO4, PO6
CO4	To implement the AI concepts to societal problems by adapting the legal concepts by securing fundamental rights	PO4, PO5, PO6
CO5	Overcome the evil genesis in the concepts of AI	PO3, PO6

CORE– ETHICS OF ARTIFICIAL INTELLIGENCE

Unit	Details	No. of Hours
I	Role of Artificial Intelligence in Human Life, Understanding Ethics, Why Ethics in AI? Ethical Considerations of AI, Current Initiatives in AI and Ethics, Ethical Issues with our relationship with artificial Entities	15
II	AI Governance by Human-right centered design, Normative models, Role of professional norms, Teaching Machines to be Moral.	15
III	Accountability in Computer Systems, Transparency, Responsibility and AI. Race and Gender, AI as a moral right-holder - Troubleshooting AI and Consent.	15
IV	Perspectives on Ethics of AI, Integrating ethical values and economic value, Automating origination, AI a 15 Binary approach, Machine learning values, Artificial Moral Agents	15
V	Ethics of Artificial Intelligence in Transport, Ethical AI in Military, Biomedical research, Patient Care, Public Health, Robot Teaching, Pedagogy, Policy, Smart City Ethics.	15
	Total	75
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

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

Reference books

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

Web Resources

- ❖ https://www.tutorialspoint.com/artificial_intelligence/index.htm
- ❖ <https://www.javatpoint.com/artificial-intelligence-ai>

Mapping with Programme Outcomes: 3 - Strong,2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	2	2	3
CO2	3	3	2	2	1	2
CO3	3	3	3	2	3	2
CO4	3	3	3	3	2	2
CO5	3	3	3	2	2	2
Weightage	15	14	14	11	10	11
Weighted percentage of Course Contribution to POs	3.0	2.8	2.8	2.2	2.0	2.2

Course Coordinator

BOS Chairman

PRACTICAL: DATA SCIENCE LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S5UADP05	CORE	Practical	-	-	Y	5	4

Learning Objectives

- ❖ To understand the concept and components of Power BI service.
- ❖ To apply the relevant tools and features of Power BI in creating the dashboard
- ❖ To analyze the different business problems with respect to Power BI features.
- ❖ To examine the relationship between dashboards and reports, visualizations and filters.
- ❖ To create the dashboard for the business visualization and forecasting

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the concept and components of Power BI service.	PO1
CO2	Apply the relevant tools and features of Power BI in creating the dashboard	PO1, PO2
CO3	Analyze the different business problems with respect to Power BI features.	PO4, PO6
CO4	Examine the relationship between dashboards and reports, visualizations and filters.	PO4, PO5, PO6
CO5	create the dashboard for the business visualization and forecasting.	PO3, PO6

PRACTICAL: DATA SCIENCE LAB

Program List	No. of Hours
1. Business Data Import and Cleaning Using Power Query 2. Creating of Basic Business Report in Power Bi 3. Customer Segmentation Using Unpivot and Grouping Techniques 4. Dashboards with KPIs Indicators and Cards 5. Market Analysis Using Slicers and Filters in Power Bi 6. Interactive Sales Dashboards Using Drill-Down and Bookmarks 7. Geo Mapping of sales using map and Q&A visuals 8. Creating and Using DAX measures for financial metrics 9. Create a multi-page dashboard with synced slicers and business visuals 10. Report publishing and sharing with business stakeholders	75
Total	75

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	3	3	2	1	1	2	1
CO2	3	2	2	3	1	3	1	2	1	1
CO3	3	1	3	2	2	3	1	1	2	2
CO4	2	1	3	3	2	1	1	2	2	1
CO5	3	2	2	1	3	3	2	1	1	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	2
CO2	3	3	3	2	2	3
CO3	2	2	1	3	3	3
CO4	3	3	3	3	3	2
CO5	3	3	3	3	3	2
Weightage	14	14	13	14	14	12
Weighted percentage of Course Contribution to POs	2.8	2.8	2.6	2.8	2.8	2.4

Course Coordinator

BOS Chairman

CORE– DATABASE DESIGN AND MANAGEMENT

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S5UAD06	CORE	Theory	Y	Y	-	5	4

Learning Objectives

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

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the database development life cycle and apply conceptual modeling	PO1
CO2	Apply SQL and programming in SQL to create, manipulate and query the database	PO1, PO2
CO3	Apply the conceptual-to-relational mapping and normalization to design relational database(DML)	PO4, PO6
CO4	Determine the serializability of any non-serial schedule using concurrency techniques on multiple tables.	PO4, PO5, PO6
CO5	learn data model and querying in object-relational and No-SQL databases	PO3, PO6

CORE– DATABASE DESIGN AND MANAGEMENT

Unit	Details	No. of Hours
I	Database environment –Database system development lifecycle – Requirements collection – Database design - Entity-Relationship model –Enhanced-ER model.	15
II	Relational model concepts --Integrity constraints -SQL Data manipulation –SQL Data definition –Views --SQL programming – Triggers.	15
III	ER and EER-to-Relational mapping –Update anomalies – Functional dependencies-Inference rules Minimal cover – Properties of relational decomposition –Normalization up to BCNF.	15
IV	Transaction concepts –properties –Schedules Serializability – Concurrency Control –Two-phase locking techniques – Database Recovery.	15
V	Mapping EER to ODB schema –Object identifier reference types – row types –UDTs –Subtypes and super types –user-defined routines –Collection types Object Query Language.	15
	Total	75
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

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

Reference books

- ❖ Toby Teorey, Sam Lightstone, Tom Nadeau, H. V. Jagadish, —DATABASE MODELING AND DESIGN -Logical Design, Fifth Edition, Morgan Kaufmann Publishers, 2011.
- ❖ Carlos Coronel, Steven Morris, and Peter Rob, Database Systems: Design, Implementation, and Management, Ninth Edition, Cengage learning, 2012
- ❖ Abraham Silberschatz, Henry F Korth, S Sudharshan, —Database System Concepts", 6th Page 37 of 84 Edition, Tata Mc Graw Hill, 2011.
- ❖ Hector Garcia-Molina, Jeffrey D Ullman, Jennifer Widom, "Database Systems:The Complete Book", 2nd edition, Pearson.

- ❖ S Sumathi, S Esakkirajan, — Fundamentals of Relational Database Management Systems, (Studies in Computational Intelligence), Springer-Verlag, 2007.
- ❖ Raghu Ramakrishnan, —Database Management Systems", 4th Edition, Tata Mc Graw Hill, 2010.

Web Resources

- ❖ <https://www.javatpoint.com/dbms-tutorial>

Mapping with Programme Outcomes: 3 - Strong,2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage	15	12	10	11	12	13
Weighted percentage of Course Contribution to POs	3.0	2.4	2.0	2.2	2.4	2.6

Course Coordinator

BOS Chairman

SEMESTER – VI

THIRD YEAR - SIXTH SEMESTER
CORE – ROBOTIC PROCESS AUTOMATION

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UAD07	CORE	Theory	Y	Y	-	6	4

Learning Objectives

- ❖ To introduce the fundamental concept sand techniques of natural language processing(NLP)
- ❖ To model the workflow of different scrapping methodologies
- ❖ To understand how the Citrix and the Image Recognition can be helpful
- ❖ To understand Image, Text and Data Tables Automation
- ❖ To learn the concept of Robotic Process

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the fundamental concepts and techniques of natural language processing (NLP)	PO1
CO2	Model the workflow of different scrapping methodologies	PO1, PO2
CO3	Understand how the Citrix and the Image Recognition can be helpful.	PO4, PO6
CO4	Understand Image, Text and Data Tables Automation	PO4, PO5, PO6
CO5	Understand Robotics Process Automation	PO3, PO4

CORE – ROBOTIC PROCESS AUTOMATION

Unit	Details	No. ofHours
I	Robotic Process Automation (RPA):Fundamentals of RPA – Programming basics from RPA perspective – Applying RPA – RPA development methodology – Architecture of RPA – RPA and emerging ecosystem.	18
II	Basics of RPA - RPA Benefits - Processes that can be automated – Types of Robots. Automation and RPA Concepts: Business models for implementing RPA – Centre of Excellence - Types and their applications – Building an RPA team - Approach for implementing RPA initiatives.	18
III	Automation stages and the role of a Business Manager - Guidelines for tracking the implementation success – Metrics /Parameters to be considered for gauging success- Choosing the right licensing option.	18
IV	Introduction - Automation debugging – Automation library – Activities Packages – Basic automation tasks - Text and image automation. Setting up the UiPath environment -- Introduction to UiPath - The User Interface - Keyboard Shortcuts.	18
V	Tables in RPA - Data Manipulation in excel - Extracting Data from PDF – Using anchors in PDF – CSV Automation – File automation.	18
	Total	90
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

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

Reference books

- ❖ Allen B. Downey, —Think Stats: Exploratory Data Analysis in Python®, Green Tea Press, 2014.

Web Resources

- ❖ <https://www.uipath.com/landing/academic-studio-download>
- ❖ <https://www.uipath.com/rpa/robotic-process-automation>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	2	3
CO2	3	2	2	2	2	2
CO3	3	2	3	3	2	3
CO4	3	2	2	2	2	2
CO5	3	2	2	2	2	3
Weightage	15	11	11	12	10	13
Weighted percentage of Course Contribution to POs	3.0	2.2	2.2	2.4	2.0	2.6

Course Coordinator

BOS Chairman

CORE – NATURAL LANGUAGE PROCESSING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UAD08	CORE	Theory	Y	Y	-	6	4

Learning Objectives

- ❖ To introduce the fundamental concept sand techniques of natural language processing (NLP).
- ❖ To Develop speech-based applications that use speech analysis (phonetics, speech recognition, and synthesis).
- ❖ To analyze the syntax, semantics, and pragmatics of a statement written in a natural language.
- ❖ To develop a conversational agent that uses natural language understanding and generation.
- ❖ To evaluate the performance of NLP tools and systems.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the fundamental concepts and techniques of natural language processing (NLP)	PO1, PO2, PO6
CO2	Understanding of the models and algorithms in the field of NLP	PO2, PO3, PO5
CO3	Demonstrate the computational proper ties of natural languages and the commonly used algorithms for processing linguistic in formation.	PO1, PO3, PO6
CO4	Understanding semantic sand pragmatics of languages for processing	PO2, PO6
CO5	Develop NLP Application	PO1, PO3, PO6

CORE – NATURAL LANGUAGE PROCESSING

Unit	Details	No. ofHours
I	Introduction: application of NLP technique sand key issues-MT grammar checkers-dictation document generation- NL interfaces- Natural language processing key issues- the different analysis level used for NLP: morpho – lexical – syntactic – semantic – pragmatic - markup (TEI, UNICODE)- finite state automata- Recursive and augmented transition networks-open problems	18
II	Lexical level: error tolerant lexical processing (spelling error correction)- transducers for the design of morphologic analyzers features – towards syntax: part-of- speech tagging (BRILL, HMM) - efficient representations for linguistic resources (lexica, grammars....) tries and Finite state automata.	18
III	Syntactic level: grammars (eg. Formal / Chomsky hierarchy, DCSGs, systematic case, unification, stochastic) – parsing (top-down, bottom-up, char (early algorithm), CYK algorithm)- automated estimation of probabilistic model parameters (inside – outside algorithm) data-oriented parsing grammar formalisms and tree banks-efficient parsing for context free grammars (CFGs) - statistical Parsing and probabilistic CFGs (PCFGs)- lexicalized PCFG.	18
IV	Semantic level: logical forms – ambiguity resolution -semantic network and parsers - procedural semantics- Montague semantics - vector space approaches - distributional semantics lexical semantics and word sense disambiguation - compositional semantic role labelling and semantic parsing	18
V	Pragmatic level: knowledge representation – reasoning – plan / goal recognition – speech acts / intentions – belief models-discourse - reference. Natural language generation: content determination – sentence planning – surface realization, subjectivity and sentiment analysis - Dialogue Conversational Agents.	18
	Total	90
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Daniel J and James H. Martin,|| speech and language processing an introduction to natural Language processing, computational linguistics & speech recognition, prenticehall,2009.

Reference books

- ❖ Lan H Written and Elbep, Mark A.Hall, datamining: practical machine learning tools and techniques, Morgan Kaufmann,2013.

Web Resources

- ❖ https://www.tutorialspoint.com/natural_language_processing/index.htm
- ❖ <https://www.geeksforgeeks.org/natural-language-processing-nlp-tutorial/>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	2	3
CO2	3	2	2	3	3	3
CO3	3	3	3	2	3	3
CO4	2	2	1	3	3	2
CO5	3	3	3	3	3	3
Weightage	14	13	12	14	14	14
Weighted percentage of Course Contribution to POs	2.8	2.6	2.4	2.8	2.8	2.8

Course Coordinator

BOS Chairman

PRACTICAL: PROGRAMMING IN UI PATH AUTOMATION LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UADP06	CORE	Practical	-	-	Y	6	4

Learning Objectives

- ❖ To get a knowledge in dissecting the myths from the facts and realize the true benefits of RPA
- ❖ To create Acquire knowledge of fundamental UI automation concepts
- ❖ To Gain ability to create and debug workflows using UiPath
- ❖ To implement Master installation of UiPath Studio on Windows
- ❖ To Gain ability to implement error exception handling.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand business functionalities in Robotics Process Automation	PO1
CO2	Implement RPA functions across the Organizations to boost revenues	PO1, PO2
CO3	Demonstrate the basics of robotic process automation using UI Path.	PO4, PO6
CO4	Manage RPA solutions to ensure lasting results	PO4, PO5, PO6
CO5	To develop a software to solve real-world problems using UI PATH	PO3, PO5

PRACTICAL: PROGRAMMING IN UI PATH AUTOMATION LAB

Program List	No.of Hours
1. Robotic Process Automation – Introduction, Working 2. UiPath – Basics, Installation and Understanding User Interface Components 3. Keyboard Shortcuts & Customization. 4. Visual workflow automation straightforward and intuitive 5. UiPath is providing automated workflow design, which can be used without programming knowledge 6. Recording are important functionality of UiPath studio, enables us to capture user's action on the screen and translate them into sequences. 7. Develop Excel Automation. 8. Develop Email Automation. 9. Develop File Automation. 10. Develop Presentation Automation.	90
Total	90

Mapping with Programme Outcomes: 3-Strong, 2–Medium,1–Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	3	3	2	1	1	2	1
CO2	3	2	2	3	1	3	1	2	1	1
CO3	3	1	3	2	2	3	1	1	2	2
CO4	2	1	3	3	2	1	1	2	2	1
CO5	3	2	2	1	3	3	2	1	1	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3
Weightage	15	14	11	15	15
Weighted percentage of Course Contribution to POs	3.0	2.8	2.2	3.0	3.0

Course Coordinator

BOS Chairman

Generic Elective Courses
Semester-I
Elective-1

ELECTIVE – ALLIED PHYSICS-I

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1UPHA01	ELECTIVE	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.
- ❖ To enable the students to understand waves and oscillations. ∞ To inculcate the concepts of various properties of matter.
- ❖ Understand the concept of nanomaterials, including their, properties, synthesis and applications.
- ❖ To impart knowledge on the basic concepts of Electricity and Digital Electronics.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Explain types of motion and extend their knowledge in the study of various dynamic motions analyze and demonstrate mathematically. Relate theory with practical applications in various field.	PO1, PO3
CO2	Explain their knowledge of understanding about materials and their behaviors and apply it to various situations in laboratory and real life.	PO1, PO2, PO3
CO3	Understanding the fundamental properties and behaviors of nanomaterials. Ability to apply various techniques for synthesizing nanomaterials. Awareness of how nanomaterials are used in real-world applications across different industries.	PO4, PO6
CO4	Comprehension of fundamental concepts such as current, voltage, resistance, and power in electrical circuits. Ability to analyze using techniques such as Ohm's law and Kirchhoff's laws. Knowledge of the principles and operation of potentiometers and their role in electrical circuits.	PO4, PO5, PO6
CO5	Interpret the real life solutions using AND, OR, NOT basic logic gates and their ideas to universal building blocks. Infer operations using Boolean algebra and acquire elementary ideas of IC circuits. Use the number system, binary arithmetic conversion	PO3, PO8

ELECTIVE – ALLIED PHYSICS-I

Unit	Details	No. of Hours
I	WAVES, OSCILLATIONS AND ACOUSTICS: Simple Harmonic Motion (SHM) - Composition of two SHMs at Right Angles (Periods in the Ratio 1:1) - Lissajous Figures -Uses-Laws of Transverse Vibrations of Strings - Determination of AC Frequency using Sonometer (Steel and Brass Wires) – Ultrasound-Production - Piezoelectric Method – Magnetostriction method - Application of Ultrasonics. Power point presentation on: Medical Imaging.	12
II	PROPERTIES OF MATTER: Elasticity:Young's modulus-Rigidity modulus- Bulk modulus - Bending of Beam - Determination of Young's Modulus by Uniform and NonUniform Bending – Torsional oscillations of a body - Determination of Rigidity Modulus by Torsional Pendulum. Viscosity: Streamline and Turbulent Motion - Critical Velocity - Coefficient of Viscosity - Poiseuille's Formula - Comparison of Viscosities - Burette Method. Surface Tension: Definition - Drop Weight Method – Experiment to determine the Interfacial Surface Tension	12
III	NANOMATERIALS: Need and origin of nano-Synthesis and classification of synthesis methods-techniques used in synthesis of nano materials- Chemical Vapour Deposition,Sol-gel-Electro Deposition-Ball Milling methodProperties and applications of nano materials. Laboratory Experiment on Synthesis of Silver Nanoparticles. (Report on observations during the experiment)	12
IV	CURRENT ELECTRICITY: Ohm's Law-Verification of Ohm's Law-Kirchhoff's laws-Application's of Kirchoff's law: Wheat stone's bridge-Metre bridge-Carey Foster's bridge- Potentiometer-Calibration of low range voltmeter - Calibration of low range ammeter- Types of Switches- Types of Fuses - Circuit Breakers. Model preparation: Solar mobile phone charger / power supply	12
V	DIGITAL ELECTRONICS Logic Gates OR, AND, NOT, NAND, NOR, EXOR - Logic gates using Diodes and Transistor (AND, OR, NOT)- NAND & NOR as Universal Building Blocks - Boolean Algebra - De Morgan's Theorem – Verification-Number system-Binary system-Addition-SubtractionMultiplication-Division-Binary to decimal and decimal to Binary conversion.	12
	Total	60
• PPT, Laboratory Experiments & Model preparation-related to the above topics are to be considered for Internal Exam Only		

Textbooks

- ❖ R.Murugesan, Allied Physics, S.Chand & Co, New Delhi, Revised edition 2010.
- ❖ Charles P.Poole Jr, Frank J.Owens, Introduction to Nanotechnology, Wiley, India, Revised edition 2014.Quantitative Aptitude, R.S. AGGARWAL., S.Chand & Company Ltd.,

Reference books

- ❖ Resnick Halliday and Walker (2018), Fundamentals of Physics, 11th Edn., John Willey and Sons, Asia Pvt.Ltd.,Singapore.
- ❖ V.K.Metha(2004). Principles of electronics 6thEdn. S.Chand and company.
- ❖ T.Pradeep, NANO: The Essentials, McGraw-Hill Education. 1st Edition 2007.

Web Resources

- ❖ https://youtu.be/M_5KYncYNyc
- ❖ <https://youtu.be/liJLJgIvaHY>
- ❖ https://youtu.be/7mGqd9HQ_AU
- ❖ <https://youtu.be/h5jOAw57OXM>
- ❖ [https://learningtechnologyofficial.com/category/fluid- mechanics-lab/](https://learningtechnologyofficial.com/category/fluid-mechanics-lab/)

Mapping with Programme Outcomes: 3 - Strong, 2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	3	3	3
CO2	2	3	3	3	2	3	3	3	3	2
CO3	2	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	2	3	3	3	3	3	3	3	3	3

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Course Coordinator

BOS Chairman

ELECTIVE: ALLIED- PHYSICS PRACTICAL-I

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1UPHAP01	ELECTIVE	Practical	-	-	Y	2	2

Learning Objectives

- ❖ It is aimed at exposing the undergraduate allied students to the technique of handling simple measuring instrument and also make them measure certain properties of materials.
- ❖ Apply various physics concepts to understand Properties of Matter and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate result.
- ❖ To determine the modulus of elasticity and rigidity modulus by various methods.
- ❖ To know the working principle of logic gates.
- ❖ To understand the basic role of various components in an electronic circuit, to build the circuits such as digital circuits.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Analyze the relation between theory and experimental results.	PO1, PO2
CO2	Understand the theoretical concepts through real experiments.	PO4, PO6
CO3	Plan the experimental procedure, record and interpret the results.	PO3, PO8
CO4	The hands-on exercises to apply physics principles to evaluate physical parameters.	PO1, PO3, PO8
CO5	Compute the experimental investigations of mechanical, heat and optical Physics.	PO4, PO5

ELECTIVE: ALLIED- PHYSICS PRACTICAL-I

Program List (Any Seven Only)	No. of Hours
1. Young's modulus by uniform bending using pin and microscope 2. Young's modulus by non-uniform bending using optic lever, scale and telescope. 3. Rigidity modulus by static torsion method. 4. Rigidity modulus by torsional oscillations without mass. 5. Surface tension and interfacial Surface tension - drop weight method. 6. Comparison of viscosities of two liquids - burette method. 7. Verification of laws of transverse vibrations using sonometer. 8. Calibration of low range voltmeter using potentiometer. 9. Calibration of low range ammeter using potentiometer. 10. Verification of truth tables of basic logic gates using ICs. 11. Verification of De Morgan's theorems using logic gate ICs . 12. Use of NAND as universal building block.	30
Total	30

Text Books

- ❖ M.N.Srinivasan, S.Balasubramanian, R.Ranganathan, A textbook of PRACTICAL PHYSICS, Sultan chand and sons educational publishers, New Delhi. Edition 2017.
- ❖ M.K. Subramanian, S.Padmanathan, S.Somasundram, B.Sc Practical Physics, Apsara Publications, Trichy, Revised edition 2020.

Reference Books

- ❖ C.C.Ourseph, C.Rangarajan, R.Balakrishnan - A Text Book of Practical Physics - S. Viswanathan Publisher - Part II (1996)
- ❖ S.L. Gupta and V.Kumar - Practical Physics - Pragti Prakashan - 25th Edition (2002)

Web Resources

- ❖ <https://www.sultanchandandsons.com/book/331/a-textbook-of-practical-physics>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	3	3	3
CO2	2	3	3	3	2	3	3	3	3	2
CO3	2	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	2	3	3	3	3	3	3	3	3	3

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Course Coordinator**BOS Chairman**

Generic Elective Courses
Semester-II
Elective-2

ELECTIVE – ALLIED PHYSICS-II

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2UPHA02	ELECTIVE	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ To understand the basic concepts of optics.
- ❖ To provide a coherent and concise coverage of the important atomic and nuclear concept of physics.
- ❖ To provide students with a comprehensive understanding of the fundamental principles governing celestial phenomena.
- ❖ To expose the students to the applications of Quantum Mechanics and Relativity.
- ❖ Providing an overview of the principles, operation and applications of special devices.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Explain the concepts of interference diffraction using principles of superposition of waves and rephrase the concept of polarization based on wave patterns.	PO1
CO2	Outline the basic foundation of different atom models and various experiments establishing quantum concepts. Summarize the properties of nuclei, nuclear forces, structure of atomic nucleus and nuclear models. Interpret nuclear processes like fission and fusion	PO1, PO2
CO3	Understand the basics of how the universe works, including stars, galaxies, and cosmic events.	PO4, PO6
CO4	Understand how light can release electrons from a material and explain the basic principles behind it. To describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation.	PO4, PO5, PO6
CO5	Summarize the working of semiconductor devices like junction diode, Zener diode, transistors and practical devices like EV charging stations.	PO3, PO8

ELECTIVE – ALLIED PHYSICS-II

Unit	Details	No. of Hours
I	PHYSICAL OPTICS: Interference - Interference in Thin Films - Colors of Thin Films - Air Wedge – experiment to find the thickness of a wire – Newton’s rings – theory and experimental – Michelson’s Interferometer and its applications. Determination of Wavelength using Diffraction - Polarization - Polarization by Reflection - Brewster’s Law - Optical Activity - Laurent’s Half Shade Polarimeter. Hands on Training: Optical instruments like Spectrometer and Microscopes.	12
II	ATOMIC AND NUCLEAR PHYSICS: Atom Models - Bohr Atom Model - Mass Number - Atomic Number - Vector Atom Model - Quantum Numbers associated with the vector atom model - Pauli’s Exclusion Principle - Electronic Configuration – coupling schemes- L.S and JJ coupling. Nuclear Models - Liquid Drop Model –Semi empirical mass formula- Magic Numbers - Shell Model - Nuclear Energy - Mass Defect - Binding Energy - Nuclear Fission - Bohr and Wheeler’s theory of nuclear fission-Atom Bomb - Nuclear Fusion-Thermonuclear reactions.	12
III	ASTROPHYSICS: Planets-internal structure- crust, mantle and core of the earth-different region of earth’s atmosphere-rotation of the earth magnetosphere- Planets and their satellites-Comets-Meteors-Asteroids- Phases and their Features of moonTypes of variable stars-Types of galaxies-origin of universe: Big bang theory-Pulsating theory-Steady state theory. Power point presentation on: Regular nights dedicated to observing celestial events.	12
IV	MODERN PHYSICS: Photo electric effect-Laws of Photo electric effect-Einstein’s photo electric equation-Verification of Einstein’s photo electric equation by Millikan’s experiment-photo electric cells and its applications-Frame of Reference - Postulates of Special Theory of Relativity - Galilean Transformation Equations - Lorentz Transformation Equations - Derivation - Length Contraction - Time Dilation.	12
V	ANALOG ELECTRONICS: Energy bands in Conductor, Semiconductor and Insulator-Types of Semiconductor-PN Junction Diode - Forward and Reverse Biasing - Characteristics of Junction Diode - Zener Diode - Characteristics of Zener Diode - LED –theory-construction and working -Introduction to E-Vehicles and EV Charging Stations. Field Visit to Electric Vehicles charging station and Report Submission.	12
	Total	60
Hands on training, PPT & Field visit-related to the above topics are to be considered for Internal Exam Only		

Textbooks

- ❖ R.Murugesan, Allied Physics, S.Chand & Co, New Delhi, Revised edition 2010.
- ❖ Baidynath Basu, Sudhindra Nath Biswas and Tanuka Chattopadhyay, An Introduction to Astrophysics, Prentice Hall of India, New Delhi (2010).

Reference books

- ❖ Resnick Halliday and Walker (2018), Fundamentals of Physics, 11th Edn., John Wiley and Sons, Asia Pvt.Ltd., Singapore.
- ❖ Thomas L. Floyd (2017), Digital Fundamentals, 11th Edn., Universal Book Stall, New Delhi.
- ❖ R.Murugesan, Modern Physics, S.Chand & Co, New Delhi. Revised edition 2018.

Web Resources

- ❖ <https://www.youtube.com/watch?v=JrRrp5F-Qu4>
- ❖ <https://www.validyne.com/blog/leak-test-using-pressure-transducers/>
- ❖ <https://www.atoptics.co.uk/atoptics/blsky.htm> -
- ❖ <https://www.metoffice.gov.uk/weather/learn-about/weather/optical-effects>

Mapping with Programme Outcomes: 3 - Strong, 2-Medium, 1 - Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	3	3	3
CO2	2	3	3	3	2	3	3	3	3	2
CO3	2	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	2	3	3	3	3	3	3	3	3	3

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Course Coordinator

BOS Chairman

ELECTIVE: ALLIED- PHYSICS PRACTICAL-II

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2UPHAP02	ELECTIVE	Practical	-	-	Y	2	2

Learning Objectives

- ❖ To determine the radius of curvature of the thin lens.
- ❖ To determine the wavelength of most prominent colours of mercury spectrum.
- ❖ To find the thickness of thin wire.
- ❖ To know the working principle of logic gates.
- ❖ To construct regulated power supplies.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Analyse the relation between the theory and experimental results.	PO1, PO2
CO2	Understand the theoretical concept to the real experiments.	PO4, PO6
CO3	Plan the experimental procedure record interrupt the results.	PO3, PO8
CO4	The hands-on exercise to apply physics principles to evaluate physical parameters.	PO1, PO3, PO8
CO5	Compute the experimental investigation of mechanical physics.	PO4, PO5

ELECTIVE: ALLIED- PHYSICS PRACTICAL-II

Program List (Any Seven Only)	No. of Hours
1. Radius of curvature of lens by forming Newton's rings 2. Thickness of a wire using air wedge 3. Wavelength of mercury lines using spectrometer and grating 4. Determination of AC frequency using sonometer 5. Sonometer -frequency of a tuning fork 6. Determination of Coefficient of viscosity using a graduated burette 7. Determination of figure of merit table galvanometer 8. Determination of Earth's magnetic field using field along the axis of a coil 9. Characterisation of Zener diode 10. Construction of Zener/IC regulated power supply 11. Construction of AND, OR, NOT gates using diodes and transistor 12. NOR gate as a universal building block	30
Total	30

Text Books

- ❖ M.N.Srinivasan, S.Balasubramanian, R.Ranganathan, A textbook of PRACTICAL PHYSICS, Sultan chand and sons educational publishers, New Delhi. Edition 2017.
- ❖ M.K. Subramanian, S.Padmanathan, S.Somasundram, B.Sc Practical Physics, Apsara Publications, Trichy, Revised edition 2020.

Reference Books

- ❖ C.C.Ourseph, C.Rangarajan, R.Balakrishnan - A Text Book of Practical Physics - S. Viswanathan Publisher - Part II (1996)
- ❖ S.L. Gupta and V.Kumar - Practical Physics - Pragti Prakashan - 25th Edition (2002)

Web Resources

- ❖ <https://www.sultanchandandsons.com/book/331/a-textbook-of-practical-physics>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	3	3	3
CO2	2	3	3	3	2	3	3	3	3	2
CO3	2	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	2	3	3	3	3	3	3	3	3	3

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Course Coordinator**BOS Chairman**

Discipline Specific Electives
Semester-V
Elective-5

ELECTIVE – AGILE PROJECT MANAGEMENT

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S5UADE01	ELECTIVE	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ Learning of software design, software technologies and APIs.
- ❖ Detailed demonstration about Agile development and testing techniques.
- ❖ Learning about Agile Planning and Execution.
- ❖ Understanding of Agile Management Design and Quality Check.
- ❖ Detailed examination of Agile development and testing techniques.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understanding of software design, software technologies and APIs using Agile Management.	PO1
CO2	Understanding of Agile development and testing techniques.	PO1, PO2
CO3	Understanding about Agile Planning and Execution using Sprint.	PO4, PO5
CO4	Understanding of Agile Management Design, scope, Procurement, managing Time and Cost and Quality Check.	PO4, PO5, PO6
CO5	Analyzing of Agile development and testing techniques.	PO2, PO4

ELECTIVE – AGILE PROJECT MANAGEMENT

Unit	Details	No. of Hours
I	Introduction: Modernizing Project Management: Project Management Needed a Makeover – Introducing Agile Project Management. Applying the Agile Manifesto and Principles: Understanding the Agile manifesto – Outlining the four values of the Agile manifesto – Defining the 15 Agile Principles – Adding the Platinum Principles – Changes as a result of Agile Values – The Agile litmus test. Why Being Agile Works Better: Evaluating Agile benefits – How Agile approaches beat historical approaches – Why people like being Agile.	12
II	Being Agile: Agile Approaches: Diving under the umbrella of Agile approaches – Reviewing the Big Three: Lean, Scrum, Extreme Programming - Summary. Agile Environments in Action: Creating the physical environment – Low-tech communicating – High-tech communicating – Choosing tools.	12
III	Agile Planning and Execution: Defining the Product Vision and Roadmap: Agile planning – Defining the product vision – Creating a product roadmap – Completing the product backlog. Planning Releases and Sprints: Refining requirements and estimates – Release planning – Sprint planning. Agile roles in the sprint – Creating shippable functionality – The end of the day. Preparing for Release: Preparing the product for deployment (the release sprint) – Preparing the operational support – Preparing the organization for product deployment - Preparing the marketplace for product deployment	12
IV	Agile Management Managing Scope and Procurement: What ‘s different about Agile scope management – Managing Agile scope – What ‘s different about Agile procurement – Managing Agile procurement. Managing Time and Cost: Managing Agile schedules– Managing Agile budgets. Managing Team Dynamics and Communication Managing Agile team dynamics — Managing Agile communication. Managing Quality and Risk: What’s different about Agile quality – Managing Agile quality – What ‘s different about Agile risk management – Managing Agile risk.	12
V	Implementing Agile: Building a Foundation: Organizational and individual commitment – Choosing the right pilot team members – Creating an environment that enables Agility – Support Agility initially and over time. Being a Change Agent: Becoming Agile requires change – why change doesn’t happen on its own – Platinum Edge ‘s Change Roadmap – Avoiding pitfalls – Signs your changes are slipping. Benefits, Factors for Success and Metrics: Ten key benefits of Agile project management – Ten key factors for project success – Ten metrics for Agile Organizations.	12
	Total	60
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Mark C. Layton, Steven J. Ostermiller, Agile Project Management for Dummies, 2nd Edition, Wiley India Pvt. Ltd., 2018.
- ❖ Jeff Sutherland, Scrum – The Art of Doing Twice the Work in Half the Time, Penguin, 2014.

Reference books

- ❖ Mark C. Layton, David Morrow, Scrum for Dummies, 2nd Edition, Wiley India Pvt. Ltd., 2018.
- ❖ Mike Cohn, Succeeding with Agile – Software Development using Scrum, Addison-Wesley Signature Series, 2010.

Web Resources

- ❖ www.agilealliance.org/resources

Mapping with Programme Outcomes: 3 - Strong, 2–Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	3	2
Weightage	15	14	11	15	15	10
Weighted percentage of Course Contribution to POs	3.0	2.8	2.2	3.0	3.0	2.0

Course Coordinator

BOS Chairman

ELECTIVE – ANALYTICS FOR SERVICE INDUSTRY

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S5UADE02	ELECTIVE	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ To recognize challenges in dealing with data sets in service industry.
- ❖ To identify and apply appropriate algorithms for analyzing the healthcare, Human resource, hospitality and tourism data.
- ❖ To make choices for a model for new machine learning tasks.
- ❖ To identify employees with high attrition risk.
- ❖ To Prioritizing various talent management initiatives for your organization.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand and critically apply the concepts and methods of business analytics	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Identify, model and solve decision problems in different settings.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Interpret results/solutions and identify appropriate courses of action for a given managerial situation whether a problem or an opportunity.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Create viable solutions to decision making problems.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Instill a sense of ethical decision-making and a commitment to the long-run welfare of both organizations and the communities they serve.	PO1, PO2, PO3, PO4, PO5, PO6

ELECTIVE – ANALYTICS FOR SERVICE INDUSTRY

Unit	Details	No. of Hours
I	Healthcare Analytics: Introduction to Healthcare Data Analytics - Electronic Health Records – Components of HER - Coding Systems - Benefits of EHR- Barrier to Adopting HER Challenges- Phenotyping Algorithms. Biomedical Image Analysis and Signal Analysis- Genomic Data Analysis for Personalized Medicine. Review of Clinical Prediction Models.	12
II	Healthcare Analytics Applications: Applications and Practical Systems for Healthcare – Data Analytics for Pervasive Health - Fraud Detection in Healthcare - Data Analytics for Pharmaceutical Discoveries – Clinical Decision Support Systems - Computer-Assisted Medical Image Analysis Systems - Mobile Imaging and Analytics for Biomedical Data.	12
III	HR Analytics: Evolution of HR Analytics, HR information systems and data sources, HR Metric and HR Analytics, Evolution of HR Analytics; HR Metrics and HR Analytics; Intuition versus analytical thinking; HRMS/HRIS and data sources; Analytics frameworks like LAMP, HCM:21(r) Model.	12
IV	Performance Analysis: Predicting employee performance, Training requirements, evaluating training and development, Optimizing selection and promotion decisions.	12
V	Tourism and Hospitality Analytics: Guest Analytics – Loyalty Analytics – Customer Satisfaction – Dynamic Pricing – optimized disruption management – Fraud detection in payments.	12
	Total	60
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Chandan K. Reddy and Charu C Aggarwal, —Healthcare data analytics, Taylor & Francis, 2015.
- ❖ Edwards Martin R, Edwards Kirsten (2016), —Predictive HR Analytics: Mastering the HR Metric, Kogan Page Publishers, ISBN-0749473924.
- ❖ Fitz-enzJac (2010), —The new HR analytics: predicting the economic value of your company's human capital investments, AMACOM, ISBN-13: 978-0-8144-1643-3
- ❖ RajendraSahu, Manoj Dash and Anil Kumar. Applying Predictive Analytics Within the Service Sector.

Reference books

- ❖ Hui Yang and Eva K. Lee, —Healthcare Analytics: From Data to Knowledge to Healthcare Improvement, Wiley, 2016.
- ❖ Fitz-Enz Jac, Mattox II John (2014), —Predictive Analytics for Human Resources, Wiley, ISBN- 1118940709.

Web Resources

- ❖ <https://www.ukessays.com/essays/marketing/contemporary-issues-in-marketing-marketing-essay.php>
- ❖ <https://yourbusiness.azcentral.com/examples-contemporary-issues-marketing-field-26524.html>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	2	3	3	3	3	3
CO3	3	3	2	3	3	2
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Weightage	14	15	14	15	15	14
Weighted percentage of Course Contribution to POs	2.8	3.0	2.8	3.0	3.0	2.8

Course Coordinator

BOS Chairman

ELECTIVE – ARTIFICIAL INTELLIGENCE

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S5UADE03	ELECTIVE	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ To learn various concepts of AI Techniques.
- ❖ To learn various Search Algorithm in AI.
- ❖ To learn probabilistic reasoning and models in AI.
- ❖ To learn about Markov Decision Process.
- ❖ To learn various type of Reinforcement learning.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the various concepts of AI Techniques	PO1
CO2	Understand various Search Algorithm in AI.	PO1, PO2
CO3	Understand probabilistic reasoning and models in AI.	PO4, PO6
CO4	Understand Markov Decision Process.	PO4, PO5, PO6
CO5	Understand various type of Reinforcement learning Techniques.	PO3, PO4

ELECTIVE – ARTIFICIAL INTELLIGENCE

Unit	Details	No. ofHours
I	Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree	12
II	Search Algorithms: Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, best first search, A* algorithm, Game Search.	12
III	Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.	12
IV	Markov Decision process: MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.	12
V	Reinforcement Learning: Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning	12
	Total	60
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Stuart Russell and Peter Norvig, —Artificial Intelligence: A Modern Approach, 3rd Edition, Prentice Hall.
- ❖ Elaine Rich and Kevin Knight, —Artificial Intelligence, Tata McGraw Hill.

Reference books

- ❖ Trivedi, M.C., —A Classical Approach to Artificial Intelligence, Khanna Publishing House, Delhi.
- ❖ Saroj Kaushik, —Artificial Intelligence, Cengage Learning India, 2011.
- David Poole and Alan Mackworth, —Artificial Intelligence: Foundations for Computational Agents, Cambridge University Press 2010.

Web Resources

- ❖ <https://github.com/dair-ai/ML-Course-Notes>
- ❖ <https://web.cs.hacettepe.edu.tr/~erkut/ain311.f21/index.html>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage	15	12	10	11	12	13
Weighted percentage of Course Contribution to POs	2.8	3.0	2.0	2.2	2.4	2.6

Course Coordinator

BOS Chairman

ELECTIVE – ARTIFICIAL NEURAL NETWORKS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S5UADE04	ELECTIVE	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ Understand the basics of artificial neural networks, learning process, single layer
- ❖ Understand the Error Correction and various learning algorithms and tasks.
- ❖ Identify the various Single Layer Perception Learning Algorithm.
- ❖ Identify the various Multi-Layer Perception Network.
- ❖ Analyze the Deep Learning of various Neural network and its Applications.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Students will learn the basics of artificial neural networks with single layer and multi-layer perception networks.	PO1
CO2	Learn about the Error Correction and various learning algorithms and tasks.	PO1, PO2
CO3	Learn the various Perception Learning Algorithm.	PO4, PO6
CO4	Learn about the various Multi-Layer Perception Network.	PO4, PO5, PO6
CO5	Understand the Deep Learning of various Neural network and its applications.	PO3, PO4

ELECTIVE – ARTIFICIAL NEURAL NETWORKS

Unit	Details	No. ofHours
I	Artificial Neural Model- Activation functions- Feed forward and Feedback, Convex Sets, Convex Hull and Linear Separability, Non-Linear Separable Problem - Multilayer Networks. Learning Algorithms - Error correction - Gradient Descent Rules, Perception Learning Algorithm, Perception Convergence Theorem.	12
II	Introduction, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning, Boltzmann learning, credit assignment problem, learning with and without teacher, learning tasks, Memory and Adaptation.	12
III	Single layer Perception: Introduction, Pattern Recognition, Linear classifier, Simple perception, Perception learning algorithm, Modified Perception learning algorithm, Adaptive linear combiner, Continuous perception, Learning in continuous perception. Limitation of Perception.	12
IV	Multi-Layer Perception Networks: Introduction, MLP with 2 hidden layers, Simple layer of a MLP, Delta learning rule of the output layer, Multilayer feed forward neural network with continuous perceptions, Generalized delta learning rule, Back propagation algorithm.	12
V	Deep learning- Introduction- Neuro architectures building blocks for the DL techniques, Deep Learning and Noncognitions, Deep Convolutional Neural Networks, Recurrent Neural Networks (RNN), feature extraction, Deep Belief Networks, Restricted Boltzman Machines, Training of DNN and Applications	12
	Total	60
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Neural Networks A Classroom Approach- Satish Kumar, McGraw Hill- Second Edition.
- ❖ Neural Network- A Comprehensive Foundation- Simon Haykins, Pearson Prentice Hall, 2nd Edition, 1999.

Reference books

- ❖ Artificial Neural Networks-B. Yegnanarayana, PHI, New Delhi 1998.

Web Resources

- ❖ https://www.w3schools.com/ai/ai_neural_networks.asp

Mapping with Programme Outcomes: 3 - Strong, 2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	2	3	2	3	2	2
Weightage	14	14	11	15	10	10
Weighted percentage of Course Contribution to POs	2.8	2.8	2.2	3.0	2.0	2.0

Course Coordinator

BOS Chairman

ELECTIVE – IMAGE PROCESSING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S5UADE05	ELECTIVE	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ To learn fundamentals of digital image processing.
- ❖ To learn about various 2D Image transformations
- ❖ To learn about various image enhancement processing methods and filters
- ❖ To learn about various classification of Image segmentation techniques
- ❖ To learn about various image compression techniques

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the fundamental concepts of digital image processing	PO1
CO2	Understand various 2D Image transformations	PO1, PO2
CO3	Understand image enhancement processing techniques and filters	PO4, PO6
CO4	Understand the classification of Image segmentation techniques	PO4, PO5, PO6
CO5	Understand various image compression techniques	PO3, PO5

ELECTIVE – IMAGE PROCESSING

Unit	Details	No. of Hours
I	Digital Image Fundamentals: Image representation - Basic relationship between pixels, Elements of DIP system -Applications of Digital Image Processing - 2D Systems - Classification of 2D Systems - Mathematical Morphology- Structuring Elements- Morphological Image Processing - 2D Convolution - 2D Convolution Through Graphical Method -2D Convolution Through Matrix Analysis	12
II	2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform- Haar transform- Discrete Cosine Transform - Karhunen-Loeve Transform -Singular Value Decomposition	12
III	Image Enhancement: Spatial domain methods- Point processing - Intensity transformations - Histogram processing- Spatial filtering - smoothing filter- Sharpening filters - Frequency domain methods: low pass filtering, high pass Filtering- Homomorphic filter.	12
IV	Image segmentation: Classification of Image segmentation techniques - Region approach – Clustering techniques - Segmentation based on thresholding - Edge based segmentation - Classification of edges- Edge detection - Hough transform- Active contour.	12
V	Image Compression: Need for compression -Redundancy- Classification of image- Compression schemes- Huffman coding- Arithmetic coding - Dictionary based compression -Transform based compression,	12
	Total	60
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ S Jayaraman, S Esakkirajan, T Veerakumar, Digital image processing, Tata McGraw Hill, 2015
- ❖ Gonzalez Rafael C, Digital Image Processing, Pearson Education, 2009.

Reference books

- ❖ Jain Anil K, Fundamentals of digital image processing: , PHI,1988
- ❖ Kenneth R Castleman, Digital image processing, Pearson Education,2/e,2003
- ❖ Pratt William K, Digital Image Processing, John Wiley,4/e,2007.

Web Resources

- ❖ <https://dl.acm.org/doi/10.5555/559707>
- ❖ <https://www.ijert.org/image-processing-using-web-2-0-2>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	2	3	2	3	2	2
Weightage	14	14	11	15	10	10
Weighted percentage of Course Contribution to POs	2.8	2.8	2.2	3.0	2.0	2.0

Course Coordinator

BOS Chairman

Discipline Specific Electives
Semester-V
Elective-6

ELECTIVE – BIG DATA ANALYTICS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S5UADE06	ELECTIVE	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ To understand the Big Data Platform and its Use cases, Map Reduce Jobs
- ❖ To identify and understand the basics of cluster and decision tree
- ❖ To study about the Association Rules, Recommendation System
- ❖ To learn about the concept of stream
- ❖ Understand the concepts of NoSQL Databases

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Work with big data tools and its analysis techniques.	PO1
CO2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO5
CO4	Perform analytics on data streams.	PO3, PO5, PO6
CO5	Learn NoSQL databases and management.	PO3, PO4

ELECTIVE – BIG DATA ANALYTICS

Unit	Details	No. of Hours
I	Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value - Understanding Big Data Storage — A General Overview of HighPerformance Architecture — HDFS — Map Reduce and YARN — Map Reduce Programming Model.	12
II	Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions. Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes Theorem — Naïve Bayes Classifier.	12
III	Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association & finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches.	12
IV	Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform (RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics	12
V	NoSQL Databases: Schema-less Models: Increasing Flexibility for Data Manipulation-Key Value Stores - Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding — Hbase — Analyzing big data with twitter — Big data for ECommerce Big data for blogs — Review of Basic Data Analytic Methods using R.	12
	Total	60
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Anand Rajaraman and Jeffrey David Ullman, —Mining of Massive Datasetsl, Cambridge University Press, 2012.

Reference books

- ❖ David Loshin, —Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graphl, Morgan Kaufmann/Elsevier Publishers, 2013.
- ❖ EMC Education Services, —Data Science and Big Data Analytics: Discovering, Analysing, Visualizing and Presenting Data, Wiley publishers, 2015.

Web Resources

- ❖ <https://www.simplilearn.com>
- ❖ https://www.sas.com/en_us/insights/analytics/big-data-analytics.html

Mapping with Programme Outcomes: 3 - Strong, 2–Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	3	3
CO2	3	3	2	3	3	3
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	3
CO5	3	3	2	3	3	2
Weightage	15	14	11	15	15	13
Weighted percentage of Course Contribution to POs	3.0	2.8	2.2	3.0	3.0	2.6

Course Coordinator

BOS Chairman

ELECTIVE – ROBOTICS AND ITS APPLICATIONS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S5UADE07	ELECTIVE	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ To understand the robotics fundamentals
- ❖ To understand the sensors and matrix methods
- ❖ To understand the Localization: Self-localizations and mapping
- ❖ To study about the concept of Path Planning, Vision system
- ❖ To learn about the concept of robot artificial intelligence

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Describe the different physical forms of robot architectures.	PO1
CO2	Kinematically model simple manipulator and mobile robots.	PO1, PO2
CO3	Mathematically describe a kinematic robot system	PO4, PO6
CO4	Analyze manipulation and navigation problems using knowledge of coordinate frames, kinematics, optimization, control, and uncertainty.	PO4, PO5, PO6
CO5	Program robotics algorithms related to kinematics, control, optimization, and uncertainty.	PO3, PO4

ELECTIVE – ROBOTICS AND ITS APPLICATIONS

Unit	Details	No. of Hours
I	Introduction: Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.	12
II	Actuators and sensors :Types of actuators, stepper-DC -servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers-strain gauge based force torque sensor - proximity and distance measuring sensors - Kinematics of robots: Representation of joints and frames, frames transformation, homogeneous matrix, D-H matrix, Forward and inverse kinematics: two link planar (RR) and spherical robot (RRP). Mobile robot Kinematics: Differential wheel mobile robot	12
III	Localization: Self-localizations and mapping - Challenges in localizations – IR based localizations – vision-based localizations – Ultrasonic based localizations - GPS localization systems	12
IV	Path Planning: Introduction, path planning-overview - road map path planning-cell decomposition path planning potential field path planning-obstacle avoidance-case studies Vision system: Robotic vision systems-image representation-object recognition-and categorization depth measurement- image data compression-visual inspection-software considerations	12
V	Application: Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications-nuclear applications-space Applications-Industrial robots-artificial intelligence in robots-application of robots in material handling continuous arc welding-spot welding-spray painting assembly operation-cleaning-etc.	12
	Total	60
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Richared D.Klafter. Thomas Achmielewski and Mickael Negin, Robotic Engineering and Integrated Approach, Prentice Hall India-Newdelhi-2001
- ❖ Saeed B.Nikku, Introduction to robotics, analysis, control and applications, Wiley India, 2nd edition 2011

Reference books

- ❖ Industrial robotic technology-programming and application by M.P. Groover et al, McGrawhill 2008.
- ❖ Robotics technology and flexible automation by S.R. Deb, THH-2009.
- ❖ EMC Education Services, —Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, Wiley publishers, 2015.

Web Resources

- ❖ https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligencerobotics.htm
- ❖ <https://www.geeksforgeeks.org/robotics-introduction/>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
Weightage	15	14	11	15	15	10
Weighted percentage of Course Contribution to POs	3.0	2.8	2.2	3.0	3.0	2.0

Course Coordinator

BOS Chairman

ELECTIVE – COMPUTING INTELLIGENCE

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S5UADE08	ELECTIVE	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ To identify and understand the basics of AI and its search.
- ❖ To study about the Fuzzy logic systems.
- ❖ To understand and apply the concepts of Neural Network and its functions.
- ❖ To understand the concepts of Artificial Neural Network
- ❖ To study about the Genetic Algorithm.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Describe the fundamentals of artificial intelligence concepts and searching techniques.	PO1
CO2	Develop the fuzzy logic sets and membership function and defuzzification techniques.	PO1, PO2
CO3	Understand the concepts of Neural Network and analyze and apply the learning techniques	PO4, PO6
CO4	Understand the artificial neural networks and its applications.	PO4, PO5, PO6
CO5	Understand the concept of Genetic Algorithm and Analyze the optimization problems using GAs.	PO3, PO5

ELECTIVE – COMPUTING INTELLIGENCE

Unit	Details	No. of Hours
I	Introduction to AI: Problem formulation – AI Applications – Problems – State Space and Search – Production Systems – Breadth First and Depth First – Travelling Salesman Problem – Heuristic search techniques: Generate and Test – Types of Hill Climbing.	12
II	Fuzzy Logic Systems: Notion of fuzziness – Operations on fuzzy sets – T-norms and other aggregation operators – Basics of Approximate Reasoning – Compositional Rule of Inference – Fuzzy Rule Based Systems – Schemes of Fuzzification – Inferencing – Defuzzification – Fuzzy Clustering – fuzzy rule-based classifier.	12
III	Neural Networks: What is Neural Network, Learning rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Backpropagation (BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications	12
IV	Artificial Neural Networks: Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.	12
V	Genetic Algorithm: Introduction – Biological Background – Genetic Algorithm Vs Traditional Algorithm – Basic Terminologies in Genetic Algorithm – Simple GA – General Genetic Algorithm – Operators in Genetic Algorithm	12
	Total	60
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ S.N. Sivanandam and S.N. Deepa, —Principles of Soft Computing, 2nd Edition, Wiley India Pvt. Ltd.
- ❖ Stuart Russell and Peter Norvig, Artificial Intelligence - A Modern Approach, 2nd Edition, Pearson Education in Asia.
- ❖ S. Rajasekaran, G. A. Vijayalakshmi, —Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, PHI.

Reference books

- ❖ F. Martin, Mcneill, and Ellen Thro, Fuzzy Logic: A Practical approach, AP Professional, 2000.
- Chin Teng Lin, C. S. George Lee, Neuro-Fuzzy Systems, PHI

Web Resources

- ❖ <https://www.javatpoint.com/artificial-intelligence-tutoria>
- ❖ <https://www.w3schools.com/ai/>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage	15	12	10	11	12	13
Weighted percentage of Course Contribution to POs	3.0	2.4	2.0	2.2	2.4	2.6

Course Coordinator

BOS Chairman

ELECTIVE – CRYPTOGRAPHY

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S5UADE09	ELECTIVE	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ To understand the fundamentals of Cryptography.
- ❖ To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- ❖ To understand the various key distribution and management schemes.
- ❖ To understand how to deploy encryption techniques to secure data in transit across data networks.
- ❖ To design security applications in the field of Information technology.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Analyze the vulnerabilities in any computing system and hence be able to design a security solution.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Apply the different cryptographic operations of symmetric cryptographic algorithms	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Apply the different cryptographic operations of public key cryptography	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Apply the various Authentication schemes to simulate different applications.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand various Security practices and System security standards	PO1, PO2, PO3, PO4, PO5, PO6

ELECTIVE – CRYPTOGRAPHY

Unit	Details	No. of Hours
I	Introduction: The OSI security Architecture – Security Attacks – Security Mechanisms – Security Services – A model for network Security.	12
II	Classical Encryption Techniques: Symmetric cipher model – Substitution Techniques: Caesar Cipher – Monoalphabetic cipher – Play fair cipher – Poly Alphabetic Cipher – Transposition techniques – Stenography	12
III	Block Cipher and DES: Block Cipher Principles – DES – The Strength of DES – RSA: The RSA algorithm.	12
IV	Network Security Practices: IP Security overview - IP Security architecture – Authentication Header. Web Security: Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction.	12
V	Intruders – Malicious software – Firewalls.	12
	Total	60
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ William Stallings, —Cryptography and Network Security Principles and Practices.

Reference books

- ❖ Behrouz A. Foruzan, —Cryptography and Network Security, Tata McGraw-Hill, 2007.
- ❖ Atul Kahate, —Cryptography and Network Security, Second Edition, 2003, TMH.
- ❖ M.V. Arun Kumar, —Network Security, 2011, First Edition, USP.

Web Resources

- ❖ <https://www.tutorialspoint.com/cryptography/>
- ❖ <https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	2	3	2
CO2	3	2	3	2	3	3
CO3	3	3	3	2	3	2
CO4	2	3	3	3	2	3
CO5	3	2	3	3	3	3
Weightage	14	13	15	12	14	14
Weighted percentage of Course Contribution to POs	2.8	2.6	3.0	2.4	2.8	2.8

Course Coordinator

BOS Chairman

ELECTIVE – SOFTWARE PROJECT MANAGEMENT

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S5UADE10	ELECTIVE	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ To define and highlight importance of software project management.
- ❖ To formulate and define the software management metrics & strategy in managing projects
- ❖ To familiarize in Software Project planning
- ❖ To Understand to apply software testing techniques in commercial environment
- ❖ To evaluate and mitigate risks associated with software development process

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the principles and concepts of project management	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Knowledge gained to train software project managers	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Apply software project management methodologies.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Able to create comprehensive project plans	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Evaluate and mitigate risks associated with software development process	PO1, PO2, PO3, PO4, PO5, PO6

ELECTIVE – SOFTWARE PROJECT MANAGEMENT

Unit	Details	No. of Hours
I	Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models - The SEI CMM - International Organization for Standardization.	12
II	Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project -Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones - Work Packages - Building a WBS for Software.	12
III	Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed.	12
IV	Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling.	12
V	Quality: Requirements – The SEI CMM - Guidelines - Challenges - Quality Function Deployment - Building the Software Quality Assurance - Plan - Software Configuration Management: Principles - Requirements - Planning and Organizing - Tools - Benefits - Legal Issues in Software - Case Study	12
	Total	60
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Robert T. Futrell, Donald F. Shafer, Linda I. Safer, —Quality Software Project Management, Pearson Education Asia 2002.

Reference books

- ❖ PankajJalote, —Software Project Management in Practicel, Addison Wesley 2002.
- ❖ Hughes, —Software Project Management, Tata McGraw Hill 2004, 3rd Edition.

Web Resources

- ❖ Software Project Management e-resources from Digital libraries
- ❖ www.smartworld.com/notes/software-project-management

Mapping with Programme Outcomes: 3 - Strong, 2–Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	2	2	2
CO2	3	1	3	2	2	2
CO3	2	3	2	3	3	3
CO4	3	3	2	3	3	2
CO5	2	2	2	3	3	3
Weightage	13	11	10	13	13	12
Weighted percentage of Course Contribution to POs	2.6	2.2	2.0	2.6	2.6	2.4

Course Coordinator

BOS Chairman

Discipline Specific Electives
Semester-VI
Elective-7

ELECTIVE – FUZZY LOGIC

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UADE11	ELECTIVE	Theory	Y	Y	-	5	3

Learning Objectives

- ❖ To understand the basic concept of Fuzzy logic
- ❖ To learn the various operations on relation properties
- ❖ To study about the membership functions
- ❖ To learn about the Defuzzification and Fuzzy Rule-Based System
- ❖ To learn the concepts of Applications of Fuzzy Logic

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the basics of Fuzzy sets, operation and properties.	PO1
CO2	Apply Cartesian product and composition on Fuzzy relations and use the tolerance and Equivalence relations.	PO1, PO2
CO3	Analyze various fuzzification methods and features of membership Functions.	PO4, PO6
CO4	Evaluate defuzzification methods for real time applications.	PO3, PO4, PO6
CO5	Design an application using Fuzzy logic and its Relations.	PO3, PO6

ELECTIVE – FUZZY LOGIC

Unit	Details	No. of Hours
I	Introduction to Fuzzy Logic- Fuzzy Sets- Fuzzy Set Operations, Properties of Fuzzy Sets, Classical and Fuzzy Relations: Introduction-Cartesian Product of Relation-Classical Relations- Cardinality of Crisp Relation.	15
II	Operations on Crisp Relation-Properties of Crisp Relations- Composition Fuzzy Relations, Cardinality of Fuzzy Relations- Operations on Fuzzy Relations - Properties of Fuzzy Relations- Fuzzy Cartesian Product and Composition-Tolerance and Equivalence Relations, Crisp Relation.	15
III	Membership Functions: Introduction, Features of Membership Function, Classification of Fuzzy Sets, Fuzzification, Membership Value Assignments, Intuition, Inference, Rank Ordering.	15
IV	Defuzzification: Introduction, Lambda Cuts for Fuzzy Sets, Lambda Cuts for Fuzzy Relations, Defuzzification Methods, Fuzzy Rule-Based System: Introduction, Formation of Rules, Decomposition of Rules, Aggregation of Fuzzy Rules, Properties of Set of Rules.	15
V	Applications of Fuzzy Logic: Fuzzy Logic in Automotive Applications, Fuzzy Antilock Brake System-Antilock-Braking System and Vehicle Speed - Estimation Using Fuzzy Logic.	15
	Total	75
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ S. N. Sivanandam, S. Sumathi and S. N. Deepa-Introduction to Fuzzy Logic using MATLAB, Springer-Verlag Berlin Heidelberg 2007.

Reference books

- ❖ Guanrong Chen and Trung Tat Pham- Introduction to Fuzzy Sets, Fuzzy Logic and Fuzzy Control Systems.
- ❖ Timothy J Ross, Fuzzy Logic with Engineering Applications.

Web Resources

- ❖ <https://www.javatpoint.com/fuzzy-logic>
- ❖ <https://www.guru99.com/what-is-fuzzy-logic.html>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	2	3	2
Weightage	15	14	11	14	11	10
Weighted percentage of Course Contribution to POs	3.0	2.8	2.2	2.8	2.2	2.0

Course Coordinator

BOS Chairman

ELECTIVE – GRID COMPUTING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UADE12	ELECTIVE	Theory	Y	Y	-	5	3

Learning Objectives

- ❖ To learn the basic construction and application of Grid computing.
- ❖ To learn grid computing organization and their Role.
- ❖ To learn Grid Computing Anatomy.
- ❖ To learn Grid Computing road map.
- ❖ To learn various type of Grid Architecture.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the basic elements and concepts of Grid computing.	PO1
CO2	Understand the Grid computing toolkits and Framework.	PO1, PO2
CO3	Understand the concepts of Anatomy of Grid Computing.	PO4, PO6
CO4	Understand the concept of service-oriented architecture.	PO4, PO6
CO5	Gain knowledge on grid and web service architecture.	PO3, PO5

ELECTIVE – GRID COMPUTING

Unit	Details	No. of Hours
I	Introduction: Early Grid Activity, Current Grid Activity, Overview of Grid Business areas, Grid Applications, Grid Infrastructures.	15
II	Grid Computing organization and their Roles: Organizations Developing Grid Standards, and Best Practice Guidelines, Global Grid Forum (GCF), Organization Developing Grid Computing Toolkits and Framework, Organization and building and using grid-based solutions to solve computing, commercial organization building and Grid Based solutions.	15
III	Grid Computing Anatomy: The Grid Problem, The conceptual of virtual organizations, Grid Architecture and relationship to other distributed technology.	15
IV	The Grid Computing Road Map: Autonomic computing, Business on demand and infrastructure virtualization, Service-Oriented Architecture and Grid, Semantic Grids.	15
V	Merging the Grid services Architecture with the Web Services Architecture: Service-Oriented Architecture, Web Service Architecture, XML messages and Enveloping, Service message description Mechanisms, Relationship between Web Services and Grid Services, Web services Interoperability and the role of the WS-I Organization.	15
	Total	75
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Joshy Joseph and Craig Fellenstein, Grid computing, Pearson / IBM Press, PTR, 2004.

Reference books

- ❖ Ahmer Abbas and Graig computing, A Practical Guide to technology and applications, Charles River Media, 2003.

Web Resources

- ❖ https://en.wikipedia.org/wiki/Grid_computing
- ❖ https://link.springer.com/chapter/10.1007/978-1-84882-409-6_4
- ❖ <https://www.redbooks.ibm.com/redbooks/pdfs/sg246778.pdf>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	2	2
Weightage	15	14	11	15	10	10
Weighted percentage of Course Contribution to POs	3.0	2.8	2.2	3.0	3.0	2.0

Course Coordinator

BOS Chairman

ELECTIVE – HUMAN COMPUTER INTERACTION

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UADE13	ELECTIVE	Theory	Y	Y	-	5	3

Learning Objectives

- ❖ To learn about the foundations of Human Computer Interaction.
- ❖ To learn the design and software process technologies.
- ❖ To learn HCI models and theories.
- ❖ To learn Mobile Ecosystem.
- ❖ To learn the various types of Web Interface Design.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the fundamentals of HCI.	PO1
CO2	Understand the design and software process technologies.	PO1, PO2
CO3	Understand HCI models and theories.	PO4, PO6
CO4	Understand Mobile Ecosystem, types of Mobile Applications, mobile Architecture and design	PO4, PO6
CO5	Understand the various types of Web Interface Design.	PO3, PO4

ELECTIVE – HUMAN COMPUTER INTERACTION

Unit	Details	No. of Hours
I	FOUNDATIONS OF HCI: The Human: I/O channels – Memory Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity-Paradigms. - Case Studies	15
II	DESIGN & SOFTWARE PROCESS: Interactive Design: Basics – process – scenarios Navigation: screen design Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.	15
III	MODELS AND THEORIES: HCI Models: Cognitive models: - Socio-Organizational issues and stakeholder requirements Communication and collaboration models-Hypertext, Multimedia and WWW.	15
IV	Mobile HCI: Mobile Ecosystem: Platforms, Application frameworks - Types of Mobile Applications: Widgets, Applications, Games - Mobile Information Architecture, Mobile 2.0, - Mobile Design: Elements of Mobile Design, Tools. - Case Studies	15
V	WEB INTERFACE DESIGN: Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies.	15
	Total	75
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ||Human -Computer Interaction||, III Edition, Pearson Education, 2004 (UNIT I, II & III)
- ❖ Brian Fling, —||Mobile Design and Development||, I Edition, O_Reilly Media Inc., 2009(UNIT–IV)
- ❖ Bill Scott and Theresa Neil, —Designing Web Interfaces||, First Edition, O_Reilly, 2009. (UNIT-V)

Reference books

- ❖ Shneiderman, —Designing the User Interface: Strategies for Effective Human-Computer Interaction||, V Edition, Pearson Education.

Web Resources

- ❖ <https://www.interaction-design.org/literature/topics/human-computer-interaction>
- ❖ https://link.springer.com/10.1007/978-0-387-39940-9_192
- ❖ https://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction

Mapping with Programme Outcomes: 3 - Strong, 2-Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	3	2
Weightage	15	14	11	15	11	10
Weighted percentage of Course Contribution to POs	3.0	2.8	2.2	3.0	2.2	2.0

Course Coordinator

BOS Chairman

ELECTIVE – INTRODUCTION TO DATA SCIENCE

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UADE14	ELECTIVE	Theory	Y	Y	-	5	3

Learning Objectives

- ❖ To learn about basics of Data Science and Big data.
- ❖ To learn about overview and building process of Data Science.
- ❖ To learn about various Algorithms in Data Science.
- ❖ To learn about Hadoop Framework.
- ❖ To learn about case study about Data Science.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the basics in Data Science and Big data.	PO1
CO2	Understand overview and building process in Data Science.	PO1, PO2
CO3	Understand various Algorithms in Data Science.	PO3, PO6
CO4	Understand Hadoop Framework in Data Science.	PO4, PO5
CO5	Case study in Data Science.	PO3, PO5

ELECTIVE – INTRODUCTION TO DATA SCIENCE

Unit	Details	No. of Hours
I	Introduction: Benefits and uses – Facts of data – Data science process – Big data ecosystem and data science	15
II	The Data science process: Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building.	15
III	Algorithms: Machine learning algorithms – Modelling process – Types – Supervised – Unsupervised - Semi-supervised	15
IV	Introduction to Hadoop: Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types	15
V	Case Study: Prediction of Disease - Setting research goals - Data retrieval – preparation - exploration - Disease profiling - presentation and automation	15
	Total	75
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Introducing Data Science, manning publications 2016.

Reference books

- ❖ Roger Peng, The Art of Data Science, lulu.com 2016.
- ❖ MurtazaHaider, Getting Started with Data Science – Making Sense of Data with Analytics, IBM press, E-book.
- ❖ Davy Cielen, Arno D.B. Meysman, Mohamed Ali, Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools, Dreamtech Press 2016.
- ❖ Annalyn Ng, Kenneth Soo, Numsense, Data Science for the Layman: No Math Added, 2017, 1st Edition.
- ❖ Cathy O'Neil, Rachel Schutt, —Doing Data Science Straight Talk from the Frontline, O'Reilly Media 2013.
- ❖ Lillian Pierson, —Data Science for Dummies, 2017 II Edition

Web Resources

- ❖ <https://www.w3schools.com/datascience/>
- ❖ https://en.wikipedia.org/wiki/Data_science

Mapping with Programme Outcomes: 3 - Strong, 2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	3	2
Weightage	15	14	11	15	11	10
Weighted percentage of Course Contribution to POs	3.0	2.8	2.2	3.0	2.2	2.0

Course Coordinator

BOS Chairman

ELECTIVE – DATA VISUALIZATION

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UADE15	ELECTIVE	Theory	Y	Y	-	5	3

Learning Objectives

- ❖ To introduce the concept of Data Visualization
- ❖ To explain the various techniques in Data Visualization
- ❖ To introduce students to the fundamental problems
- ❖ To realize concepts, and approaches in the design and analysis of data visualization systems
- ❖ To understand building blocks of Data.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the basics of data visualization.	PO1
CO2	Understand the importance of data visualization and the design and use of many visual components	PO1, PO3
CO3	Explain the process of data visualization	PO2, PO6
CO4	Explain the basics of interactive data visualization techniques visualization-based issues.	PO4, PO5, PO6
CO5	Understand the concept of various types of visualization	PO5, PO6

ELECTIVE – DATA VISUALIZATION

Unit	Details	No. of Hours
I	Introduction-context of data visualization – definition methodology, visualization design objectives. Key factors-purpose, visualization function and tone, visualization design options- data representation, data presentation, seven stages of data visualization, widgets, data visualization tools.	15
II	Visualizing data methods -mapping, timeseries - ==-connections and correlations – scatter plot maps - trees, Hierarchies and recursion-networks naad graphs, infographics	15
III	Visualizing data process- acquiring data, where to find data, tools of acquiring data from the internet, locating file for use with processing, loading text data, dealing with files and folders, listing files in a folder, asynchronous image downloads, advanced web techniques, using a database, dealing with large number of files.	15
IV	Interactive data visualization-drawing with data, scales-axes-updates, transaction and mode interactivity – layouts - geo-mapping-exporting framework.	15
V	Security data visualization-port scan visualization- vulnerability assessment and exploitation – firewall log visualization – instruction detection log visualization - attacking and defending visualization systems creating security visualization system	15
	Total	75
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Scott Murray, Interactive data visualization for the web, O'Reilly media Inc, 2013.

Reference books

- ❖ Benfry, visualizing data, O'Reilly media inc, 2007.
- ❖ Greg conti, security data visualization: graphical techniques for network analysis, Nostarch press inc, 2007

Web Resources

- ❖ https://www.tutorialspoint.com/business_writing_skills/data_visualization.htm#:~:text=Data%20Visualization%20is%20used%20to,accessible%2C%20understandable%2C%20and%20usable.

Mapping with Programme Outcomes: 3 - Strong, 2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	2	2	2	2
CO3	2	2	3	3	3	3
CO4	3	2	3	2	3	2
CO5	2	3	3	3	3	3
Weightage	13	13	14	13	14	13
Weighted percentage of Course Contribution to POs	2.6	2.6	2.8	2.6	2.8	2.6

Course Coordinator

BOS Chairman

Discipline Specific Electives
Semester-VI
Elective-8

ELECTIVE – INTERNET OF THINGS AND ITS APPLICATIONS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UADE16	ELECTIVE	Theory	Y	Y	-	5	3

Learning Objectives

- ❖ Use of Devices, Gateways and Data Management in IoT.
- ❖ Design IoT applications in different domain and be able to analyze their performance
- ❖ Implement basic IoT applications on embedded platform
- ❖ To gain knowledge on Industry Internet of Things
- ❖ To Learn about the privacy and Security issues in IoT

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Work with big data tools and its analysis techniques.	PO1
CO2	Design IoT applications in different domain	PO1, PO2
CO3	Implement basic IoT applications on embedded platform	PO4, PO6
CO4	gain knowledge on Industry Internet of Things.	PO4, PO5, PO6
CO5	Learn about the privacy and Security issues in IoT.	PO3, PO5

ELECTIVE – INTERNET OF THINGS AND ITS APPLICATIONS

Unit	Details	No. of Hours
I	IoT& Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.	15
II	M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.	15
III	IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture-Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views	15
IV	IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management	15
V	Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security	15
	Total	75
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Vijay Madisetti and ArshdeepBahga, —Internet of Things: (A Hands-on Approach), Universities Press (INDIA) Private Limited 2014, 1st Edition.

Reference books

- ❖ Michael Miller, The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World, kindle version.
- ❖ Francis da Costa, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, A-press Publications 2013, 1st Edition.
- ❖ Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice
- ❖ Cuno Pfister, —Getting Started with the Internet of Things, O'Reilly Media 2011

Web Resources

- ❖ <https://www.simplilearn.com>
- ❖ <https://www.javatpoint.com>
- ❖ <https://www.w3schools.com>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	3	3
CO2	3	2	2	3	3	3
CO3	3	2	3	3	3	3
CO4	3	3	2	3	3	3
CO5	3	3	2	3	3	2
Weightage	15	12	11	15	15	14
Weighted percentage of Course Contribution to POs	3.0	2.4	2.2	3.0	3.0	2.8

Course Coordinator

BOS Chairman

ELECTIVE – DATA ANALYTICS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UADE17	ELECTIVE	Theory	Y	Y	-	5	3

Learning Objectives

- ❖ To study the basic inferential statistics and sampling distribution.
- ❖ To understand the concept of estimation of parameters using fundamental tests and testing of hypotheses.
- ❖ To demonstrate the skills to perform various tests in the given data
- ❖ To apply the knowledge to derive hypotheses for given data
- ❖ To perform statistical analytics on a data set

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand and critically apply the concepts and methods of analytics	PO1
CO2	Analyze the concept of sampling	PO1, PO2
CO3	Demonstrate the skills to perform various tests in the given data	PO4, PO6
CO4	Apply the knowledge to derive hypotheses for given data.	PO4, PO5, PO6
CO5	Perform statistical analytics on a data set	PO3, PO5

ELECTIVE – DATA ANALYTICS

Unit	Details	No. of Hours
I	Introduction Data Analytics – Data Analysis Vs Data Analytics – Data Analytics – Types - Data Analytics – Framework – Data Analytics – Tool - R language - Understanding R -features - Installing R and R Studio – Packages and Library	15
II	Importing and Exporting Files: CSV File – JSON File – txt File – Excel File – Xml File - Command Line Vs. Scripts. - Data Pre-Processing – Missing Value – Omitting Null Values – Data Transformation – Data Selection – Data Integration.	15
III	Command Line Vs. Scripts Data Manipulation: Slicing - Subscripts and Indices – Data Subset – Dplyr Package: Select Function - Filter Function - Mutate Function - Arrange Function.	15
IV	Data Summarization & Visualization - Mean – Median – Mode - Variability Measures - Variance – Range - IQR – Standard Deviation – Sum of Squares –Identifying Outliers using IQR.	15
V	Data Analytics Case Studies – Marketing – Logistic Management Insurance – Behavioral Analytics – Data Analytics on Diamond Dataset.	15
	Total	75
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ V. Bhuvaneswari, —Data Analytics with R Step by Step, Scitech Publisher, ISBN – 978-81- 929131-2-4, Edition 2016.& 9)
- ❖ Roger D.Peng, —R Programming for Data Science, Lean Publishing, 2014
- ❖ Vignesh Prajapati, —Big Data Analytics with R and Hadoop, Packt Publishing, ISBN- 978-1- 78216-328-2, 2013.)
- ❖ Sholom Weiss, et.al, —The Text Mining Handbook: Advanced Approaches in Analysing Unstructured Data, Springer, Paperback 2010
- ❖ Emmanuel Paradis, —R for Beginners, 2005.

Reference books

- ❖ Robert S. Witte and John S. Witte, —Statistics, Eleventh Edition, Wiley Publications, 2017.
- ❖ Allen B. Downey, —Think Stats: Exploratory Data Analysis in Python, Green Tea Press, 2014.

Web Resources

- ❖ <https://www.techtarget.com/searchdatamanagement/definition/data-analytics>
- ❖ <https://careerfoundry.com/en/blog/data-analytics/what-is-data-analytics/>
- ❖ <https://www.mastersindatascience.org/learning/what-is-data-analytics/>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
Weightage	15	14	11	15	15	10
Weighted percentage of Course Contribution to POs	3.0	2.8	2.2	3.0	3.0	2.0

Course Coordinator

BOS Chairman

ELECTIVE – CLOUD COMPUTING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UADE18	ELECTIVE	Theory	Y	Y	-	5	3

Learning Objectives

- ❖ To learn fundamental concepts and Technologies of Cloud Computing.
- ❖ To learn various cloud service types and their uses and pitfalls.
- ❖ To learn about Cloud Architecture and Application design.
- ❖ To know the various aspects of application design, benchmarking and security on the Cloud.
- ❖ To learn the various Case Studies in Cloud Computing

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the fundamental concepts and Technologies in Cloud Computing	PO1
CO2	Able to understand various cloud service types and their uses and pitfalls.	PO1, PO2
CO3	Able to understand Cloud Architecture and Application design.	PO4, PO5
CO4	Understand the various aspects of application design, benchmarking and security in the Cloud.	PO4, PO5, PO6
CO5	Understand various Case Studies in Cloud Computing.	PO3, PO6

ELECTIVE – CLOUD COMPUTING

Unit	Details	No. of Hours
I	Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.	15
II	Cloud Services: Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines. Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage. Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure. SQL Database - Windows Azure Table Service. Application Services: Application Runtimes and Frameworks – Queuing Services - Email Services - Notification Services - Media Services - Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery. Network Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight. Deployment and Management Services: Amazon Elastic Beanstalk - Amazon CloudFormation. Identity and Access Management Services: Amazon Identity and Access Management - Windows Azure Active Directory. Open Source Private Cloud Software: Cloud Stack – Eucalyptus - OpenStack	15
III	Cloud Application Design: Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services –Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).	15

IV	Cloud Application Benchmarking and Tuning: Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping. Cloud Security: Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security: Securing data at rest, securing data in motion – Key Management – Auditing.	15
V	Case Studies: Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.	15
	Total	75
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ ArshdeepBahga, Vijay Madisetti, Cloud Computing – A Hands On Approach, Universities Press (India) Pvt. Ltd., 2018

Reference books

- ❖ Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw-Hill, 2013.
- ❖ Barrie Sosinsky, Cloud Computing Bible, Wiley India Pvt. Ltd., 2013.
- ❖ David Crookes, Cloud Computing in Easy Steps, Tata McGraw Hill, 2015.
- ❖ Dr. Kumar Saurabh, Cloud Computing, Wiley India, Second Edition 2012.

Web Resources

- ❖ https://en.wikipedia.org/wiki/Cloud_computing
- ❖ https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7
- ❖ <https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
Weightage	15	14	11	15	15	10
Weighted percentage of Course Contribution to POs	3.0	2.8	2.2	3.0	3.0	2.0

Course Coordinator

BOS Chairman

ELECTIVE – VIRTUAL REALITY

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UADE19	ELECTIVE	Theory	Y	Y	-	5	3

Learning Objectives

- ❖ To outline the basic terminologies, techniques and applications of VR and AR
- ❖ To describe different architectures and principles of VR and AR
- ❖ To use suitable hardware and software technologies for different varieties of virtual and augmented reality applications systems study the basic inferential statistics and sampling distribution.
- ❖ To analyze and explain the behavior of VR and AR technology relates to human perception and cognition
- ❖ To assess the importance of VR/AR content and interactions to implement for the real world problem

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Outline the basic terminologies, techniques and applications of VR and AR	PO1
CO2	Describe different architectures and principles of VR and AR systems	PO1, PO2
CO3	Use suitable hardware and software technologies for different varieties of virtual and augmented reality applications	PO4, PO6
CO4	Analyze and explain the behaviour of VR and AR technology relates to human perception and cognition	PO4, PO5, PO6
CO5	Assess the importance of VR/AR content and interactions to implement for the real-world problem	PO3, PO5

ELECTIVE – VIRTUAL REALITY

Unit	Details	No. of Hours
I	Virtual Reality: The Three I's of VR – History – Early commercial VR Technology – Components of a VR System –Input Devices: Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces	15
II	Output Devices: Graphics Displays – Sound Displays – Haptic Feedback - Computer Architecture for VR: The Rendering Pipeline- PC Graphics Architecture - VR Programming: Toolkits and Scene Graphs – Traditional and Emerging Applications of VR	15
III	Augmented Reality: Introduction – Augmented Reality Concepts: Working Principle of AR –Concepts related to AR- Ingredients of an Augmented Reality Experience.	15
IV	Augmented Reality Hardware – Augmented Reality Software – Software to create content for AR Application – Tools and Technologies.	15
V	Augmented Reality Content: Introduction- Creating Content for Visual, Audio, and other senses – Interaction in AR - Mobile Augmented Reality: Introduction – Augmented Reality Applications Areas- Collaborative Augmented Reality.	15
	Total	75
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Grigore C. Burdea and Philippe Coiffet, —Virtual Reality Technology, Wiley Student Edition, Second Edition (Unit I: Chapter 1,2 & Unit II: Chapter 3,4,6,8 & 9)
- ❖ Alan B. Craig (2013), —Understanding Augmented Reality: Concepts and Applications (Unit III: Chapter 1, 2, Unit IV: Chapter 3, 4 & Unit V: Chapter 5,6,8)
- ❖ Jon Peddie (2017), —Augmented Reality: Where We Will All Live, Springer, 1st Edition (Unit IV: Chapter 7 (Tools & Technologies))

Reference books

- ❖ Alan Craig & William R. Sherman & Jeffrey D. Will, Morgan Kaufmann (2009), Developing Virtual Reality Applications: Foundations of Effective Design, Elsevier (Morgan Kaufmann Publishers)
- ❖ Bruno Arnaldi & Pascal Guitton & Guillaume Moreau (2018), —Virtual Reality and Augmented Reality: Myths and Realities, Wiley

Web Resources

- ❖ <http://msl.cs.uiuc.edu/vr/>
- ❖ <http://www.britannica.com/technology/virtual-reality/Living-in-virtual-worlds>
- ❖ <https://mobidev.biz/blog/augmented-reality-development-guide>

Mapping with Programme Outcomes: 3 - Strong, 2-Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
Weightage	15	14	11	15	15	10
Weighted percentage of Course Contribution to POs	3.0	2.8	2.2	3.0	3.0	2.0

Course Coordinator

BOS Chairman

ELECTIVE – COGNITIVE SCIENCE AND ANALYTICS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UADE20	ELECTIVE	Theory	Y	Y	-	5	3

Learning Objectives

- ❖ To explain cognitive computing and design principles
- ❖ To distinguish between NLP and cognitive computing.
- ❖ To apply advanced analytics to cognitive computing.
- ❖ To discuss application of cognitive computing in business
- ❖ To illustrate various applications of cognitive computing

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Apply cognitive computing and design principles.	PO1
CO2	Understand the concept NLP and cognitive computing.	PO1, PO3
CO3	Analyze advanced analytics to cognitive computing.	PO2, PO6
CO4	Discuss application of cognitive computing in business.	PO4, PO5, PO6
CO5	Evaluate the performance of analytical frameworks	PO5, PO6

ELECTIVE – COGNITIVE SCIENCE AND ANALYTICS

Unit	Details	No. of Hours
I	Foundation of Cognitive Computing: cognitive computing as a new generation, the uses of cognitive systems, system cognitive, gaining insights from data, Artificial Intelligence as the foundation of cognitive computing, understanding cognition.	15
II	Design Principles for Cognitive Systems: Components of a cognitive system, building the corpus, bringing data into cognitive system, machine learning, hypotheses generation and scoring, presentation and visualization services.	15
III	Natural Language Processing in support of a Cognitive System: Role of NLP in a cognitive system, semantic web, Applying Natural language technologies to Business problems	15
IV	Relationship between Big Data and Cognitive Computing: Dealing with human-generated data, defining big data, architectural foundation, analytical data warehouses, Hadoop, data in motion and streaming data, integration of big data with traditional data	15
V	Business Implications of Cognitive Computing: Preparing for change, advantages of new disruptive models, knowledge meaning to business, difference with a cognitive systems approach, meshing data together differently, using business knowledge to plan for the future.	15
	Total	75
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

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

Reference books

- ❖ Arun Kumar Sangaiah, Arunkumar Thangavelu, et al., Cognitive Computing for Big Data Systems Over IoT: Frameworks, Tools and Applications: Lecture Notes on Data Engineering and Communications Technologies 1st edition 2018
- ❖ Min Chen and Kai Hwang, Big-Data Analytics for Cloud, IoT and Cognitive Computing

Wiley Publication, 1st Edition, 2017.

- ❖ Mallick, Pradeep Kumar, Borah, Samarjeet," Emerging Trends and Applications in Cognitive Computing, IGI Global Publishers, 2019

Web Resources

- ❖ <https://www.ulster.ac.uk/cognitive-analytics-research/cognitive-analytics>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	2	2
CO3	2	2	3	3	3	2
CO4	3	2	3	2	3	3
CO5	2	3	3	3	3	3
Weightage	13	13	14	14	14	13
Weighted percentage of Course Contribution to POs	3.6	2.6	2.8	2.8	2.8	2.6

Course Coordinator

BOS Chairman

Skill Enhancement Courses
Semester-II
SEC-I

SEC - FUNDAMENTALS OF INFORMATION TECHNOLOGY

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2UADS01	SEC	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ To understand basic concepts and terminology of information technology.
- ❖ To have a basic understanding of personal computers and their operation.
- ❖ To be able to identify data storage and its usage.
- ❖ To get great knowledge of software and its functionalities.
- ❖ To understand about operating system and their uses.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcome
CO1	Learn the basics of computer, Construct the structure of the required things in computer, learn how to use it.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop organizational structure using for the devices present currently under input or output unit.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Learn the concept of storing data in computer using two headers namely RAM and ROM with different types of ROM with advancement in storage basis.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Work with different software, Write program in the software and applications of software.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Usage of Operating system in information technology which really acts as a interpreter between software and hardware.	PO1, PO2, PO3, PO4, PO5, PO6

SEC - FUNDAMENTALS OF INFORMATION TECHNOLOGY

Unit	Details	No. of Hours
I	Introduction to Computers: Introduction, Definition, Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification of Computers, Applications of Computer, Capabilities and limitations of computer.	6
II	Basic Computer Organization: Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and its types. Printers: Impact Printers and its types. Non-Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers.	6
III	Storage Fundamentals: Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives	6
IV	Software: Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w.	6
V	Operating System: Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi-Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.	6
	Total	30

Text books

- ❖ Anoop Mathew, S. KavithaMurugesan, “Fundamental of Information Technology”, Alpha Science International, Limited, 2013.

Reference books

- ❖ Bhardwaj Sushil Puneet Kumar, “Fundamental of Information Technology”, Excel books, 2009.
- ❖ A Ravichandran, “Fundamentals of Information Technology”, Khanna Book Publishing, 2008.

Web Resources

- ❖ <https://testbook.com/learn/computer-fundamentals>
- ❖ <https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	1	1	2	1
CO2	3	3	3	3	3	3	1	2	1	1
CO3	3	3	3	3	3	3	2	1	1	2
CO4	3	3	3	3	3	3	2	2	1	1
CO5	3	3	3	3	3	3	1	1	2	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	2	3	2
Weightage	15	15	14	15	14
Weighted percentage of Course Contribution to POs	3.0	3.0	2.8	3.0	2.8

Course Coordinator

BOS Chairman

SEC - INTRODUCTION TO HTML

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2UADS02	SEC	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ To insert a graphic within a web page.
- ❖ To create a link within a web page.
- ❖ To create a table within a web page
- ❖ To insert heading levels within a web page
- ❖ To insert ordered and unordered lists within a web page.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcome
CO1	Learn the basic concept of resources in HTML	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Learn the basic concept of Meta Data.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the page formatting and learning the concept of list.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Know the concept of creating link to email address.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand the table creation.	PO1, PO2, PO3, PO4, PO5, PO6

SEC - INTRODUCTION TO HTML

Unit	Details	No. of Hours
I	Introduction: Web Basics: What is Internet – Web browsers – What is Webpage –HTML Basics: Understanding tags.	6
II	Tags for Document structure (HTML, Head, Body Tag). Block level text elements: Headings paragraph (<p> tag) –Font style elements: (bold, italic, font, small, strong, strike, big tags).	6
III	Lists: Types of lists: Ordered, Unordered – Nesting Lists –Other tags: Marquee, HR, BR – Using Images – Creating Hyperlinks.	6
IV	Tables: Creating basic Table, Table elements, Caption – Table and cell alignment –Rowspan, Colspan – Cell padding.	6
V	Frames: Frameset – Targeted Links – Noframe – Forms: Input, Textarea, Select, Option.	6
	Total	30

Text books

- ❖ Leslie Sikos, “Mastering HTML5 and CSS3 Made Easy”, Teach U Comp Inc., 2014.
- ❖ Thomas Michaud, “Foundations of Web Design: Introduction to HTML & CSS”, Pearson Education, 2013.

Web Resources

- ❖ <https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf>
- ❖ <https://www.w3schools.com/html/default.asp>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	1	1	2	1
CO2	3	3	3	3	3	3	1	2	1	1
CO3	3	3	3	3	3	3	2	1	1	2
CO4	3	3	3	3	3	3	2	2	1	1
CO5	3	3	3	3	3	3	1	1	2	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	2
Weightage	14	15	14	15	14
Weighted percentage of Course Contribution to POs	2.8	3.0	2.8	3.0	2.8

Course Coordinator

BOS Chairman

SEC - WEB DESIGNING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2UADS03	SEC	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ To Understand the basics of HTML and its components
- ❖ To study about the Graphics in HTML
- ❖ To understand and apply the concepts of XML and DHTML
- ❖ To understand the concept of JavaScript
- ❖ To identify and understand the goals and objectives of the Ajax

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcome
CO1	Develop working knowledge of HTML.	PO1, PO3, PO6
CO2	Develop and publish Web pages using Hypertext Markup Language (HTML).	PO1, PO2, PO3, PO6
CO3	Optimize page styles and layout with Cascading Style Sheets (CSS).	PO3, PO5
CO4	Develop a java script.	PO1, PO2, PO3,
CO5	Develop web application using Ajax.	PO2, PO6

SEC - WEB DESIGNING

Unit	Details	No. of Hours
I	HTML: HTML – Introduction – tag basics – page structure – adding comments working with texts, paragraphs and line break. Emphasizing test - heading and horizontal rules – list - font size, face and color - alignment links – tables - frames.	6
II	Forms & Images Using Html: Graphics: Introduction - How to work efficiently with images in web pages, image maps, GIF animation, adding multimedia, data collection with html forms textbox, password, list box, combo box, text area, tools for building web page front page. Model Development: Design a web form to get student details.	6
III	XML & DHTML: Cascading style sheet (CSS)-what is CSS-Why we use CSS-adding CSS to your web pages-Grouping styles-extensible markup language (XML).	6
IV	Dynamic HTML: Document object model (DCOM)-Accessing HTML & CSS through DCOM Dynamic content styles & positioning-Event bubbling-data binding. JavaScript: Client-side interactivity with JavaScript-simple Java Script, variables, functions, conditions, loops and repetition. Model Development: Web form validation with JavaScript.	6
V	Advance script, Java Script and objects, Java Script own objects, the DOM and web browser environments, forms and validations. JavaScript with SQL: Database Connectivity-Store and Retrieval of data from database. Hands on Training: Website deployment.	6
	Total	30
• Model Development and Hands on training - related to the above topics are to be considered for Internal Exam Only		

Text books

- ❖ Mike Mcgrath, “Java Script”, 6th Edition, Dream Tech Press, 2020.
- ❖ Stanley Hoffman, Stephen Hoffman, “JavaScript The Ultimate Guide to Learn JavaScript and SQL (JavaScript for Beginners, SQL, Database Programming)”, CreateSpace Independent Publishing Platform, 2016.
- ❖ Achyut S, Godbole, AtulKahate,” Web Technologies”, Tata McGraw-Hill , 2008.

Reference books

- ❖ Laura Lemay, Rafe Colburn , Jennifer Kyrnin, “Mastering HTML, CSS & Javascript Web Publishing”, Pearson Education, 2015.

Web Resources

❖ NPTEL & MOOC courses titled Web Design and Development

❖ <https://www.geeksforgeeks.org>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	1	1	2	1
CO2	3	3	3	3	3	3	1	2	1	1
CO3	3	3	3	3	3	3	2	1	1	2
CO4	3	3	3	3	3	3	2	2	1	1
CO5	3	3	3	3	3	3	1	1	2	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	2	2
CO2	2	3	2	2	3
CO3	3	3	2	3	2
CO4	3	2	3	2	3
CO5	3	2	2	2	3
Weightage	14	12	10	12	13
Weighted percentage of Course Contribution to POs	2.8	2.4	2.0	2.4	2.6

Course Coordinator

BOS Chairman

SEC – MULTIMEDIA SYSTEMS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2UADS04	SEC	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ To Understand the definition of Multimedia
- ❖ To study about the Image File Formats, Sounds Audio File Formats
- ❖ To understand the concepts of Animation and Digital Video Containers
- ❖ To study about the Stage of Multimedia Project
- ❖ To understand the concept of Ownership of Content Created for Project Acquiring Talent

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcome
CO1	Understand the concepts, importance, application and the process of developing multimedia	PO1
CO2	Have basic knowledge and understanding about image related processings	PO1, PO2
CO3	Understand the framework of frames and bit images to animations	PO4, PO6
CO4	Speaks about the multimedia projects and stages of requirement in phases of project.	PO4, PO5, PO6
CO5	Understanding the concept of cost involved in multimedia planning, designing, and producing	PO3, PO6

SEC – MULTIMEDIA SYSTEMS

Unit	Details	No. of Hours
I	Multimedia Definition - Use of Multimedia - Delivering Multimedia - Text: About Fonts and Faces - Using Text in Multimedia - Computers and Text Font Editing and Design Tools - Hypermedia and Hypertext.	6
II	Images: Plan Approach - Organize Tools - Configure Computer Workspace - Making Still Images - Color - Image File Formats. Sound: The Power of Sound –Digital Audio – Midi Audio - Midivs. Digital Audio – Multimedia System Sounds Audio File Formats - Vaughan's Law of Multimedia Minimums - Adding Sound to Multimedia Project.	6
III	Animation: The Power of Motion-Principles of Animation-Animation by Computer - Making Animations that Work. Video: Using Video - Working with Video and Displays - Digital Video Containers - Obtaining Video Clips - Shooting and Editing Video.	6
IV	Making Multimedia: The Stage of Multimedia Project - The Intangible Needs -The Hardware Needs - The Software Needs - An Authoring Systems Needs-Multimedia Production Team.	6
V	Planning and Costing: The Process of Making Multimedia – Scheduling - Estimating - RFPs and Bid Proposals. Designing and Producing - Content and Talent: Acquiring Content – Ownership of Content Created for Project – Acquiring Talent.	6
	Total	30

Text books

- ❖ TayVaughan, "Multimedia: Making It Work", 8th Edition, Osborne/McGraw-Hill, 2001.

Reference books

- ❖ Ralf Steinmetz & Klara Nahrstedt "Multimedia Computing, Communication & Applications", Pearson Education, 2012.

Web Resources

- ❖ <https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/>

Mapping with Programme Outcomes: 3-Strong, 2–Medium, 1–Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	1	1	2	1
CO2	3	3	3	3	3	3	1	2	1	1
CO3	3	3	3	3	3	3	2	1	1	2
CO4	3	3	3	3	3	3	2	2	1	1
CO5	3	3	3	3	3	3	1	1	2	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	3	3	3
CO2	2	3	2	3	2
CO3	1	2	3	3	3
CO4	3	2	2	2	1
CO5	2	3	1	3	3
Weightage	10	12	11	14	12
Weighted percentage of Course Contribution to POs	2.0	2.4	2.2	2.8	2.4

Course Coordinator**BOS Chairman**

Skill Enhancement Courses
Semester-III
SEC-II & SEC-III

SEC - DATA ANALYTICS USING R

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3UADS05	SEC	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ To understand the problem-solving approaches.
- ❖ To learn the basic programming constructs in R Programming.
- ❖ To practice various computing strategies for R Programming -based solutions to real world problems
- ❖ To use R Programming data structures - lists, tuples, and dictionaries
- ❖ To do input/output with files in R Programming

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcome
CO1	Work with big data tools and its analysis techniques.	PO1
CO2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO3
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO2, PO6
CO4	Perform analytics on data streams.	PO4, PO5, PO6
CO5	Understand the input/output with file concept.	PO5, PO6

SEC - DATA ANALYTICS USING R

Unit	Details	No. of Hours
I	Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Model.	6
II	Introduction to R: Variables – Scalars – Vectors - Matrices – List – Data frames – Factors - Using c, Cbind, Rbind, attach and detach functions in R.	6
III	Functions and Loops: Mathematical functions – summary functions – String functions – user defined functions – local and global variables. While loop – for loop – if statement – Operators.	6
IV	Importing Data: Reading tabular data files, CSV files – importing data from excel and SAS – Writing to files. Manipulating Data: Selecting rows/observations – selecting columns/fields – merging data – relabeling the column name – converting variable types – Data sorting and aggregation.	6
V	Charts and plots: Box plot – Histogram – Pareto Chart – Pie graph – Line Chart – Scatter plot – Developing graphs.	6
	Total	30

Text books

- ❖ Roger D. Peng, “R Programming for Data Science”, 2012.
- ❖ Norman Matloff, “The Art of R Programming- A Tour of Statistical Software Design”, 2011.

Reference Books

- ❖ Garrett Grolemond, Hadley Wickham, “Hands-On Programming with R: Write Your Own Functions and Simulations”, 1st Edition, 2014.
- ❖ Venables, W.N., and Ripley, “R Programming”, Springer, 2010.

Web Resources

- ❖ <https://www.w3schools.com/r/default.asp>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	1	1	2	1
CO2	3	3	3	3	3	3	1	2	1	1
CO3	3	3	3	3	3	3	2	1	1	2
CO4	3	3	3	3	3	3	2	2	1	1
CO5	3	3	3	3	3	3	1	1	2	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	2
Weightage	14	15	14	15	14
Weighted percentage of Course Contribution to POs	2.8	3.0	2.8	3.0	2.8

Course Coordinator

BOS Chairman

SEC - DATA ANALYTICS USING R LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3UADSP01	SEC	Practical	-	-	Y	2	1

Learning Objectives

- ❖ To understand the problem solving approaches.
- ❖ To learn the basic programming constructs in R Programming.
- ❖ To practice various computing strategies for R Programming -based solutions to real world problems
- ❖ To use R Programming data structures - lists, tuples, and dictionaries
- ❖ To do input/output with files in R Programming

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcome
CO1	Work with big data tools and its analysis techniques.	PO1
CO2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO3
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO2, PO6
CO4	Perform analytics on data streams.	PO4, PO5, PO6
CO5	Understand the input/output with file concept.	PO5, PO6

SEC - DATA ANALYTICS USING R LAB

Program List	No.of Hours
1. To develop a Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice. 2. To develop Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user. 3. To design a program to find list of even numbers from 1 to n using R Loops. 4. To create a function to print squares of numbers in sequence. 5. To Write a program to join columns and rows in a data frame using cbind() and rbind() in R. 6. To implement different data structures in R (Vectors, Lists, Data Frames) 7. To develop a program to read a csv file and analyze the data in the file in R. 8. To develop pie chart and bar chart using R. 9. To create a data set and do statistical analysis on the data using R. 10. To develop a program to count the number of even and odd numbers from array of N numbers.	15
Total	15

Text books

- ❖ Roger D. Peng, “R Programming for Data Science”, 2012.
- ❖ Norman Matloff, “The Art of R Programming- A Tour of Statistical Software Design”, 2011.

Reference Books

- ❖ Garrett Grolemond, Hadley Wickham, “Hands-On Programming with R: Write Your Own Functions and Simulations” , 1st Edition, 2014.
- ❖ Venables W.N. and Ripley, “R Programming”, Springer, 2010.

Web Resources

- ❖ <https://www.w3schools.com/r/default.asp>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	1	1	2	1
CO2	3	3	3	3	3	3	1	2	1	1
CO3	3	3	3	3	3	3	2	1	1	2
CO4	3	3	3	3	3	3	2	2	1	1
CO5	3	3	3	3	3	3	1	1	2	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	2
Weightage	14	15	14	15	14
Weighted percentage of Course Contribution to POs	2.8	3.0	2.8	3.0	2.8

Course Coordinator**BOS Chairman**

SEC- DATA ANALYTICS USING ADVANCED EXCEL

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3UADS06	SEC	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ Handle large amount of data and managing worksheets.
- ❖ Aggregate numeric data and summarize into categories and subcategories.
- ❖ Creating chart and advanced conditional formatting, filtering.
- ❖ Create advanced formulas and advanced chart.
- ❖ Create pivot tables to consolidate data from multiple files.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcome
CO1	Knows the basic concept of worksheets and managing the worksheets.	PO1-PO6
CO2	Knows, how to aggregate numeric data and summarizing the data.	PO1-PO6
CO3	Knows to create advanced formulas and advanced chart	PO1-PO6
CO4	Know the concept of advanced formulas.	PO1-PO6
CO5	Create pivot table and handling multiple files.	PO1-PO6

SEC- DATA ANALYTICS USING ADVANCED EXCEL

Unit	Details	No. of Hours
I	INTRODUCTION TO EXCEL: Cells – name range – references – Creating and editing worksheets-Cell Formatting-Creating and using formulas and functions-Use of Macros –Sorting and querying data- usage of Paste special.	6
II	APPLICATIONS OF EXCEL IN DIFFERENT AREAS: Preparation of a table Using EXCEL e.g. Employees payroll, Sales data, Students marks and perform the functions (Total, Average, Percentage, conditional sum and show the results in chart) - Creating formulas for financial solutions.	6
III	ADVANCED EXCEL: Cell Referencing - Data Validation-Naming a Cell or Range of Cells (Name Manager)-Basic formulas (SUM, COUNTA, AVERAGE, MAX, and MIN). Text Functions (RIGHT, LEFT, MID, SUBSTITUTE, FIND, LEN). Date Functions (TODAY, NOW, DAY, MONTH, YEAR, EDATE, EOMONTH, TEXT).	6
IV	ADVANCED EXCEL II: Lookup Functions (VLOOKUP, HLOOKUP, MATCH, and INDEX). - Logical Functions (IF, AND, OR). -Data Analysis Functions (SUMIF, SUMIFS, COUNTIF, COUNTIFS) - Conditional Formatting, Filtering and Sorting. - Graphs, Charts and Pivot Tables remove duplicates.	6
V	CONDUCTING ONLINE SURVEYS: Usage of Google drive – micro soft online surveys – sharing with the help of social media.	6
	Total	30

Text books

- ❖ Beskeen, D, and Microsoft Office 2013: Illustrated introductory, first course. Stamford, CT: Cengage Learning, 2013.
- ❖ Rinkoo Jainn, A to Z of MS EXCEL, A Book for Learners and Trainers, Amazon digital Services LLC-KDP print US. 2021.

Reference books

- ❖ Introduction to Computers and Communications, Peter Norton-Sixth Edition-Tata McGraw Hill, 2009.
- ❖ V.Rajaraman, Introduction to Information Technology, Prentice Hall India, 2008.
- ❖ Winston-Microsoft Office Excel Data Analysis and Business Modeling, First Edition, Prentice Hall India. 2007.
- ❖ David Whigham, Business Data Analysis Using Excel, Oxford University Press, first Indian Edition.

Web Resources

- ❖ <https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf>
- ❖ <https://www.w3schools.com/html/default.asp>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	2	3	1	1	2	1
CO2	3	2	3	1	3	3	1	2	1	1
CO3	3	3	3	3	2	3	2	1	1	2
CO4	3	2	3	3	3	3	2	2	1	1
CO5	3	3	2	2	3	3	1	1	2	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	2	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	2	3
Weightage	14	15	14	14	15
Weighted percentage of Course Contribution to POs	2.8	3.0	2.8	2.8	3.0

Course Coordinator

BOS Chairman

SEC- DATA ANALYTICS USING ADVANCED EXCEL LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3UADSP02	SEC	Practical	-	-	Y	2	1

Learning Objectives

- ❖ Understand Data Analytics Concepts.
- ❖ Learn about Data Preparation and Cleaning
- ❖ Applying the concept of Advanced Excel Functions
- ❖ Apply and using the Data Analysis Tools
- ❖ Understanding the Data Visualization

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcome
CO1	Explain basic concepts of Excel and create/edit spreadsheet.	PO2
CO2	Apply basic excel formula in various functional areas of management.	PO1, PO2
CO3	Demonstrate knowledge in using advanced excel functions.	PO2,PO4,PO6
CO4	Apply logical functions of Excel	PO2,PO4,PO5
CO5	Use online methods to conduct surveys.	PO2,PO4

SEC- DATA ANALYTICS USING ADVANCED EXCEL LAB

Program List	No.of Hours
1. Write a program to create and editing worksheets by using Excel. 2. Write a program to Creating Excel Sheets with Formula and Functions. 3. Write a program to implement the Simple statistical functions. 4. Write a program to implement the logical functions. 5. Write a program to implement Decision making using IF, SUMIF, COUNTIF. 6. Write a program to perform the Text functions. 7. Write a program to perform the Look up functions. 8. Write a program for Creating and Formatting a Sales Table in Excel. 9. Write programs for implementing the Visualization using charts. 10. Write programs for implementing Page referencing.	15
Total	15

Text books

- ❖ Beskeen D, and Microsoft Office 2013: Illustrated introductory, first course. Stamford, CT: Cengage Learning, 2013.
- ❖ Rinkoo Jainn, A to Z of MS EXCEL, A Book for Learners and Trainers, Amazon digital Services LLC-KDP print US. 2021.

Reference books

- ❖ Introduction to Computers and Communications, Peter Norton-Sixth Edition-Tata McGraw Hill, 2009.
- ❖ Winston, Microsoft Office Excel Data Analysis and Business Modeling, First Edition, Prentice Hall India. 2007.
- ❖ David Whigham, Business Data Analysis Using Excel, Oxford University Press, first Indian Edition.

Web Resources

- ❖ <https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf>
- ❖ <https://www.w3schools.com/html/default.asp>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	1	1	2	1
CO2	3	3	3	3	3	3	1	2	1	1
CO3	3	3	3	3	3	3	2	1	1	2
CO4	3	3	3	3	3	3	2	2	1	1
CO5	3	3	3	3	3	3	1	1	2	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	2	2	1
CO2	3	1	3	2	3
CO3	3	2	2	0	2
CO4	2	0	3	3	3
CO5	3	3	3	3	3
Weightage	12	9	13	10	12
Weighted percentage of Course Contribution to POs	2.4	1.8	2.6	2.0	2.4

Course Coordinator

BOS Chairman

Skill Enhancement Courses
Semester-IV
SEC-IV & SEC-V

SEC – MACHINE LEARNING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4UADS07	SEC	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ To Learn about Machine Intelligence and Machine Learning applications
- ❖ To implement and apply machine learning algorithms to real-world applications
- ❖ To identify and apply the appropriate machine learning technique to classification, pattern recognition, optimization and decision problems
- ❖ To create instant based learning
- ❖ To apply advanced learning

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcome
CO1	Appreciate the importance of visualization in the data analytics solution	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Apply structured thinking to unstructured problems.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand a very broad collection of machine learning algorithms and problems.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop an appreciation for what is involved in learning from data.	PO1, PO2, PO3, PO4, PO5, PO6

SEC – MACHINE LEARNING

Unit	Details	No. of Hours
I	Introduction Machine Learning: Designing a Learning system – Perspectives and issues in ML – Learning task – Learning as Search – Decision Tree Learning: Representation – basic decision tree algorithm – hypothesis space search – issues in decision tree learning.	6
II	Artificial Neural Networks: NN representation – Perceptrons – Multilayer networks and Backpropagation algorithm – Remarks on the Backpropagation. Evaluating hypothesis: Estimating hypothesis accuracy – basics of sampling theory – central limit theorem – hypothesis testing.	6
III	Bayesian Learning: Bayes theorem – Brute-Force bayes – Minimum description length principle – Gibbs algorithm – Naïve Bayes classifier – Bayesian belief networks – EM algorithm.	6
IV	Instance based learning: k-Nearest Neighbour learning – locally weighted learning – Radial basis functions- case based reasoning – Lazy and Eager learning. Genetic algorithm: operators – fitness function and selection – models of evolution and learning – parallelizing genetic algorithm.	6
V	Analytical learning: inductive and analytical learning – Explanation based learning – combining inductive and analytical learning – Reinforcement learning: Learning task – Q learning – temporal difference learning.	6
	Total	30

Text books

- ❖ Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education (India) Private Limited, 2013.
- ❖ Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning" 2015, MIT Press.

Reference Books

- ❖ Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
- ❖ Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press, 2009.

Web Resources

- ❖ <https://www.w3schools.com/r/default.asp>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	1	1	2	1
CO2	3	3	3	3	3	3	1	2	1	1
CO3	3	3	3	3	3	3	2	1	1	2
CO4	3	3	3	3	3	3	2	2	1	1
CO5	3	3	3	3	3	3	1	1	2	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	2
Weightage	15	15	14	15	14
Weighted percentage of Course Contribution to POs	3.0	3.0	2.8	3.0	2.8

Course Coordinator

BOS Chairman

SEC – MACHINE LEARNING LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4UADSP03	SEC	Practical	-	-	Y	2	2

Learning Objectives

- ❖ To Learn about Machine Intelligence and Machine Learning applications
- ❖ To implement and apply machine learning algorithms to real-world applications
- ❖ To identify and apply the appropriate machine learning technique to classification, pattern recognition, optimization and decision problems
- ❖ To create instant based learning
- ❖ To apply advanced learning

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcome
CO1	Appreciate the importance of visualization in the data analytics solution	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Apply structured thinking to unstructured problems.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand a very broad collection of machine learning algorithms and problems.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop an appreciation for what is involved in learning from data.	PO1, PO2, PO3, PO4, PO5, PO6

SEC – MACHINE LEARNING LAB

Program List (use Weka Tool)	No. of Hours
1. Solving Regression & Classification using Decision Trees 2. Root Node Attribute Selection for Decision Trees using Information Gain 3. Bayesian Inference in Gene Expression Analysis 4. Pattern Recognition Application using Bayesian Inference 5. Bagging in Classification 6. Bagging, Boosting applications using Regression Trees 7. Data & Text Classification using Neural Networks 8. Using Weka tool for SVM classification for chosen domain application 9. Data & Text Clustering using K-means algorithm 10. Data & Text Clustering using Gaussian Mixture Models	30
Total	30

Text books

- ❖ Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education (India) Private Limited, 2013.
- ❖ Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning" 2015, MIT Press.

Reference Books

- ❖ Ethem Alpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
- ❖ Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009.

Web Resources

- ❖ <https://www.tutorialspoint.com/weka/index.htm>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	1	1	2	1
CO2	3	3	3	3	3	3	1	2	1	1
CO3	3	3	3	3	3	3	2	1	1	2
CO4	3	3	3	3	3	3	2	2	1	1
CO5	3	3	3	3	3	3	1	1	2	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	2
Weightage	15	15	14	15	14
Weighted percentage of Course Contribution to POs	3.0	3.0	2.8	3.0	2.8

Course Coordinator

BOS Chairman

SEC - PHP PROGRAMMING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4UADS08	SEC	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ To provide the necessary knowledge on basics of PHP.
- ❖ To design and develop dynamic, database-driven web applications using PHP version.
- ❖ To get an experience on various web application development techniques.
- ❖ To learn the necessary concepts for working with the files using PHP.
- ❖ To get a knowledge on OOPS with PHP.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcome
CO1	Write PHP scripts to handle HTML forms	PO1,PO4,PO6
CO2	Write regular expressions including modifiers, operators, and meta characters.	PO2,PO5
CO3	Create PHP Program using the concept of array.	PO3,PO4,PO5
CO4	Create PHP programs that use various PHP library functions.	PO2,PO3,PO5
CO5	Manipulate files and directories.	PO3,PO5,PO6

SEC - PHP PROGRAMMING

Unit	Details	No. of Hours
I	Introduction to PHP -Basic Knowledge of websites -Introduction of Dynamic Website -Introduction to PHP -Scope of PHP -XAMPP and WAMP Installation	6
II	PHP Programming Basics -Syntax of PHP -Embedding PHP in HTML -Embedding HTML in PHP. Introduction to PHP Variable -Understanding Data Types -Using Operators -Using Conditional Statements -If(), else if() and else if condition Statement.	6
III	Switch() Statements -Using the while() Loop -Using the for() Loop PHP Functions -Creating an Array -Modifying Array Elements - Processing Arrays with Loops - Grouping Form Selections with Arrays -Using Array Functions.	6
IV	PHP Advanced Concepts -Reading and Writing Files -Reading Data from a File.	6
V	Managing Sessions and Using Session Variables -Destroying a Session -Storing Data in Cookies -Setting Cookies.	6
Total		30

Text books

- ❖ Lynn mighley and Michael Morrison, “Head First PHP & MySQL: A Brain-Friendly Guide”, O'Reilly Media, 2008.
- ❖ Alan Forbes, “The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL”, CreateSpace Independent Publishing Platform, 2012.

Reference books

- ❖ Steven Holzner, “PHP: The Complete Reference”, McGraw-Hill Education, 2008.
- ❖ DT Editorial Services, “HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)”, Willey India Pvt. Limited, Paperback 2016.

Web Resources

- ❖ Opensource digital libraries: PHP Programming
- ❖ <https://www.w3schools.com/php/default.asp>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	1	1	2	1
CO2	3	3	3	3	3	3	1	2	1	1
CO3	3	3	3	3	3	3	2	1	1	2
CO4	3	3	3	3	3	3	2	2	1	1
CO5	3	3	3	3	3	3	1	1	2	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	2	1
CO2	3	3	2	2	3
CO3	3	3	2	3	3
CO4	3	2	3	2	2
CO5	3	2	2	2	3
Weightage	15	12	10	11	12
Weighted percentage of Course Contribution to POs	3.0	2.4	2.0	2.2	2.4

Course Coordinator**BOS Chairman**

SEC – PHP PROGRAMMING LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4UADSP04	SEC	Practical	-	-	Y	2	2

Learning Objectives

- ❖ To provide the necessary knowledge on basics of PHP.
- ❖ To design and develop dynamic, database-driven web applications using PHP version.
- ❖ To get an experience on various web application development techniques.
- ❖ To learn the necessary concepts for working with the files using PHP.
- ❖ To get a knowledge on OOPS with PHP

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcome
CO1	Write PHP scripts to handle HTML forms.	PO1, PO4, PO6
CO2	Write regular expressions including modifiers, operators and meta characters.	PO2,PO5
CO3	Create PHP Program using the concept of array.	PO3, PO4, PO5
CO4	Create PHP programs that use various PHP library functions.	PO2, PO3, PO5
CO5	Manipulate files and directories.	PO3, PO5, PO6

SEC – PHP PROGRAMMING LAB

Program List	No.of Hours
1. Write a PHP program to get name of the user from a form and show greeting text. 2. Write a PHP program to check whether given number is Armstrong or not. 3. Write a Mathematical calculator program. 4. Write a Age calculator program. 5. Write a PHP program to check whether given number is String palindrome or not. 6. Write a PHP program to Array manipulation. 7. Create a PHP page for login page with SQL connection. 8. Write a PHP program to perform file operations. 9. Write a PHP program hit counter using cookies. 10. Create a PHP page for login system using session.	30
Total	30

Text books

- ❖ Lynn mighley and Michael Morrison, “Head First PHP & MySQL: A Brain-Friendly Guide”, O'Reilly Media, 2008.
- ❖ Alan Forbes, “The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL”, CreateSpace Independent Publishing Platform, 2012.

Reference books

- ❖ Steven Holzner, “PHP: The Complete Reference”, McGraw-Hill Education, 2008.
- ❖ DT Editorial Services, “HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)”, Willey India Pvt. Limited, Paperback 2016.

Web Resources

- ❖ Opensource digital libraries: PHP Programming
- ❖ <https://www.w3schools.com/php/default.asp>

Mapping with Programme Outcomes: 3-Strong, 2-Medium, 1-Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	1	1	2	1
CO2	3	3	3	3	3	3	1	2	1	1
CO3	3	3	3	3	3	3	2	1	1	2
CO4	3	3	3	3	3	3	2	2	1	1
CO5	3	3	3	3	3	3	1	1	2	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	1	0
CO2	2	0	1	1	2
CO3	3	3	1	1	0
CO4	1	3	2	1	0
CO5	3	2	1	1	0
Weightage	12	11	6	5	2
Weighted percentage of Course Contribution to POs	2.4	2.2	1.2	1.0	0.4

Course Coordinator

BOS Chairman

Skill Enhancement Courses
Semester-VI
SEC-VI

SEC – QUANTITATIVE APTITUDE

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UADS09	SEC	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ To understand the basic concepts of numbers.
- ❖ To understand and apply the concept of percentage, profit & loss.
- ❖ To study the basic concepts of time and work, interests
- ❖ To learn the concepts of permutation, probability, discounts
- ❖ To study about the concepts of data representation, graphs

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	understand the concepts, application and the problems of numbers	PO1
CO2	Have basic knowledge and understanding about percentage, profit & loss related processing	PO1, PO2
CO3	Understand the concepts of time and work	PO4, PO6
CO4	Speaks about the concepts of probability, discount	PO4, PO5
CO5	Understanding the concept of problem solving involved in stocks & shares, graphs	PO3, PO6

ELECTIVE – QUANTITATIVE APTITUDE

Unit	Details	No. of Hours
I	Numbers-HCF and LCM of numbers-Decimal Fractions-Simplification-Square root and cube roots - Average-problems on Numbers.	6
II	Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion - partnership Chain rule.	6
III	Time and work - pipes and cisterns - Time and Distance - problems on trains -Boats and streams - simple interest - compound interest - Logarithms - Area-Volume and surface area -races and Games of skill.	6
IV	Permutation and combination-probability-True Discount-Bankers Discount – Height and Distances - Odd man out & Series.	6
V	Calendar - Clocks - stocks and shares - Data representation - Tabulation – Bar Graphs- Pie Charts-Line graphs.	6
	Total	30
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Quantitative Aptitude, R.S. AGGARWAL., S.Chand & Company Ltd.,

Reference books

- ❖ Quantitative Aptitude for Competitive Examinations, R.S. Aggarwal, S.Chand & Company Ltd, reprint-2017.

Web Resources

- ❖ <https://www.javatpoint.com/aptitude/quantitative>
- ❖ <https://www.toppr.com/guides/quantitative-aptitude/>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	2	2	2	2
CO2	2	3	2	3	3	1
CO3	2	2	2	3	3	2
CO4	3	2	1	3	3	2
CO5	3	3	2	3	3	3
Weightage	13	11	9	14	14	10
Weighted percentage of Course Contribution to POs	2.6	2.2	1.8	2.8	2.8	2.0

Course Coordinator

BOS Chairman

SEC – CYBER FORENSICS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UADS10	SEC	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ To understand the definition of computer forensics fundamentals.
- ❖ To study about the Types of Computer Forensics Evidence
- ❖ To Understand and apply the concepts of Duplication and Preservation of Digital Evidence
- ❖ To understand the concepts of Electronic Evidence and Identification of Data
- ❖ To study about the Digital Detective, Network Forensics Scenario, Damaging Computer Evidence.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the definition of computer forensics fundamentals.	PO1
CO2	Evaluate the different types of computer forensics technology.	PO1, PO2
CO3	Analyze various computer forensics systems.	PO4, PO6
CO4	Apply the methods for data recovery, evidence collection and data seizure.	PO4, PO5, PO6
CO5	Gain your knowledge of duplication and preservation of digital evidence.	PO3, PO6

ELECTIVE – CYBER FORENSICS

Unit	Details	No. of Hours
I	Overview of Computer Forensics Technology: Computer Forensics Fundamentals: What is Computer Forensics Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of professional Forensics Methodology, Steps taken by Computer Forensics Specialists. Types of Computers. Forensics Technology: Types of Business Computer Forensic, Technology–Types of Military Computer Forensic Technology–Types of Law Enforcement–Computer Forensic. Technology–Types of Business Computer Forensic Technology.	6
II	Computer Forensics Evidence and capture: Data Recovery: Data Recovery Defined, Data Back–up and Recovery, The Role of Back –up in Data Recovery, The Data –Recovery Solution. Evidence Collection and Data Seizure: Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collections, Artefacts, Collection Steps, Controlling Contamination: The chain of custody.	6
III	Duplication and Preservation of Digital Evidence: Processing steps, Legal Aspects of collecting and Preserving Computer forensic Evidence. Computer image Verification and Authentication: Special needs of Evidential Authentication, Practical Consideration, Practical Implementation.	6
IV	Computer Forensics Analysis: Discovery of Electronic Evidence: Electronic Document Discovery: A Powerful New Litigation Tool. Identification of Data: Time Travel, Forensic Identification and Analysis of Technical Surveillance Devices.	6
V	Reconstructing Past Events: How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files. Networks: Network Forensics Scenario, a technical approach, Destruction Of E–Mail, Damaging Computer Evidence, DocumentingThe Intrusion on Destruction of Data, System Testing.	6
	Total	30
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ John R. Vacca, —Computer Forensics: Computer Crime Investigation, 3/E, Firewall Media, New Delhi, 2002.

Reference books

- ❖ Nelson, Phillips Enfinger, Steuart, Computer Forensics and Investigations Enfinger, Steuart, CENGAGE Learning, 2004.
- ❖ Anthony Sammes and Brian Jenkinson, Forensic Computing: A Practitioner's Guide, Second Edition, Springer-Verlag London Limited, 2007.
- ❖ Robert M. Slade, Software Forensics Collecting Evidence from the Scene of a Digital Crime, TMH 2005.

Web Resources

- ❖ <https://www.vskills.in>
- ❖ <https://www.hackingarticles.in/best-of-computer-forensics-tutorials/>

Mapping with Programme Outcomes: 3 - Strong, 2-Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	2	2	2	2
CO2	2	3	2	3	3	1
CO3	3	2	2	3	3	2
CO4	3	3	1	3	3	2
CO5	3	3	2	3	3	3
Weightage	14	12	9	14	14	10
Weighted percentage of Course Contribution to POs	2.8	2.4	1.8	2.8	2.8	2.0

Course Coordinator

BOS Chairman

SEC – PATTERN RECOGNITION

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UADS11	SEC	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ To learn the fundamentals of Pattern Recognition techniques
- ❖ To learn the various Statistical Pattern recognition techniques
- ❖ To learn the linear discriminant functions and unsupervised learning and clustering
- ❖ To learn the various Syntactical Pattern recognition techniques
- ❖ To learn the Neural Pattern recognition techniques

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the concepts, importance, application and the process of developing Pattern recognition over view.	PO1
CO2	Basic knowledge and understanding about parametric and non-parametric related concepts.	PO1, PO2
CO3	Understand the framework of frames and bit images to animations.	PO4, PO6
CO4	Speaks about the multimedia projects and stages of requirement in phases of project	PO4, PO5, PO6
CO5	Understanding the concept of cost involved in multimedia planning, designing, and producing	PO3, PO6

ELECTIVE – PATTERN RECOGNITION

Unit	Details	No. of Hours
I	PATTERN RECOGNITION OVERVIEW: Pattern recognition, Classification and Description-Patterns and feature Extraction with Examples-Training and Learning in PR systems-Pattern recognition Approaches	6
II	STATISTICAL PATTERN RECOGNITION: Introduction to statistical Pattern Recognition - supervised Learning using Parametric and Non-Parametric Approaches.	6
III	LINEAR DISCRIMINANT FUNCTIONS AND UNSUPERVISED LEARNING AND CLUSTERING: Introduction-Discrete and binary Classification Problems-Techniques to directly Obtain linear Classifiers - Formulation of Unsupervised Learning Problems-Clustering for unsupervised learning and classification.	6
IV	SYNTACTIC PATTERN RECOGNITION: Overview of Syntactic Pattern Recognition-Syntactic recognition via parsing and other grammars-Graphical Approaches to syntactic pattern recognition-Learning via grammatical inference.	6
V	NEURAL PATTERN RECOGNITION: Introduction to Neural Networks-Feed-forward Networks and training by Back Propagation-Content Addressable Memory Approaches and Unsupervised Learning in Neural PR	6
	Total	30
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Robert Schalkoff, —Pattern Recognition: Statistical Structural and Neural Approaches, John Wiley & Sons.
- ❖ Duda R.O., P.E.Hart & D. G Stork, — Pattern Classification, 2nd Edition, J.Wiley
- ❖ Duda R.O. & Hart P.E., —Pattern Classification and Scene Analysis, J.Wiley.
- ❖ Bishop C.M., —Neural Networks for Pattern Recognition, Oxford University Press.

Reference books

- ❖ Earl Gose, Richard Johnsonbaugh, Steve Jost, —Pattern Recognition and Image Analysis, Prentice Hall of India, Pvt Ltd, New Delhi.

Web Resources

- ❖ <https://www.geeksforgeeks.org/pattern-recognition-introduction/>
- ❖ <https://www.mygreatlearning.com/blog/pattern-recognition-machine-learning/>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	2	2
CO2	3	3	2	2	3	1
CO3	3	3	3	3	2	2
CO4	3	3	3	3	3	2
CO5	3	3	2	2	3	3
Weightage	15	15	12	12	13	10
Weighted percentage of Course Contribution to POs	3.0	3.0	2.4	2.4	2.6	2.0

Course Coordinator

BOS Chairman

SEC – ENTERPRISE RESOURCE PLANNING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S6UADS12	SEC	Theory	Y	Y	-	2	2

Learning Objectives

- ❖ To understand the basic concepts, Evolution and Benefits of ERP.
- ❖ To know the need and Role of ERP in logical and Physical Integration.
- ❖ To identify the important business functions provided by typical business software such as enterprise resource planning and customer relationship management
- ❖ To train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth
- ❖ To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the basic concepts of ERP.	PO1, PO2, PO6
CO2	Identify different technologies used in ERP	PO2, PO3, PO4
CO3	Understand and apply the concepts of ERP Manufacturing Perspective and ERP Modules.	PO1, PO3, PO6
CO4	Discuss the benefits of ERP	PO2, PO6
CO5	Apply different tools used in ERP	PO1, PO3, PO5

ELECTIVE – ENTERPRISE RESOURCE PLANNING

Unit	Details	No. of Hours
I	ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP, Components and needs of ERP, ERP Vendors; Benefits & Limitations of ERP packages.	6
II	Need to focus on Enterprise Integration/ERP; Information mapping; Role of common shared Enterprise database; System Integration, Logical vs. Physical System Integration, Benefits & limitations of System Integration, ERP 's Role in Logical and Physical Integration. Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management (PLM), LAP, Supply chain Management.	6
III	ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP-Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications. Cloud and Open Source, Quality Management, Material Management, Financial Module, CRM and Case Study.	6
IV	ERP Implementation Basics, ERP implementation Strategy, ERP Implementation Life Cycle, Pre-Implementation task, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees.	6
V	ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE format to case study.	6
	Total	30
• Model Construction and Model Development – related to the above topic are to be considered for Internal Exam only		

Textbooks

- ❖ Enterprise Resource Planning – Alexis Leon, Tata McGraw Hill.

Reference books

- ❖ Enterprise Resource Planning – Diversified by Alexis Leon, TMH.

Web Resources

- ❖ https://www.tutorialspoint.com/management_concepts/enterpriseresource_planning.htm
- ❖ <https://www.oracle.com/in/erp/what-is-erp/>

Mapping with Programme Outcomes: 3 - Strong, 2–Medium,1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	2	3	1	2	1	1
CO2	1	3	2	1	1	2	1	2	1	2
CO3	2	3	2	3	1	1	2	1	2	1
CO4	1	2	2	3	1	3	2	1	2	1
CO5	2	1	2	1	3	3	1	2	2	1

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	2	2	2
CO2	3	3	2	2	3	2
CO3	3	3	3	3	3	2
CO4	3	3	3	3	3	2
CO5	3	3	3	2	2	3
Weightage	15	15	14	12	13	11
Weighted percentage of Course Contribution to POs	3.0	3.0	2.8	2.4	2.6	2.2

Course Coordinator

BOS Chairman