K.M.G. COLLEGE OF ARTS AND SCIENCE

(AUTONOMOUS)

Approved by the Government of Tamil Nadu
Permanently Affiliated to Thiruvalluvar University, Vellore
Recognized under Section 2(f) and 12(B) of the UGC Act 1956
Accredited by NAAC (2nd Cycle) with (CGPA of 3.24/4) 'A' Grade

DEPARTMENT OF DATA SCIENCE

B.Sc., DATA SCIENCE

SYLLABUS

(CHOICE BASED CREDIT SYSTEM)

Under

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)

(Effective for the Batch of Students Admitted from 2024-2025)

PREFACE

Data Science is a vast field comprising many topics of Statistics, Mathematics, and IT. A Data Science course syllabus for beginners covers basic and advanced concepts of data analytics, Machine learning, Statistics, and programming languages like Python or R. It also teaches students how to interpret large datasets and identify patterns to create predictive models. Data Science has come a long way. Data Scientists were once referred to as business problem solvers" who knew how to make sense of incoherent data clusters. Fast-forward to the present, Data Scientists are the most important resources for any business looking to thrive in this mad rush. They are now the wizards of all problem solvers".

The course is enabled to include several interdisciplinary areas like: programming languages, algorithms, operating systems, databases, machine learning, data mining, business intelligence, big data, probability and statistics, data optimization, statistical simulation and data analysis, management decision analysis, decision models and predictive analysis. Data Science has gained paramount importance in the computer science domain. The need for scientists who understand data in all its aspects will continue to grow strongly. Students graduating from the program will have significantly more depth and breadth in the broad area of Data Science and receive all the information they need to work with various kinds of data and statistical data. The program is designed so that students have in-depth knowledge of the many approaches, aptitudes, methodologies, and instruments needed to deal with corporate data. Students receive instruction in the abilities needed to find the needed solutions and assist in making significant judgments.

This is the primary reason the syllabus of Data Science courses includes concepts that touch base on cloud computing, big data, natural language processing, and data sentiment analysis. The future of Data Science is estimated to bring opportunities in various areas of banking, finance, insurance, entertainment, telecommunication, automobile, etc. A data scientist will help grow an organization by assisting them in making better decisions. Data science has become important due to recent technology disruptions. Most fundamental is Moore's Law which has driven an exponential growth in computing, storage, and communications per rupee over the past 50 years. This rate of growth shows no signs of abating. Consequently, today we have the Internet of Things: a plethora of sensors costing 10s of rupees or less, a global Internet with almost limitless bandwidth, and enormous storage in global clouds. The present era is full of

technological advances in almost all spectrum of life and we are flooded with enormous amount of data. There is an increasing demand of capturing, analyzing, and synthesizing this large amount of data sets in a number of application domains to better understand various phenomena and to convert the information available in the data into actionable strategies such as new scientific discoveries, business applications, policy making, and healthcare etc.

Data science is the area where applications of various tools and techniques from the disciplines of applied statistics, mathematics and computer science are used to get greater insight and to make better and informed decisions for various purposes by analyzing a large amount of data. Consequently, the study of data science as a discipline as become essential to cater the growing need for professionals and researchers to deal with the future challenges.

The purpose of the outcome-based education is meant to provide an exposure to the fundamental aspects in different branches of Computer Science and its applications, keeping in mind the growing needs for higher education, employability, entrepreneurship and social responsibility. The periodical restructuring of the syllabi is carried out to fulfill the requirements of graduate attributes, qualification descriptors, programme learning outcomes and course outcomes. The outcome-based education enriches the curriculum to deliver the basic principles, synthetic strategies, mechanisms and application-oriented learning for the benefit of students. It also includes self-learning module, minor projects and industrial internship to enable students to get equipped for higher studies and employment. The non-major elective courses offer chances to learn and augment interest in other related fields. The outcome-based curriculum is intended to enrich the learning pedagogy to global standards. ICT enabled teaching-learning platforms are provided to students along with the interaction of international scientists. The seminars periodically delivered by industrialists, subject experts and former professors would certainly help the students to update with latest technology/trends in different fields of chemistry. The exposure to the industrial internship and MoUs with industries can open an avenue for a start-up and its progress would be followed regularly. The OBE based evaluation methods will reflect the true cognitive levels of the students as the curriculum is designed with course outcomes and cognitive level correlations as per BLOOM’s Taxonomy.

ABOUT THE COLLEGE

The College was founded in the new millennium 2000 by the vision of late Shri.K.M.Govindarajan fondly known as Iyah, with a mission to offer higher education in the fields of Arts and Science to the needy and the poor middle class students of this area and make them fully employable and economically self-reliant. With a humble beginning of launching an elementary school named Thiruvalluvar Elementary School in the year 1952, Iyah groomed it into a Higher Secondary School and later into a college. Education was his soul and breathe. The college has grown into a full-fledged educational hub offering 12 under graduate programmes, 8 post graduate programmes, 5 M.Phil research programmes and 4 Ph.D programmes. The college has been accredited with 'A' grade by NAAC in 2nd cycle and recognized under section 2(f) & 12(B) of the UGC act 1956. The College is permanently affiliated to Thiruvalluvar University. The College is also acquired the status of Autonomous from the academic year 2024-2025. The College is an associate member of ICT Academy and registered member of NPTEL and Spoken Tutorials of IIT Bombay. The college is also a member of INFLIBNET and NDL.

VISION OF THE COLLEGE

Empower young men and women by educating them in the pursuit of excellence, character building and responsible citizen.

MISSION OF THE COLLEGE

Offer higher education in the fields of Arts, Science & Management to the needy and make them fully self-dependent.

QUALITY POLICY OF THE COLLEGE

KMG Students achieve the best learning results and personal growth with modern education that equip them for working life and a changing society to become deserving citizens.

ABOUT THE DEPARTMENT

Department of Data Science (DS) has been established in the year 2023 with a goal of training students for data–centric world and human values. The students will have an opportunity to learn principles, tools and techniques to model various real-world problems, analyze them, and discover useful information. The primary focus of this programme is to equip students with statistical skills, Learning algorithms, knowledge discovery and visualization skills.

VISION OF THE DEPARTMENT

The vision of the Department of Data Science is to create the next generation of students as data scientists who will solve these grand challenges and innovate through world-class research to take advantage of these opportunities.

MISSION OF THE DEPARTMENT

- To develop the skills and knowledge to analyze data in many forms and communicate insights.
- To impart quality and value based education and contribute towards the innovation of computing, expert system, Data Science to raise satisfaction level of all stakeholders.
- Our effort is to apply new advancements in high performance computing hardware and software.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. Professional Excellence: Graduates will demonstrate competency and excellence in their chosen fields of study, applying theoretical knowledge to practical situations effectively.

2. Character Development: Graduates will exhibit strong moral and ethical character, upholding values of integrity, honesty, and respect for others in both personal and professional endeavors.

3. Leadership and Citizenship: Graduates will emerge as responsible leaders and active citizens, contributing positively to their communities and society at large through their actions and initiatives.

4. Continuous Learning: Graduates will engage in lifelong learning and professional development activities, adapting to evolving technologies, methodologies, and societal needs.

5. Self-Dependency and Entrepreneurship: Graduates will possess the skills and mindset necessary to be self-reliant and entrepreneurial, capable of creating opportunities for themselves and others through innovation and initiative.

6. Effective Communication and Collaboration: Graduates will demonstrate proficiency in communication skills, both verbal and written, and exhibit the ability to collaborate effectively with diverse teams and stakeholders.

7. Global Perspective: Graduates will have a broad understanding of global issues and perspectives, demonstrating cultural sensitivity and adaptability in multicultural environments.

PROGRAM OUTCOMES (POs)

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

POs	Graduate Attributes	Statements
PO1	Disciplinary Knowledge	Acquire detailed knowledge and expertise in all the disciplines of the subject.
PO2	Communication Skills	Ability to express thoughts and ideas effectively in writing, listening and confidently Communicate with others using appropriate media
PO3	Critical Thinking	Students will develop aptitude Integrate skills of analysis, critiquing, application and creativity.
PO4	Analytical Reasoning	Familiarize to evaluate the reliability and relevance of evidence, collect, analyze and interpret data.
PO5	Problem Solving	Capacity to extrapolate the learned competencies to solve different kinds of non-familiar problems.
PO6	Employability and Entrepreneurial Skill	Equip the skills in current trends and future expectations for placements and be efficient entrepreneurs by accelerating qualities to facilitate startups in the competitive environment.
PO7	Individual and Team Leadership Skill	Capability to lead themselves and the team to achieve organizational goals and contribute significantly to society.
PO8	Multicultural Competence	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.
PO 9	Moral and Ethical awareness/reasoning	Ability to embrace moral/ethical values in conducting one's life.
PO10	Lifelong Learning	Identify the need for skills necessary to be successful in future at personal development and demands of work place.

PROGRAM SPECIFIC OUTCOMES (PSOs)

On successful completion of the B.Sc., Data Science, the students will be able to:

PSOs	Statements
PSO1	Able to apply data analytical skills that rely on mathematical and statistical methods to solve problems in a data-driven world.
PSO2	Able to understand the nuances of data analytical skills to evolve innovative ideas and communicate the social relevance and impact of their analytical findings.
PSO3	Becoming analytical experts and data entrepreneurs with exemplary behavior safeguarding the public interest.

Correlation Rubrics:

High	Moderate	Low	No Correlation
3	2	1	-

Mapping of PSOs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PSO1	3	3	3	3	3	3	2	-	-	2
PSO2	3	3	2	3	2	3	2	-	-	3
PSO3	3	3	3	3	3	3	2	2	3	3

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Subject and Credit System- B.Sc., Data Science

(Effective for the Batch of Students Admitted from 2024-2025)

Semester	Part	Category	Course Code	Course Title	Ins.Hrs/ Week	Credit	Maximum Marks		
							Internal	External	Total
SEMESTER - I	I	Language	AULT10 / AULU10	General Tamil – I / Urdu - I	6	3	25	75	100
	II	English	AULE10	English – I	6	3	25	75	100
	III	Core - 1	AUCDS11	Python Programming	5	5	25	75	100
		Core - 2	AUCPDS12	Practical I – Python Programming	5	5	25	75	100
		Elective Course I (Choose any One)	AUEMA13A	Mathematical Statistics – I	4	3	25	75	100
			AUEMA13B	Numerical Methods I					
	IV	Skill Enhancement	AUSDS14	Fundamentals of Information Technology	2	2	25	75	100
		Skill Enhancement (Foundation Course)	AUFDS15	Problem Solving Technique	2	2	25	75	100
				Semester Total	**30**	**23**			
SEMESTER - II	I	Language	AULT20 / AULU20	General Tamil – II / Urdu - II	6	3	25	75	100
	II	English	AULE20	English – II	6	3	25	75	100
	III	Core - 3	AUCDS21	Data Structures and Algorithms	5	5	25	75	100
		Core – 4	AUCPDS22	Practical II - Data Structures using Python	5	5	25	75	100
		Elective-II (Choose any One)	AUEMA23A	Mathematical Statistics – II	4	3	25	75	100
			AUEMA23B	Numerical Methods II					
	IV	Skill Enhancement	AUSDS24	Introduction to HTML	2	2	25	75	100
	IV	Skill Enhancement	AUSDS25	PHP Programming	2	2	25	75	100
				Semester Total	**30**	**23**			

Semester	Part	Category	Course Code	Course Title	Ins.Hrs/ Week	Credit	Maximum Marks		
							Internal	External	Total
SEMESTER - III	I	Language	AULT30 / AULU30	General Tamil – III / Urdu - III	6	3	25	75	100
	II	English	AULE30	English – III	6	3	25	75	100
	III	Core - 5	AUCDS31	Fundamentals of Data Science	5	5	25	75	100
		Core – 6	AUCPDS32	Practical III - Data Science	5	5	25	75	100
		Elective-III (Choose any One)	AUEMA33A	Discrete Mathematics–I	3	3	25	75	100
			AUEDS33B	Computer Networks					
	IV	Skill Enhancement	AUSDS34	E-Commerce	1	1	25	75	100
		Skill Enhancement	AUSDS35	Big Data Analytics	2	2	25	75	100
		Compulsory Paper	AUES30	Environmental Studies	2	2	25	75	100
				Semester Total	**30**	**24**			
SEMESTER - IV	I	Language	AULT40 / AULU40	General Tamil – IV / Urdu - IV	6	3	25	75	100
	II	English	AULE40	English – IV	6	3	25	75	100
	III	Core - 7	AUCDS41	Relational Database Management System	5	5	25	75	100
		Core – 8	AUCPDS42	Practical IV - RDBMS Lab Using Oracle	5	5	25	75	100
		Elective-IV (Choose any One)	AUEMA43A	Discrete Mathematics–II	4	3	25	75	100
			AUEDS43B	Network Security					
	IV	Skill Enhancement Course	AUSDS44	Data Mining and Warehousing	2	2	25	75	100
		Skill Enhancement	AUSDS45	Open Source Software Technologies	2	2	25	75	100
				Semester Total	**30**	**23**			

Semester	Part	Category	Course Code	Course Title	Ins.Hrs/ Week	Credit	Maximum Marks		
							Internal	External	Total
SEMESTER - V	III	Core – 9	AUCDS51	Machine Learning	5	4	25	75	100
		Core – 10	AUCPDS52	Practical V - Machine Learning	5	4	25	75	100
		Core – 11	AUCDS53	Software Engineering	5	4	25	75	100
		Core – 12	AUPDS54	Core/Project with Viva-voce	5	4	25	75	100
		Elective-V (Choose any One)	AUEDS55A	Information Security	4	3	25	75	100
			AUEDS55B	Financial Analytics					
			AUEDS55C	Grid Computing					
		Elective-VI (Choose any One)	AUEDS56A	Operating System	4	3	25	75	100
			AUEDS56B	Simulation and Modeling					
			AUEDS56C	Quantitative Aptitude					
	IV	Compulsory Paper	AUVE50	Value Education	2	2	25	75	100
			AUIDS57	Internship/Industrial Training (Carried out in II-Year Summer vacation) (30 hours)	-	2	100	-	100
				Semester Total	**30**	**26**			
SEMESTER - VI	III	Core – 13	AUCDS61	IoT and Cloud Technologies	6	4	25	75	100
		Core – 14	AUCPDS62	Practical VI - IoT and Cloud Technologies	6	4	25	75	100
		Core – 15	AUCDS63	Artificial Intelligence	6	4	25	75	100
		Elective-VII (Choose any One)	AUEDS64A	Introduction to Linear Algebra	5	3	25	75	100
			AUEDS64B	Artificial Neural Networks					
			AUEDS64C	Analytics for Service Industry					
		Elective-VIII (Choose any One)	AUEDS65A	Computing Intelligence	5	3	25	75	100
			AUEDS65B	Data Analytics using R Programming					
			AUEDS65C	Natural Language Processing					
	IV	Skill Enhancement	AUSDS66	Robotics and Applications	2	2	25	75	100
		Compulsory	AUEA60	Extension Activity	-	1	100	-	100
				Semester Total	**30**	**21**			

Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	13	13	13	13	22	18	92
Part IV	4	4	5	4	4	3	24
Part V	-	-	-	-	-	-	-
Total	23	23	24	23	26	21	**140**

*Part I. II , and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V has to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.

COURSE DESCRIPTORS

Title of the Course	PYTHON PROGRAMMING	Hours/Week	05
Course Code	AUCDS 11	Credits	05
Category	Core-1	Year & Semester	I & I
Prerequisites	Basics of Programming Language	Regulation	2024

Objectives of the course:

- To make students understand the concepts of Python programming.
- To apply the OOPs concept in PYTHON programming.
- To impart knowledge on demand and supply concepts
- To make the students learn best practices in PYTHON programming
- To know the costs and profit maximization

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Basics of Python Programming:** History of Python-Features of Python – Literal – Constants - Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation-Operators-Expressions-Type conversions. **Python Arrays:** Defining and Processing Arrays – Array methods.	CO1 CO3	K1 K2 K3
UNIT-II	**Control Statements:** Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. **Jump Statements:** break, continue and pass statements**.**	CO1 CO2 CO3	K1 K2 K3 K4
UNIT-III	**Functions:** Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. **Function Arguments**: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments-Recursion. **Python Strings:** String operations- Immutable Strings-Built-in String Methods and Functions-String Comparison. **Modules**: import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules.	CO3 CO4	K1 K2 K3 K5

UNIT-IV	**Lists:** Creating a list -Access values in List-Updating values in Lists- Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples. **Dictionaries:** Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries..	CO2 CO3 CO4	K1 K2 K3 K5
UNIT-V	**Python File Handling:** Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods- append() method – read() and readlines() methods – with keyword – Splitting words– File methods - File Positions- Renaming and deleting files. Python Dictionaries-Numpy, Pandas, Matplotlib, Scipy.	CO2 CO3 CO4 CO5	K1 K2 K3 K5 K6

Recommended Text Books

1. Reema Thareja, "Python Programming using problem solving approach", First Edition, 2017, Oxford University Press.
2. Dr. R. Nageswara Rao, "Core Python Programming", First Edition, 2017, Dream tech Publishers.

Reference Books

1. Vamsi Kurama, "Python Programming: A Modern Approach", Pearson Education.
2. Mark Lutz, "Learning Python", O rielly.
3. Adam Stewarts, "Python Programming", Online.
4. Fabio Nelli, "Python Data Analytics", A Press.
5. Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication.

Website and e-learning source

1) https://onlinecourses.nptel.ac.in
2) http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm
3) http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html
4) https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding
5) https://www.chemtube3d.com/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Examine Python syntax and semantics and write simple programs on python	K1,K2
CO2	Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements.	K1,K2,K4
CO3	Compare function, function arguments and Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.	K1,K2,K3
CO4	Identify and differentiate List, tuples and dictionary, Write program using list, tuples and dictionary.	K1,K2,K5
CO5	Demonstrate proficiency in handling Strings and File Systems and Python Libraries.	K1,K2,K6

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	-	1	-	-	-	3	3	3
CO2	3	3	3	2	2	1	1	1	-	1	3	3	3
CO3	3	2	3	3	2	-	-	-	-	1	3	3	3
CO4	3	1	2	1	2	1	-	-	-	-	3	3	3
CO5	3	2	2	2	2	2	-	-	1	1	3	3	3

COURSE DESCRIPTORS

Title of the Course	Fundamentals of Information Technology	**Hours/Week**	02
Course Code	AUSDS14	**Credits**	02
Category	Skill Enhancement Course SEC – 1	**Year & Semester**	I & I
Prerequisites	Basic knowledge of Computers	**Regulation**	2024

Objectives of the course:

- Understand basic concepts and terminology of information technology
- Have a basic understanding of personal computers and their operation
- Be able to identify data storage and its usage
- Get great knowledge of software and its functionalities
- Understand about operating system and their uses

UNITS	Contents	COs	Cognitive Levels
UNIT-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	CO1 CO3	K1 K2 K3
UNIT-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, Soundcards, Speakers.	CO1 CO2 CO3	K1 K2 K3 K4
UNIT-III	**Storage Fundamentals:** Primary Vs Secondary Storage: Data storage & retrieval methods. Primary Storage, Secondary Storage and Cloud Storage.	CO3 CO4	K1 K2 K3

UNIT-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, DBMSs/w	CO2 CO3 CO4	K1 K2 K3 K5
UNIT-V	**Operating System:** Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.	CO2 CO3 CO4 CO5	K1 K2 K3

Recommended Text Books

Anoop Mathew, S. Kavitha Murugeshan(2009),"Fundamental of Information Technology", Majestic Books.

AlexisLeon,MathewsLeon,"FundamentalofInformationTechnology",2nd Edition.

P . Rizwan Ahmed, "Introduction to Information Technology". Margham Publications, 2010

"Cloud Computing" Antony T. Velte, McGrawhill.

Reference Books

Bhardwaj Sushil Puneet Kumar, "Fundamental of Information Technology"

GGWILKINSON,"FundamentalsofInformationTechnology",Wiley-Blackwell

A Ravichandran , "Fundamentals of Information Technology", Khanna Book Publishing

Website and e-learning source

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

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Construct the structure of the requiredthings in computer, learn how to use it.	K1,K3
CO2	Explain organizational structure using for the devices present currently under input or output unit.	K1,K2,K4
CO3	Describe the concept of storing data in computer.	K1,K2,K3
CO4	Classify and Work with different software. Write program in the software andapplications of software.	K1,K2,K5
CO5	Read the usage of Operating system in information technology which reallyacts as a interpreter between software and hardware Files. Develop programs using files.	K1,K2,K6

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	-	-	-	-	-	3	3	3
CO2	3	1	3	2	2	1	1	1	-	1	3	3	3
CO3	2	2	3	3	2	-	-	2	-	1	3	3	3
CO4	3	1	3	1	2	1	-	-	-	-	3	3	3
CO5	3	2	2	2	2	2	-	-	1	1	3	3	3

COURSE DESCRIPTORS

Title of the Course	Problem Solving Technique	**Hours/Week**	02
Course Code	AUFDS15	**Credits**	02
Category	Skill Enhancement (Foundation Course)	**Year & Semester**	I & I
Prerequisites	Basics Idea about problem solving	**Regulation**	2024

Objectives of the course:

- Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving.
- Implement different programming constructs and decomposition of problems into functions
- Use data flow diagram, Pseudocode to implement solutions.
- Define and use of arrays with simple applications
- Understand about operating system and their uses

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Programming Languages:** Machine language, Assembly language, High- level language,4 GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers. **Data:** Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output. Different phases in Program Development Cycle (PDC).	CO1 CO3	K1 K2 K3
UNIT-II	**Structured Programming: Algorithm:** Features of good algorithm, Benefits and drawbacks of algorithm. **Flowcharts:** Advantages and limitations of flowcharts, when to use flowcharts, flowchart symbols and types of flowcharts. **Pseudocode:** Writing a pseudocode. Coding, documenting and testing a program: Comment lines and types of errors. **Program design:** Modular Programming.	CO1 CO2 CO3	K1 K2 K3 K4
UNIT-III	**Selection Structures:** Relational and Logical Operators - Selecting from Several Alternatives – Applications of Selection Structures. **Repetition Structures:** Counter Controlled Loops –Nested Loops– Applications of Repetition Structures.	CO3 CO4	K1 K2 K3 K5

UNIT-IV	**Data Type:** Numeric Data and Character Based Data. **Arrays:**One Dimensional Array - Two Dimensional Arrays – Strings as Arrays of Characters. **Data Flow Diagrams:** Definition, DFD symbols and types of DFDs.**Program Modules:** Subprograms-Value and Reference parameters- Scope of a variable - Functions– Recursion.	CO2 CO3 CO4	K1,K2, K3,K5
UNIT-V	**Files:** File Basics-Creating and reading a Sequential file-Modifying Sequential Files. **Problem solving approaches:** Greedy Algorithm, Search and Sorting, Dynamic Programming, Branch and Bound.	CO2 CO3 CO4	K1,K2, K3,K5

Recommended Text Books

Stewart Venit, "Introduction to Programming: Concepts and Design", Fourth Edition, 2010, Dream Tech Publishers.

Ellis Horowitz and Sartaj sahni(2010), "Fundamentals of Computer Algorithms", Galgotia Publications Pvt. Ltd.

Website and e-learning source

https://www.codesansar.com/computer-basics/problem-solving-using-computer.htm

http://www.nptel.iitm.ac.in/video.php?subjectId=106102067

http://utubersity.com/?page_id=876

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Analyze the programming languages and Study the data types and arithmetic operations.	K1,K4
CO2	Know about the algorithms. Develop program using flow chart and pseudocode.	K1,K2,K4
CO3	Determine the various operators.Explain about the structures. Illustrate the concept of Loops	K1,K2,K3
CO4	Illustrate the DFD and program modules	K1,K2,K5
CO5	Creating and reading Files and discuss Problem solving approaches	K1,K2,K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	-	-	-	-	-	3	3	3
CO2	3	1	3	2	2	1	1	1	-	1	3	3	3
CO3	2	2	3	3	2	-	-	2	-	1	3	3	3
CO4	3	1	3	1	2	1	-	-	-	-	3	3	3
CO5	3	2	2	2	2	2	-	-	1	1	3	3	3

COURSE DESCRIPTORS

Title of the Course	Practical -Python Lab	**Hours/Week**	05
Course Code	AUCPDS12	**Credits**	05
Category	Core Course CC-II	**Year & Semester**	I & I
Prerequisites	Knowledge of Computers	**Regulation**	2024

Objectives of the course:

1. Be able to design and program Python applications.
2. Be able to create loops and decision statements in Python.
3. Be able to work with functions and pass arguments in Python.
4. Be able to build package Python modules for reusability.
5. Be able to read and write files in Python.

UNITS	Contents	COs	Cognitive Levels
LABEXERCISES	1. Program Using variables, constants, I/O statements in Python. 2. Program using Operators in Python. 3. Program using Conditional Statements. 4. Program using Loops. 5. Program using Jump Statements. 6. Program using Functions. 7. Program using Recursion. 8. Program using Arrays. 9. Program using Strings. 10. Program using Modules. 11. Program using Lists. 12. Program using Tuples. 13. Program using Dictionaries. 14. Program for File Handling.	CO1 CO3	K1 K2 K3

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Demonstrate the understanding of syntax and semantics of Python programming	K1,K3
CO2	Identify the problem and solve using PYTHON programming techniques.	K1,K2,K4
CO3	Identify suitable programming constructs for problem solving.	K1,K2,K3
CO4	Analyze various concepts of PYTHON language to solve the problem in an efficient way.	K1,K2,K5
CO5	Develop a PYTHON program for a given problem and test for its correctness.	K1,K2,K6

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	-	-	-	-	-	3	3	3
CO2	3	1	3	2	2	1	1	1	-	1	3	3	3
CO3	2	2	3	3	2	-	-	2	-	1	3	3	3
CO4	3	1	3	1	2	1	-	-	-	-	3	3	3
CO5	3	2	2	2	2	2	-	-	1	1	3	3	3

COURSE DESCRIPTORS

Title of the Course	MATHEMATICAL STATISTICS-I	Hours/Week	04
Course Code	AUEMA13A	Credits	03
Category	ELECTIVE COURSE -I	Year & Semester	I & I
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the course:

- Understand basic concepts of Statistical Methods
- Have a basic understanding of measures of location
- Have a basic understanding of measures of dispersion
- Understand about Measures of Skewness
- Understand about correlation

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction - scope and limitations of statistical methods - classification of data -Tabulation of data- Diagrammatic and Graphical representation of data – Graphical, determination of Quartiles ,Deciles and Percentiles	CO1	K1 K2 K3
UNIT-II	Measures of location: Arithmetic mean, median, mode, geometric mean and Harmonic mean and their properties.	CO2	K1 K2 K3
UNIT-III	Measures of dispersion: Range, Quartile deviation, mean deviation, Standard deviation, combined Standard deviation, and their relative measures	CO3	K1 K2 K3
UNIT-IV	Measures of Skewness: Karl Pearson's, Bowley's, and kelly's and co-efficient of Skewness and kurtosis based on moments.	CO4	K1 K2 K3
UNIT-V	Correlation - Karl Pearson - Spearman's Rank correlation - concurrent deviation methods. Regression Analysis: Simple Regression Equations.	CO5	K1 K2 K3 K4

Recommended Text Books

1. Fundamental of Mathematical Statistics-S.C.Gupta &V.K.Kapoor-Sultan Chand

Reference Books

1. Elements of Statistics -Mode. E.B.-Prentice Hall
2. Statistical Methods-Dr.S.P.Gupta-Sultan Chand &Sons

Website and e-learning source

https://www.simplilearn.com/what-is-statistical-analysis-article

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Know the basics of statistical methods	K1,K2,K3
CO2	Understanding of measures of location	K1,K2,K3
CO3	Understanding of measures of dispersion	K1,K2,K3
CO4	Understand about Measures of skewness	K1,K2,K3
CO5	Understand about correlation, concurrent deviation method	K1,K2,K3,K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	1	1	-	-	1	3	2	1
CO2	2	1	3	1	2	-	1	-	-	1	3	2	1
CO3	3	1	3	1	2	1	1	-	-	1	3	2	1
CO4	3	1	3	2	2	-	1	-	-	1	3	2	1
CO5	3	1	3	2	2	1	1	-	-	1	3	2	1

COURSE DESCRIPTORS

Title of the Course	NUMERICAL METHODS-I	Hours/Week	04
Course Code	AUEMA13B	Credits	03
Category	ELECTIVE COURSE -I	Year & Semester	I & I
Prerequisites	12th Standard Mathematics	Regulation	2024

Objectives of the course:

- To Solve Practical Technical Problems using various Numerical Method Formulas
- To derive appropriate Numerical Methods to solve Algebraci,Transcendental Equations
- To know the Numerical Methods of Solving Simultaneous Linear Equations
- To Acquire Knowledge about Forward Difference and Backward Differences and their Relationship Knowledge about Central Difference Operators and Problems based on Various Central Difference Formulae

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Curve Fitting- Principle of Least square** Fitting of straight line $y = ax + b$ parabola$y = ax^2 + bx + c$ exponential curves of forms$y = ax^b, y = e^{bx}$, and $y = ab^x$.	CO1	K1 K2 K3
UNIT-II	**The solution of numerical algebraic and transcendental Equations:** Bisection method – Iteration Method – Regula Falsi Method – Newton– Raphson method	CO2	K1 K2 K3
UNIT-III	**Solution of simultaneous linear algebraic equations:** Gauss elimination method – Gauss Jordan method – Method of Triangularization – Gauss Jacobi method – Gauss Seidel method.	CO3	K1 K2 K3
UNIT-IV	**Finite differences** Operators Δ, ∇ and E - relation between them — factorial polynomials. **Interpolation with equal intervals:** Gregory-Newton forward and backward- interpolation formulas.	CO4	K1 K2 K3
UNIT-V	**Central differences formulae** Operators μ, δ and relation with the other operators,Gauss forward and backward formulae, Stirling's formula and Bessel's formula.	CO5	K1 K2 K3

Recommended Text Books

1. P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite differences &Numerical Analysis, S. Chand & Company Ltd., New Delhi-55.

Reference Books

1. B.D. Gupta.(2001) *Numerical Analysis.*Konark Pub. Ltd., Delhi
2. M.K. Venkataraman. (1992) *Numerical methods for Science andEngineering* National Publishing Company, Chennai.
3. S. Arumugam. (2003) *Numerical Methods*, New Gamma Publishing,Palayamkottai.
4. H.C. Saxena. (1991) *Finite differences and Numerical analysis* S.Chand& Co., Delhi

Website and e-learning source

https://nptel.ac.in/courses/111107105

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Solve the problems of fitting of straight lines, parabolas and the different form of exponential curves	K1,K2,K3
CO2	Solve algebraic equations using various methods like Bisection method, Iteration method, Regula Falsi method and Newton – Raphson method	K1,K2,K3
CO3	Estimate the solution of simultaneous linear equations using different numerical methods	K1,K2,K3
CO4	Define basic concept of operators Δ, ∇and E, Solving interpolation with equal intervals problems using Gregory Newton's forward formula and Newton's backward formula	K1,K2,K3
CO5	Estimate the solution of central difference formula using the methods Gauss's forward, backward formula, Stirling's formula and Bessel,s formula	K1,K2,K3,

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	1	-	-	1	3	2	1
CO2	3	3	2	3	3	3	1	-	-	1	3	1	1
CO3	3	2	2	3	2	3	1	-	-	1	3	1	1
CO4	3	3	3	2	2	3	1	-	-	1	3	2	1
CO5	3	2	3	2	3	2	1	-	-	1	3	1	1

COURSEDESCRIPTORS

Title of the Course	**DATA STRUCTUREAND ALGORITHMS**	**Hours/Week**	5
Course Code	AUCDS21	**Credits**	5
Category	CORE -3	**Year & Semester**	I & II
Prerequisites	Knowledge of Python Programming	**Regulation**	2024

Objectives of the course:

- To Understand the meaning asymptotic time complexity analysis and various data structures
- To Enhancing the problem solving skills and thinking skills
- To write efficient algorithms and Programs
- To Understanding how linear and non-linear data structures works.
- To Understanding how searching and sorting is performed in Python

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Arrays and ordered Lists: Algorithm - Data Structure- Types -** Abstract data types – asymptotic notations – complexity analysis-Arrays and its Operations – List. Linked lists: Singly linked list – doubly linked lists - Circular linked list, General lists- stacks – Queues – Circular Queues – Evaluation of expressions	CO1	K1,K2,K3
UNIT-II	**Trees and Graphs** Trees – Binary Trees – Binary Tree Traversal – Binary Tree Representations – Binary Search Trees - threaded Binary Trees - Application of trees (Sets). Representation of Graphs – Graph implementation – graph Traversals - Minimum Cost Spanning Trees – Shortest Path Problems-Application of graphs	CO2	K1,K2
UNIT-III	**Searching and Sorting** – Bubble Sort, Insertion Sort, Selection Sort. Searching – Linear search, Divide and Conquer Technique: Binary search, Merge Sort, Quick Sort.	CO3	K2,K3,K4

UNIT-IV	**Greedy Method and Dynamic programming** Greedy Method: Knapsack problem– Job Sequencing with deadlines – Optimal storage on tapes. General method – Multistage Graph Forward Method– All pairs shortest path – Single source shortest path – Search Techniques for Graphs – DFS – Connected Components – Bi-Connected Components	CO4	K2,K3,K4
UNIT-V	**Backtracking** General Method – 8-Queen‟s – Sum Of Subsets – Graph Coloring – Hamiltonian Cycles – Branch And Bound: General Method – Travelling Sales Person Problem	CO5	K3,K5

Recommended Text Books

1. *Seymour Lipshutz(2011),Schaum‟s Outlines - Data Structures with C, Tata McGraw Hill, publications.*
2. *Ellis Horowitz and SartajSahni, Sanguthevar Raja sekaran (2010) ,Fundamentals of*
3. *Computer Algorithms, Galgotia Publications Pvt.Ltd.*
4. *P.Rizwan Ahmed, C++ and Data Structure, Margham Publications, 2012*
5. *Revathy.P &Poonkuzhali, " Data Structures" , Charulatha Publications.*

ReferenceBooks

1. Gregory L.Heileman(1996), Data Structures, Algorithms and Object-Oriented Programming, McGraw Hill International Edition, Singapore.
2. A.V.Aho, J.D. Ullman, J.E.Hopcraft(2000). Data Structures and Algorithms, Addison Wesley Publication.
3. DATA STRUCTURES USING PYTHON by Dr Shriram K. Vasudevan (Author), Mr Abhishek S. Nagarajan (Author),

Websiteande-learningsource

https://www.tutorialspoint.com/data_structures_algorithms/index.htm
https://www.programiz.com/dsa
https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Design an algorithm for a computational task and calculate the time/space complexities of the algorithm	K1,k2,K3
CO2	Understand the Concepts of Trees and Graphs Perform traversal operations on Trees and Graphs.	K1,K2
CO3	Demonstrate knowledge of sorting and searching algorithms and their run-time complexity.	K2,K3,K4
CO4	Apply and analyze the complexity of Greedy and Dynamic Programming.	K2,K3,K4
CO5	Apply Backtracking and Branch and Bound techniques to solve the real time problems	K3,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	2	1	1	1	3	3	1
CO2	3	3	3	3	3	2	2	1	-	-	3	2	2
CO3	3	3	3	3	3	2	2	1	-	1	2	3	1
CO4	3	3	3	3	3	2	2	-	1	1	3	2	3
CO5	3	3	3	3	3	2	2	1	-	-	3	2	2

COURSEDESCRIPTORS

Title of the Course	DATASTRUCTUREUSING PYTHON LAB	Hours/Week	5
Course Code	AUCPDS22	Credits	5
Category	CORE - 4	Year &Semester	I/II SEM
Prerequisites	Knowledge of Python Programming	Regulation	2024

Objectives of the course:

- To predict the performance of different algorithms in order to guide design decisions, provide theoretical estimation for the required resources of an algorithm to solve a specific computational problem

UNITS	Contents	COs	Cognitive Levels
LAB EXERCISE	1. Perform stack operations using arrays. 2. Perform queue operations using arrays. 3. Perform tree traversal operations 4. Search an element in an array using linear search. 5. Search an element in an array using binary search 6. Sort the given set of elements using Merge Sort. 7. Sort the given set of elements using Quick sort. 8. Search the Kth smallest element using Selection Sort 9. Find the Optimal solution for the given Knapsack Problem using Greedy Method. 10. Find all pairs shortest path for the given Graph using Dynamic Programming method 11. Find the Single source shortest path for the given Travelling Salesman problem using Dynamic Programming method 12. Find all possible solution for an N Queen problem using backtracking method 13. Find all possible Hamiltonian Cycle for the given graph using backtracking method	CO1 CO2 CO3 CO4 CO5	K1, K2,K3, K4,K6

Course Learning Outcomes(for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Understand the concepts of Linked List, Stack and Queue.	K1,K2
CO2	Execute traversal functions on graphs, trees and their applications.	K1,K2,K3
CO3	Apply searching and sorting techniques using python program	K3,K4
CO4	Determine the concepts of Greedy Method to apply searching techniques.	K3,K5
CO5	Apply the backtracking method and dynamic programming concepts to find optimal solution using python programming	K1,K2,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	2	2	1	-	-	3	3	1
CO2	3	2	3	3	2	2	2	1	-	-	3	2	2
CO3	3	2	3	3	2	2	2	1	-	-	3	2	1
CO4	3	2	3	3	2	2	2	1	-	-	3	2	3
CO5	3	2	3	3	2	2	2	1	-	-	3	2	2

COURSEDESCRIPTORS

Title of the Course	INTRODUCTION TO HTML	Hours/Week	2
Course Code	AUSDS24	Credits	2
Category	SKILL ENHANCEMENT	Year & Semester	I & II
Prerequisites	Knowledge of Computer	Regulation	2024

Objectives of the course:

- Create a web page. Insert a graph within a web page.
- Create a link within a web page.
- Create a table within a web page.
- Insert heading levels within a web page.
- Insert ordered and unordered lists within a web page.
- Create a web page using CSS.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction: Web Basics: What is Internet–Web browsers–What is Webpage –HTML Basics: Understanding tags.	CO1	K2,K3
UNIT-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)	CO2	K1,K2
UNIT-III	Lists: Types of lists: Ordered, Unordered– Nesting Lists–Other tags: Marquee, HR, BR- Using Images –Creating Hyper-links. CSS: What is CSS- CSS syntax – External CSS –Internal CSS – Inline CSS – Basic styling properties: Color, backgrounds, borders, margins, padding, height/width, text, font.	CO3	K1,K2,K4
UNIT-IV	Tables: Creating basic Table, Table elements, Caption–Table and cell Alignment – Row span, Col span–Cell padding.	CO4	K1,K2,K3
UNIT-V	Frames: Frameset–Targeted Links–No frame–Forms: Input, Text area, Select, Option.	CO5	K1,K2,K5,K6

Recommended Text Books

1. "Mastering HTML5 and CSS3 Made Easy", TeachUComp Inc., 2014.
2. Thomas Michaud, "Foundations of Web Design: Introduction to HTML & CSS"
3. P. Rizwan Ahmed, Open Source Programming , Margham Publications, Chennai, 2017
4. Aurna "Hyper Text Markup Language", Margham Publications, Chennai, 2017
5. Shahina begam, " Web Technology", Selvam Publications"
6. Thomas A Powel, " HTML&XHTML", TMH publications

Reference Books

https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf

https://www.w3schools.com/html/default.asp

Website and e-learning source

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

Course Learning Outcomes(for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Learn about internet technology, network models and how to create online pages with HTML tags.	K2, K3
CO2	Use Text-level formatting to present content on web page.	K1, K2
CO3	create a web page based on list and link with other documents by applying CSS concepts	K1,K2,K4
CO4	Apply the concept of row span, column span and cell padding using tables in a web page	K1,K2,K3
CO5	Display several document on a same webpage and create user interface controls and features of users.	K1,K2,K5,K6

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	3	3	1	1	2	2	2	1
CO2	3	2	3	2	3	3	3	1	-	2	3	2	1
CO3	3	2	3	2	3	3	3	1	1	1	3	3	2
CO4	3	2	3	2	3	3	3	1	1	-	3	1	1
CO5	3	2	3	2	3	3	3	1	1	1	3	3	2

COURSEDESCRIPTORS

Title of the Course	PHP Programming	Hours/Week	2
Course Code	AUSDS25	Credits	2
Category	SKILL ENHANCEMENT	Year & Semester	I & II
Prerequisites	Knowledge of Internet	Regulation	2024

Objectives of the course:

- To introduce the importance of PHP in web page design.
- To understand the features like functions, forms in PHP.
- To understand Files, OOPs concepts, Cookies, Sessions and Data base.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction to PHP -Basic Knowledge of websites -Introduction of Dynamic Website -Introduction to PHP -Scope of PHP -XAMPP and WAMP Installation- PHP Programming Basics -Syntax of PHP	CO1	K1,K2,K6
UNIT-II	Introduction to PHP Variable -Understanding Data Types -Using Operators -Using Conditional Statements -If(), else if() and else if condition Statement -Switch() Statements -Using the while() Loop -Using the for() Loop	CO2	K2,K3
UNIT-III	PHP Functions -PHP Functions -Creating an Array -Modifying Array Elements -Processing Arrays with Loops -Grouping Form Selections with Arrays -Using Array	CO3	K2,K4
UNIT-IV	PHP Advanced Concepts -Reading and Writing Files -Reading Data from a File -Managing Sessions and Using Session Variables	CO4	K1,K2,K3
UNIT-V	OOPS Using PHP -OOPS Concept-Class, Object, Abstractions, Encapsulation, Inheritance, Polymorphism -Creating Classes and Object in PHP-Cookies and Session Management	CO5	K3,K4,K5

Recommended Text Books

1. Head First PHP & MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison.
2. P. Rizwan Ahmed, Open Source Programming , Margham Publications, Chennai, 2017
3. Larry, "PHP and MYSQL for dynamic websites", Pearson Publisher

Reference Books

The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes

Website and e-learning source

https://www.w3schools.com/php/
https://www.coursera.org/learn/web-applications-php
https://www.classcentral.com/course/freecodecamp-php-programming-language-tutorial-full-course-105107
https://www.udemy.com/course/php-for-complete-beginners-includes-msql-object-oriented/?couponCode=24T4MT92724A
https://www.tutorialspoint.com/php/index.htm
https://phptherightway.com/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Understanding the basic concepts of PHP in website creation with XAMPP and WAMP installation.	K1,K2,K6
CO2	Develop program using control statements.	K2, K3
CO3	Implement functions and browser handling power of PHP Utilizing the basic concept of statements and arrays	K2,K4
CO4	Imparting Database applications, File handling, Cookies in the webpage.	K1,K2,K3
CO5	Develop programs by applying various object oriented concepts and implementing Cookies and Session Management concepts in developing web pages	K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	3	3	1	1	1	3	3	1
CO2	3	2	3	3	3	3	3	1	1	2	3	3	2
CO3	3	2	3	3	3	3	2	1	1	1	3	2	2
CO4	3	2	3	3	3	3	3	1	-	2	3	3	1
CO5	3	2	3	3	3	3	3	1	1	-	3	3	3

COURSEDESCRIPTORS

Title of the Course	**FUNDAMENTALS OF DATA SCIENCE**	**Hours/Week**	05
Course Code	AUCDS31	**Credits**	05
Category	Core-5	**Year & Semester**	II & III
Prerequisites	Programming knowledge in Python	**Regulation**	2024

Objectives of the course:

- To understand the basic concepts of Data Science
- To acquire a solid foundation in pandas
- To understand the principles of Data Loading, Storage, and File Formats
- To acquire a solid foundation in Data Wrangling
- To visualize data using plots in python

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Data Science**: definition, Datafication, Exploratory Data Analysis, The Data science process, A data scientist role in this process. NumPy Basics: The NumPyndarray: A Multidimensional Array Object, Creating ndarrays ,Data Types for ndarrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Boolean Indexing, Fancy Indexing, Data Processing Using Arrays, Expressing Conditional Logic as Array Operations, Methods for Boolean Arrays , Sorting , Unique.	CO1	K1, K2, K3, K4
UNIT-II	**Getting Started with pandas**: Introduction to pandas, Library Architecture, Features, Applications, Data Structures, Series, Data Frame, Index Objects, Essential Functionality Reindexing, Dropping entries from an axis, Indexing, selection, and filtering),Sorting and ranking, Summarizing and Computing Descriptive Statistics, Unique Values, Value Counts, Handling Missing Data, filtering out missing data.	CO2	K1, K2, K3
UNIT-III	**Data Loading, Storage, and File Formats** : Reading and Writing Data in Text Format, Reading Text Files in Pieces, Writing Data Out to Text Format, Manually Working with Delimited Formats, JSON Data, XML and HTML: Web Scraping, Binary Data Formats, Using HDF5 Format, Reading Microsoft Excel Files, Interacting with Databases, Storing and Loading Data in MongoDB	CO2, CO3	K1, K2, K3, K4

UNIT-IV	Data Wrangling: Combining and Merging Data Sets, Database style Data Frame Merges, Merging on Index, Concatenating Along 2nAxis,Combining Data with Overlap, Reshaping and Pivoting, Reshaping with Hierarchical Indexing, Data Transformation, Removing Duplicates, Replacing Values.	CO4	K3, K4, K5
UNIT-V	**Plotting and Visualization**: A Brief matplotlib API Primer, Figures and Subplots, Colors, Markers, and Line Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, Plotting Functions in pandas, Line Plots, Bar Plots, Histograms and Density Plots, Scatter Plots.	CO5	K3, K4, K5, K6

Text Books:

1. WesMcKinney,"PythonforDataAnalysis",O'REILLY,ISBN:978-1-449-31979-3,1st edition,October2012
2. Rachel Schutt & O'neil, "DoingDataScience",O'REILLY,ISBN:978-1-449-35865-5,1st edition, October 2013.

Reference Books:

1. JoelGrus,"DataSciencefromScratch:FirstPrincipleswithPython",O'ReillyMedia,2015
2. MattHarrison,"LearningthePandasLibrary:PythonToolsforDataMunging,Analysis,andVisualization,O'Reilly,2016.

Website and e-learning source

https://www.w3schools.com/datascience/

https://www.geeksforgeeks.org/data-science-fundamentals/

https://www.programiz.com/python-programming

https://www.tutorialspoint.com/numpy/numpy_introduction.htm

https://www.guru99.com/python-tutorials.html

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Describe the significance of data science and Data Science process	K1, K2, K3
CO2	Apply principles of NumPy and Pandas to the analysis of data.	K1, K2, K3
CO3	Build and prepare data for use with a variety of statistical methods and models	K1, K2, K3,K4
CO4	Apply the need and importance of pre-processing techniques.	K3,K4,K5
CO5	Analyze Data using various Visualization techniques.	K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	1	1	2	3	3	3
CO2	3	3	3	3	3	3	2	-	-	-	3	3	3
CO3	3	3	3	3	3	3	2	-	-	1	3	3	3
CO4	3	3	3	3	3	3	2	-	-	-	3	3	3
CO5	3	3	3	3	3	3	2	-	-	-	3	3	3

COURSEDESCRIPTORS

Title of the Course	**DATASCIENCELAB**	**Hours/Week**	05
Course Code	AUCPDS32	**Credits**	05
Category	**Core- 6**	**Year & Semester**	II & III
Prerequisites	Programming knowledge in Python	**Regulation**	2024

Objectives of the course:

- The main objective of the course is to inculcate the basic understanding of Data Science and it's practical implementation using Python.

Units	Contents	COs	Cognitive Levels
LAB EXERCISE	1. Creating a NumPyArray a. Basic ndarray b. Array of zeros c. Array of ones d. Random numbers in ndarray e. An array of your choice f. Imatrix in NumPy g. Evenlys paced ndarray 2. The Shape and Reshaping of NumPyArray a. Dimensions of NumPyarray b. Shape of NumPyarray c. SizeofNumPyarray d. Reshaping a NumPyarray e. Flattening a NumPyarray f. Transpose of a NumPyarray 3. Expanding and Squeezing a NumPyArray a. Expanding a NumPyarray b. Squeezing a NumPyarray c. Sorting in NumPyArrays 4.Indexing and Slicing of NumPyArray a. Slicing1-DNumPyarrays b. Slicing2-DNumPyarrays c. Slicing3-DNumPyarrays d. Negative slicing of NumPyarrays 5.Stacking and Concatenating NumpyArrays	CO1 CO2 CO3 CO4 CO5	K2,K3, K4,K6

	a. Stacking ndarrays b. Concatenating ndarrays c. Broadcasting in NumpyArrays 6. Perform following operations using pandas a. Creating dataframe b. concat() c. Setting conditions d. Adding a new column 7.Perform following operations using pandas a. Filling NaN with string b. Sorting based on column values c. groupby() 8. Read the following file formats using pandas a. Text files b. CSV files c. Excel files d. JSON files 9. Perform following preprocessing techniques on loan prediction dataset a. Feature Scaling b. Feature Standardization c. Label Encoding d. OneHotEncoding 10. Perform following visualizations using matplotlib a. Bar Graph b. Pie Chart b. Box Plot c. Histogram d. Line Chart and Subplots e. Scatter Plot		

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Demonstrate the understanding of syntax and semantics of Numpy array	K1, K2, K3
CO2	Apply principles of NumPy and Pandas to solve using Python Programming Techniques.	K1, K2, K3
CO3	Identify suitable programming constructs for problem solving.	K1, K2, K3,K4
CO4	Apply the need and importance of pre-processing techniques.	K3,K4,K5
CO5	Analyze Data using various Visualization techniques.	K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	1	-	1	3	3	3
CO2	3	3	3	3	3	3	2	1	-	-	3	3	3
CO3	3	3	3	3	3	3	2	-	-	-	3	3	3
CO4	3	3	3	3	3	3	2	-	-	-	3	3	3
CO5	3	3	3	3	3	3	2	-	-	1	3	3	3

COURSEDESCRIPTORS

Title of the Course	**COMPUTERNETWORKS**	**Hours/Week**	03
Course Code	AUEDS33B	**Credits**	03
Category	**Elective III**	**Year & Semester**	II & III
Prerequisites	Fundamentals of Computers	**Regulation**	2024

Objectives of the course:

- To make students understand the concepts of Network hardware and Network Software.
- To analyze different network models
- To impart knowledge on Design Issues of Data Link Layer
- To impart knowledge on IP Addresses and Routing algorithm
- To make the students understand the establishment of Network connection

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction–Uses of Computer Networks–Network Hardware – Network Software- Types of Network Topologies – OSI Reference Model – TCP/IP Reference Model.	CO1	K1, K2, K3, K4
UNIT-II	Physical Layer – Guided Transmission media –Wireless Transmission- Transmission Modes: Simple, Half duplex, Full duplex– Public Switched Telephone Network–Local Loop– Trunks – Multiplexing- Switching: Circuit and Packet Switching.	CO2	K1, K2, K3
UNIT-III	Data Link Layer –Design Issues-Error Detection and Correction- Flow Control and congestion control - Simplex Stop and Wait Protocol-Sliding Window Protocol.	CO2, CO3	K1,K2, K3, K4
UNIT-IV	Network Layer–Design Issues–Routing Algorithm-IP Protocol – IPV4-IP Addresses-Internet Control Protocols.	CO4	K3, K4, K5
UNIT-V	Transport Layer: Addressing- Connection Establishment-Connection Release. Internet Transport Protocol: UDP-TCP. Application Layer: DNS- Electronic Mail-World Wide Web.	CO5	K3,K4, K5, K6

Recommended Text Books

1. A.S.Tanenbaum,"ComputerNetworks",Prentice-HallofIndia2008,4thEdition.
2. Behrouz Forouzan, "Data Communication and Networking", McGraw Hill
3. William Stallings, "Data and Computer Communication", Pearson. 4. Kurose and Ross, "Computer Networking- A Top-Down Approach", Pearson

Reference Books

1. Stallings, "Data and Computer Communications", PearsonEducation2012,7thEdition
2. B.A.Forouzan,"DataCommunicationsandNetworking",TataMcGrawHill2007,4thEdition.
3. F.Halsall,"DataCommunications,ComputerNetworksandOpenSystems",PearsonEducation2008.
4. D.BertsekasandR.Gallagher,"DataNetworks",PHI2008,2ndEdition.
5. Lamarca,"CommunicationNetworks",TataMcGrawHill2002.

Website and e-learning source

https://www.geeksforgeeks.org/basics-computer-networking/
https://en.wikipedia.org/wiki/Computer_network
https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm
https://www.javatpoint.com/computer-network-tutorial
http://ceit.aut.ac.ir/~91131079/SE2/SE2%20Website/Lecture%20Slides.html

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Understand the significance and concepts of computer networks.	K1, K2,
CO2	Analyses physical layer and the technologies involved in transmitting data across networks.	K1, K2, K3
CO3	Apply channel allocation, framing, error and flow control techniques.	K2,k3
CO4	Describe the functions of Network Layer i.e. Logical addressing, subnetting& Routing Mechanism	K2,k3
CO5	Illustrate different Transport Layer functions.	K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	-	-	1	3	3	3
CO2	3	3	3	3	3	2	2	1	1	1	3	3	3
CO3	3	3	3	3	3	3	3	2	-	-	3	3	3
CO4	3	3	3	3	3	3	2	2	2	-	3	3	3
CO5	3	3	3	3	3	3	2	2	1	-	3	3	3

COURSEDESCRIPTORS

Title of the Course	**E-COMMERCE**	**Hours/Week**	01
Course Code	AUSDS34	**Credits**	01
Category	Skill Enhancement	**Year & Semester**	II & III
Prerequisites	Knowledge of Internet	**Regulation**	2024

Objectives of the course:

- Understanding of the foundations and importance of E-commerce
- Understanding of retailing in E-commerce by in terms of branding and pricing strategies determining the effectiveness of market research.
- Assess the Internet trading relationships including Business to Consumer, Business-to- Business, Intra-organizational.
- Knowing key features of Internet, Intranets and Extranets and how they relate to each other.
- Understanding legal issues and privacy in E-Commerce.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**E-Commerce:** E-Commerce Framework – E-Commerce and Media Convergence– The anatomy of E-commerce applications - E-Commerce Consumer Applications - E- Commerce Organization Applications.	CO1	K1, K2, K3, K4
UNIT-II	**Internet:** The Internet Terminology – NSFNET – Architecture and Components– National Research and Education Network – Internet Governance – An overview of Internet Applications.	CO2	K1, K2, K3
UNIT III	**E-Commerce and the World Wide Web:** Architectural Frame work for E- commerce–WWW as the architecture–Technology behind the web–Security and the web.	CO2, CO3	K1, K2, K3, K4
UNIT IV	**Electronic Payment Systems:** Types of Electronic Payment Systems –Digital token Electronic Payment Systems–Credit Card Based Electronic Payment Systems – Risk and Electronic Payment Systems.	CO4	K3, K4, K5
UNIT V	**Advertising and Marketing on the Internet:** E-Commerce Catalogs – Information Filtering – Consumer Data Interface – Emerging tools. Software Agents: Characteristics and Properties of Software Agents	CO5	K3, K4, K5, K6

Recommended Text Books

1. Ravi Kalakota & Andrew Whinston, "*Frontiers of Electronic-Commerce*", Addison Wesley.
2. P. Rizwan Ahmed, E-Commerce and E-Business, Margham Publications,Chennai2012

Reference Books

1. Efraim Turvan J. Lee, David Kugand Chung, "Electronic Commerce", Pearson Education, Asia.
2. Manlyn Greenstein and Miklos, "Electronic Commerce", TMH.

Website and e-learning source

1. https://www.the-reference.com/en/expertise/creation-and.../e-commerce
2. https://en.wikipedia.org/wiki/E-commerce
3. https://www.tutorialspoint.com/e_commerce/index.htm

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Demonstrate E-Commerce Frame works and their applications.	K1, K2, K3, K4
CO2	Analyze the E-Commerce Networks Internet Commercialization	K1, K2, K3
CO3	Evaluate how E-Commerce incorporate the Internet and Web Security	K1, K2, K3,K4
CO4	Distinguish the different payment systems.	K3,K4,K5
CO5	Understanding the Advertising and Marketing on the Internet and Software Agents	K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	1	-	1	3	2	3
CO2	3	3	3	3	3	3	2	2	-	2	3	3	3
CO3	3	3	3	3	3	3	1	-	-	-	3	3	3
CO4	3	3	3	3	3	3	2	1	-	2	3	3	3
CO5	3	3	3	3	3	3	2	-	-	1	3	3	3

COURSEDESCRIPTORS

Title of the Course	**BIG DATA ANALYTICS**	**Hours/Week**	02
Course Code	AUSDS35	**Credits**	02
Category	Skill Enhancement	**Year & Semester**	II & III
Prerequisites	Basic Programming Knowledge	**Regulation**	2024

Objectives of the course:

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with Big data.
- To learn about stream computing.
- To know about the research that requires the integration of large amounts of data.
- To analyze data by utilizing clustering and classification algorithms.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Big data Introduction:** Big Data introduction-definition and taxonomy- Big data value for the enterprise - The Hadoop ecosystem - Introduction to Distributed computing- Hadoop ecosystem – Hadoop Distributed File System (HDFS)Architecture-HDFS commands for loading/getting data-Accessing HDFS through Java program.	CO1	K1, K2, K3, K4
UNIT-II	**Map reduce :** Introduction to Map Reduce frame work - Basic Map Reduce Programming: - Advanced Map Reduce programming: Basic template of the Map Reduce program, Word count problem- Streaming in Hadoop- Improving the performance using combiners-Chaining Map Reduce jobs – Joining data from different sources.	CO2	K1, K2, K3
UNIT III	**Pig and Hive:** Applications on Big Data Using Pig and Hive–Data processing operators in Pig–Hive services–Hive QL–Querying Data in Hive – Fundamentals of HBase and Zoo Keeper.	CO2, CO3	K1, K2, K3, K4
UNIT IV	**Mongo DB :** No SQL databases: Mongo DB: Introduction – Features - Data types - Mongo DB Query language - CRUD operations – Arrays - Functions: Count–Sort–Limit–Skip–Aggregate-Map Reduce. Cursors–Indexes- Mongo Import–Mongo Export.	CO4	K3, K4, K5
UNIT V	**Cassandra:** Introduction–Features-Data types–CQLSH-Keyspaces- CRUD operations–Collections–Counter–TTL-Alter commands-Import And Export-Querying System tables	CO5	K3, K4, K5, K6

Recommended Text Books

1. JSeemaAcharya,SubhashiniChellappan,"BigDataandAnalytics",WileyPublication, 2015
2. RameshSharda,DursunDelen,EfraimTurban(2018),BusinessIntelligence,Pearson Education Services Pvt Ltd.

Reference Books

1. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, "Big Data for Dummies", John Wiley & Sons, Inc., 2013.
2. Tom White, "Hadoop: The Definitive Guide", O" Reilly Publications,2011.
3. KyleBanker,"MongoDBinAction",ManningPublicationsCompany,2012.
4. RussellBradberry,EricBlow,"PracticalCassandraAdevelopersApproach",PearsonEducation,

Website and e-learning source

1. https://www.techtarget.com/searchbusinessanalytics/definition/big-data-analytics
2. https://www.coursera.org/articles/big-data-analytics

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Understand Big Data and its analytics in the real world	K1, K2, K3, K4
CO2	Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm.	K1, K2, K3
CO3	Analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics.	K1, K2, K3,K4
CO4	Design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics.	K3,K4,K5
CO5	Implement Big Data Activities using Hive.	K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	2	2	2	2	2	3	3	2
CO2	3	3	3	3	3	3	3	2	2	3	3	3	3
CO3	3	3	3	3	3	3	2	1	2	2	3	3	3
CO4	3	3	3	3	3	3	2	2	2	3	3	3	3
CO5	3	3	3	3	3	3	2	2	2	2	3	3	3

COURSEDESCRIPTORS

Title of the Course	RELATIONAL DATABASE MANAGEMENT SYSTEM	**Total Hours**	05
Course Code	AUCDS41	**Credits**	05
Category	Core - 7	**Year & Semester**	II / IV
Prerequisites	Knowledge of Big data and Data structure and its algorithms	**Regulation**	2024

Objectives of the course:

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
- To understand and use data manipulation language to query, update, and manage a database
- To develop an understanding of essential DBMS concepts such as: database security, integrity, Concurrency
- To design and build a simple database system and demonstrate competence with the fundamental tasks Involved with modeling, designing, and implementing a DBMS.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction: Database System-Characteristics of Database Management Systems- Architecture of Database Management Systems-Database Models System Development Life Cycle-Entity Relationship Model.	CO1	K4, K5, K6
UNIT-II	Relational Database Model: Structure of Relational Model-Types of keys. Relational Algebra: Unary operations-Set operations-Join operations. Normalization: Functional Dependency- First Normal form-Second Normal Form-Third Normal form- Boyce-Codd Normal Form-Fourth Normal Form.	CO2	K1, K2, K3, K4

UNIT-III	**SQL:** Introduction. Data Definition Language: Create, alter, drop, rename and truncate statements. Data Manipulation Language: Insert, Update and Delete Statements. Data Retrieval Language: Select statement. Transaction Control Language: Commit, Rollback and Savepoint statements. Single row functions using dual: Date, Numeric and Character functions. Group/Aggregate functions: count, max, min, avg and sum functions. Set Functions: Union, union all, intersect and minus. Subquery: Scalar, Multiple and Correlated subquery. Joins: Inner and Outer joins. Defining Constraints: Primary Key, Foreign Key, Unique, Check, Not Null.	CO3	K1, K2, K3, K4
UNIT-IV	PL/SQL: Introduction-PL/SQL Basic-Character Set- PL/SQL Structure-SQL Cursor-Subprograms-Functions-Procedures. Exception Handling: Introduction-Predefined Exception-User Defined Exception	CO4	K2, K3, K4, K5
UNIT-V	Triggers-Implicit and Explicit Cursors-Loops in Explicit Cursor. Transaction Management and Concurrency Control: Transaction – properties (ACID), states, Concurrency control, locks, two phase locking serialization.	CO5	K2, K3, K4

Recommended Text Books

1. Pranab Kumar Das Gupta and P. Radha Krishnan, "Database Management System Oracle SQL and PL/SQL", Second Edition, 2013, PHI Learning Private Limited.
2. P.Rizwan Ahmed, RDBMS and Oracle, Margham Publications, Chennai. 2018
3. Database management systems Raghu RamakrishnanMCG Haw hill
4. Database Systems:Concepts Design & Applications Singh S.K. Pearson Edu
5. Oracle 9i, a Beginner,sGuide Michael Abbey TMH

Reference Books

1. RamezElmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Publications.
2. Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database System Concepts", Seventh Edition, TMH.
3. Oracle forms developer's Albert Lulushi, Pearson Edu
4. Database Management Systems MathuKrithiga,VenkateshMargham Pub

Website and e-learning source

http://www.amazon.in/DATABASE-MANAGEMENT-SYSTEM-ORACLE SQLebook/dp/B00LPGBWZ0#reader_B00LPGBWZ0.

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Design efficient database systems by applying concepts system models.	K4, K5, K6
CO2	Apply the principles of Normalization to improve the design of databases for real world applications.	K1, K2, K3, K4
CO3	Apply Structured query language (SQL) for database definition and database manipulation.	K1, K2, K3, K4
CO4	Formulate queries over relational databases using SQL and PL/SQL	K2, K3, K4, K5
CO5	Recognize the importance of triggers and transaction management for effective database programming and error handling.	K2, K3, K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	2	2	1	-	1	3	3	3
CO2	3	2	3	3	3	3	2	1	-	-	3	3	3
CO3	3	3	3	3	3	2	2	-	-	-	3	3	3
CO4	3	3	3	3	3	2	2	-	1	-	3	3	3
CO5	3	3	3	3	3	2	2	-	-	1	3	3	3

COURSEDESCRIPTORS

Title of the Course	RDBMS LAB USING ORACLE	**Total Hours**	05
Course Code	AUCPDS42	**Credits**	05
Category	Core - 8	**Year & Semester**	II / IV
Prerequisites	Programming knowledge	**Regulation**	2024

Objectives of the course:

UNITS	Contents	COs	Cognitive Levels
LAB EXERCISES	LAB EXERCISES: **LAB EXERCISES:** **SQL:** 1. Implementation of DDL commands of SQL with suitable examples Create table• Alter table• Drop Table• 2. Specifying constraints-Primary Key, Foreign Key, Unique, Check, Not Null. 3. Implementation of DML commands of SQL with suitable examples Insert• Update• Delete• 4. Set Operations. 5. Implementation of different types of Joins Inner Join• Outer Join• Natural Join. 6. Sub-queries. **PL/SQL:** 7. Control Constructs. 8. Exception Handlers. 9. Implicit Cursor. 10. Explicit Cursor. 11. Creation of stored procedure, Execution of procedure and modification of procedure. 12. Functions. 13. Creation of insert trigger, delete trigger, update trigger using database 14. TCL Commands usage (Commit, Rollback, Savepoint) **Case Study:** Students Monitoring System	CO1 CO2 CO3 CO4 CO5	K3, K4, K5, K6

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Develop a relational database schema by employing DDL commands.	K3, K4, K5, K6
CO2	Analyze SQL queries and various types of Sub-queries.	K3, K4, K5, K6
CO3	Design procedural logic using PL/SQL Control Constructs.	K3, K4, K5, K6
CO4	Differentiate between Implicit and Explicit Cursors, and apply them within Procedures and Functions.	K3, K4, K5, K6
CO5	Apply Exception Handlers and Transaction Control Language (TCL) commands to ensure data integrity and program reliability.	K3, K4, K5, K6

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	-	-	-	3	3	3
CO2	3	2	3	3	3	3	2	-	-	1	3	3	3
CO3	3	3	2	3	3	3	2	-	1	-	3	3	3
CO4	3	3	3	3	3	3	2	1	-	-	3	3	3
CO5	3	3	3	3	2	3	2	-	-	-	3	3	3

COURSE DESCRIPTORS

Title of the Course	NETWORK SECURITY	**Total Hours**	04
Course Code	AUEDS43B	**Credits**	03
Category	Elective - IV	**Year & Semester**	II / IV
Prerequisites	Knowledge of Computer Networks	**Regulation**	2024

Objectives of the course:

- To understand the fundamentals of Cryptography.
- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To give insight about the underlying mathematics in cryptographic algorithms.
- To provide insight into the working of Authentication Mechanisms, Key Management and security
- To give an exposure to different cryptographic algorithms.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Model of network security–Security attacks, services and attacks– OSI security architecture – Classical encryption techniques – SDES – Block cipher Principles DES– Strength of DES–Block cipher design principles – Block cipher mode of operation	CO1	K1, K2
UNIT-II	Number Theory– Prime number–Modular arithmetic– Euclid's algorithm	CO2	K2, K3, K4, K5
UNIT-III	Authentication requirement – Authentication function – MAC – Hash function –Security of hash function and MAC – SHA - HMAC – CMAC	CO3	K2, K3, K4, K5
UNIT-IV	Authentication applications – Kerberos – X.509 Authentication services - E-mail security–IP security- Web security.	CO4	K1, K2, K3, K4

UNIT-V	Intruder–Intrusion detection system–Virus and related threats– Counter measures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security	CO5	K2, K3, K4

Recommended Text Books

1. William Stallings," Cryptography& Network Security", Pearson Education, Fourth Edition 2010.
2. AtulKahate, "Cryptography and Network Security", Second Edition, 2003,TMH.

Reference Books

1. Behrouz A. Foruzan, "Cryptography and Network Security", Tata McGraw-Hill, 2007.
3. V. Arun Kumar, "Network Security", 2011, First Edition,USP.

Website and e-learning source

https://nordlayer.com/blog/books-on-network-security/

https://www.geeksforgeeks.org/computer-networks/network-security/

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Understand the fundamentals of network security.	K1, K2
CO2	Manipulate mathematical operations in number theory required for cryptography.	K2, K3, K4, K5
CO3	Evaluate the security requirements of authentication systems.	K2, K3, K4, K5
CO4	Differentiate the architecture and operational flow of major network authentication services.	K1, K2, K3, K4
CO5	Analyze the design principles and operational mechanisms of essential security applications.	K2, K3, K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	2	-	-	1	3	3	3
CO2	3	2	3	2	2	3	2	-	-	1	3	3	3
CO3	3	3	3	3	3	3	2	-	-	1	3	3	3
CO4	3	3	2	3	2	3	2	-	-	1	3	3	3
CO5	3	3	2	3	3	3	2	-	-	1	3	3	3

COURSEDESCRIPTORS

Title of the Course	DATA MINING AND WAREHOUSING	**Total Hours**	02
Course Code	AUSDS44	**Credits**	02
Category	Skill Enhancement Course	**Year & Semester**	II / IV
Prerequisites	Knowledge of Data and its processing	**Regulation**	2024

Objectives of the course:

- To provide the knowledge on Data Mining and Warehousing concepts and techniques.
- To study the basic concepts of cluster analysis
- To study a set of typical clustering methodologies, algorithms and applications.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Introduction: Data mining – Functionalities – Classification Introduction to Data Warehousing – Data Preprocessing: Preprocessing the Data – Data cleaning – Data Integration and Transformation – Data Reduction.	CO1	K1, K2
UNIT-II	Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Concept Description, Data Generalization and Summarization.	CO2	K2, K3, K4
UNIT-III	Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases, Multilevel Association Rules from transaction databases.	CO3	K2, K3, K4
UNIT-IV	Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation.	CO4	K2, K3, K4, K5
UNIT-V	Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Petitioning Methods – Hierarchical Methods-Density Based Methods	CO5	K1, K2, K3

Recommended Text Books

1. Han and M. Kamber, "Data Mining Concepts and Techniques", 2001, Harcourt Pvt. Ltd, New Delhi.
2. P.Rizwan Ahmed, Data Mining, Margham Publications, Chennai, 2012.

Reference Books

1. Data mining techniques ,Arun k Pujari ,University press.
2. K.P. Soman, ShyamDiwakar, V. Ajay "Insight into Data Mining Theory and Practice ", Prentice Hall of India Pvt. Ltd, New Delhi.
3. Parteek Bhatia, 'Data Mining and Data Warehousing: Principles and Practical Techniques', Cambridge University Press, 2019.

Website and e-learning source

https://www.topcoder.com/thrive/articles/data-warehousing-and-data-mining

https://www.geeksforgeeks.org/data-science/data-mining/

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Understand the fundamental concepts of data mining and data warehousing.	K1, K2
CO2	Describe the components and architecture of a data mining system.	K2, K3, K4
CO3	Analyze the algorithms for Mining Association Rules.	K2, K3, K4
CO4	Evaluate various Classification and Prediction techniques.	K2, K3, K4, K5
CO5	Implement different Cluster Analysis methods and density-based techniques	K1, K2, K3,

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	3	1	-	-	-	3	3	3
CO2	3	2	2	3	2	1	2	-	-	-	3	3	3
CO3	3	2	2	2	2	1	2	-	-	-	3	3	3
CO4	3	3	3	2	3	2	2	-	-	1	3	3	3
CO5	3	2	2	3	3	2	2	-	-	1	3	3	3

COURSEDESCRIPTORS

Title of the Course	Open Source Software Technologies	**Total Hours**	02
Course Code	AUSDS45	**Credits**	02
Category	Skill Enhancement Course	**Year & Semester**	II / IV
Prerequisites	Knowledge of Internet	**Regulation**	2024

Objectives of the course:

To impart understanding of essentials of open source technologies. Open source technologies course is designed to enable web developers and others with limited programming experience to build dynamic database driven e-commerce web sites using the PHP programming language

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Open Source – open source vs. commercial software – What is Linux? – Free Software – Where I can use Linux? - Linux kernel – Linux distributions	CO1	K1, K2, K3
UNIT-II	Introduction Linux Essential Commands – File System concept – Standard Files –The Linux Security Model – Introduction to Unix – Unix Components Unix Files	CO2	K2, K3, K4
UNIT-III	Introduction - Apache Explained – Starting, Stopping and Restarting Apache – Modifying the Default configuration – Securing Apache – Set user and Group	CO3	K1, K2, K3, K4
UNIT-IV	MySQL: Introduction to MySQL – The show databases and table – The USE command –Create Database and Tables – Describe Table	CO4	K2, K3, K4, K5
UNIT-V	Introduction –PHP Form processing – Database Access with PHP – MySQL, MySQL Functions – Inserting Records – Selecting Records – Deleting Records – Update Records.	CO5	K2, K3, K4, K5

Recommended Text Books

1. P.Rizwan Ahmed, Open Source Programming, Margham Publications, Chennai,2017
2. Web Technology MathuKrithiga,VenkateshMarghamPublications, Chennai,2017

Reference Books

1. The Complete Reference : Linux Richard Peterson ,McGraw Hill Pub
2. The Complete Reference My Sql ,VikramVaswani ,McGraw Hill Pub
3. Learning PhpMysql& Java Script, Robin Nixon, Spd

Website and e-learning source

1. Introduction to Open-Source and its benefits – GeeksforGeeks
2. https://www.w3schools.com/mysql/
3. https://www.tutorialspoint.com/php/index.html

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Discuss Free Software and Open Source concepts.	K1, K2, K3
CO2	Summarize the purpose of the Linux Essential Commands and File System concepts.	K2, K3, K4
CO3	Distinguish between the server-side and the client-side services.	K1, K2, K3, K4
CO4	Execute Structured Query Language (SQL) commands in MySQL.	K2, K3, K4, K5
CO5	Develop data base access in PHP using CRUD operations.	K2, K3, K4, K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	2	1	-	-	1	3	3	3
CO2	3	2	3	2	3	2	2	-	-	1	3	3	3
CO3	3	2	2	3	2	2	1	1	-	1	3	3	3
CO4	3	3	2	3	2	2	2	1	-	1	3	3	3
CO5	3	3	2	3	2	2	2	-	-	1	3	3	3

COURSE DESCRIPTORS

Title of the Course	MACHINE LEARNING	**Total Hours**	05
Course Code	AUCDS51	**Credits**	04
Category	CORE – 9	**Year & Semester**	III & V
Prerequisites	Proficiency in Python Programming & Mathematics	**Regulation**	2024-2025

Objectives of the course:

- 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

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Introduction Machine Learning** - Difference between AI, Machine Learning and Big data. Supervised and unsupervised learning, parametric vs non parametric models, parametric models for classification and regression.	CO1	K1, K2, K3
UNIT-II	**Neural networks and genetic algorithms -**Neural Network Representation – Perceptron Model – Multilayer Networks and Back Propagation Algorithms – Genetic algorithms– Hypothesis Space Search.	CO2	K2, K3, K4
UNIT-III	**Bayesian and computational learning** Bayes Theorem – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Naïve Bayes classifier – Bayesian Belief Network – EM Algorithm.	CO3	K2, K3, K4, K5
UNIT-IV	**Instant based learning** K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning - Support vector machines.	CO4	K2, K3, K4
UNIT-V	**Advanced learning:** Recommendation system-Opinion mining, sentiment analysis – Induction on Inverted Deduction-Inverting Resolution-Analytical Learning – Reinforcement Learning – Q-Learning – Temporal Difference Learning.	CO5	K2, K3, K4

Recommended Text Books

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

Reference Books

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

Website and e-learning source

1. https://www.geeksforgeeks.org/machine-learning/machine-learning/

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Interpret the basic concepts of Machine Learning.	K1, K2, K3
CO2	Analyze the concepts of neural networks and genetic algorithms	K2, K3, K4
CO3	Evaluate the effectiveness of Bayesian approaches in computational learning.	K3, K4, K5
CO4	Apply instance-based learning methods to classification and regression problems.	K2, K3, K4
CO5	Summarize the key ideas of analytical learning and perfect domain theories.	K2, K3, K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	2	2	1	-	1	3	3	3
CO2	3	2	3	3	3	3	2	1	-	-	3	3	3
CO3	3	3	3	3	3	2	2	-	-	-	3	3	3
CO4	3	3	3	3	3	2	2	-	1	-	3	3	3
CO5	3	3	3	3	3	2	2	-	-	1	3	3	3

COURSE DESCRIPTORS

Title of the Course	MACHINE LEARNING LAB	**Total Hours**	05
Course Code	AUCPDS52	**Credits**	04
Category	CORE - 10	**Year & Semester**	III & V
Prerequisites	Knowledge of Python Programming Language	**Regulation**	2024-2025

Objectives of the course:

- To apply the concepts of Machine Learning to solve real-world problems and to implement basic algorithms in clustering & classification applied to text & numeric data

UNITS	Contents	COs	Cognitive Levels
LAB EXERCISES	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 SVM classification for chosen domain application 9. Data & Text Clustering using K-means algorithm 10. Data & Text Clustering using Gaussian Mixture Models	CO1 CO2 CO3 CO4 CO5	K1, K2, K3, K4, K5

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Effectively use the various machine learning tools	K1, K2, K3
CO2	Implement the procedures for machine learning algorithms	K2, K3, K4
CO3	Design Python programs for various machine learning algorithms	K3, K4, K5
CO4	Apply appropriate datasets to the Machine Learning algorithms	K3, K4, K5
CO5	Analyze the graphical outcomes of learning algorithms with specific datasets	K3, K4, K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	-	-	2	3	3	3
CO2	3	2	3	3	3	3	2	-	-	3	3	3	3
CO3	3	3	2	3	3	3	2	-	1	2	3	3	3
CO4	3	3	3	3	3	3	2	1	-	2	3	3	3
CO5	3	3	3	3	2	3	2	-	-	2	3	3	3

COURSE DESCRIPTORS

Title of the Course	SOFTWARE ENGINEERING	**Total Hours**	05
Course Code	AUCDS53	**Credits**	04
Category	CORE - 11	**Year & Semester**	III & V
Prerequisites	Application Development, Database, fundamentals of programming languages	**Regulation**	2024-2025

Objectives of the course:

- To understand the software engineering concepts and to create a system model in real life applications

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Introduction:** The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering.	CO1	K1, K2, K3, K4
UNIT-II	**Requirements Analysis and Specification:** Requirements gathering and analysis, Software requirements specification (SRS)Software Design: Good software design, cohesion and coupling, neat arrangement, software design approaches, object oriented vs function-oriented design	CO2	K3, K4, K5
UNIT-III	**Function-Oriented Software Design:** Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design.	CO3	K3, K4, K5
UNIT-IV	**Coding and Testing:** Coding; code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; system testing; some general issues associated with testing.	CO4	K3, K4, K5
UNIT-V	**Software Maintenance:** Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost;	CO5	K1, K2, K3

Recommended Text Books

1. Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018

Reference Books

1. Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997.
2. Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill.

Website and e-learning source

1. https://www.geeksforgeeks.org/software-engineering/software-engineering/?utm_source=chatgpt.com

Course Learning Out comes (for Mapping with Pos and PSOs)

On completion of the course the Students should be able to

COs	CO Description	Cognitive Level
CO1	Analyze the role of software engineering in managing complex software projects.	K1, K2, K3, K4
CO2	Apply software design principles to develop structured software solutions.	K3, K4, K5
CO3	Examine the role of DFDs and structured design in developing modular software	K3, K4, K5
CO4	Examine general issues and challenges associated with software testing.	K3, K4, K5
CO5	Summarize the role of maintenance in improving software quality and performance.	K1, K2, K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	3	1	-	-	2	3	3	3
CO2	3	2	2	3	2	1	2	-	-	2	3	3	3
CO3	3	2	2	2	2	1	2	-	-	2	3	3	3
CO4	3	3	3	2	3	2	2	-	-	3	3	3	3
CO5	3	2	2	3	3	2	2	-	-	3	3	3	3

COURSE DESCRIPTORS

Title of the Course	INFORMATION SECURITY	**Total Hours**	04
Course Code	AUEDS55A	**Credits**	03
Category	ELECTIVE - V	**Year & Semester**	III & V
Prerequisites	Knowledge of Network Security	**Regulation**	2024-2025

Objectives of the course:

- To know the objectives of information security
- To understand the importance and application of each of confidentiality, integrity, authentication and availability
- To understand various cryptographic algorithms
- To understand the basic categories of threats to computers and networks

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Introduction to Information Security:** Security mindset, Computer Security Concepts (CIA), Attacks, Vulnerabilities and protections, Security Goals, Security Services, Threats, Attacks, Assets, malware, program analysis and mechanisms.	CO1	K1, K2, K3, K4
UNIT-II	**Program Security:** Non-malicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels	CO2	K2, K3, K4, K5
UNIT-III	**File protection Mechanisms:** User Authentication Designing Trusted O.S: Security polices models of security, trusted O.S design, Assurance in trusted O.S. Implementation examples.	CO3	K2, K3, K4
UNIT-IV	**Security in Networks:** Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honey pots, Traffic flow security	CO4	K1, K2, K3
UNIT-V	**Web Security:** Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction. **Cyber Security**: Definition – Crime, Cyber Crime, Information Security, Digital Forensics – Conventional Crime Vs. Cyber Crime - Uniqueness of Cyber Crime – History of Cyber Crimes.	CO5	K2, K3, K4, K5

Recommended Text Books

1. Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education
2. Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson

Reference Books

1.Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.

2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 2nd Edition

3. Information Security, Principles and Practice: Mark Stamp, Wiley India.

4. Principles of Computer Sceurity: WM. Arthur Conklin, Greg White, TMH

Website and e-learning source

1. https://www.tutorialspoint.com/what-is-information-security
2. https://www.geeksforgeeks.org/computer-networks/what-is-information-security/

Course learning out comes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Analyze vulnerabilities and possible security attacks in computer systems.	K1, K2, K3, K4
CO2	Examine different attack mechanisms affecting program security.	K2, K3, K4, K5
CO3	Apply file protection mechanisms to secure system resources.	K2, K3, K4
CO4	Summaries security issues and protection mechanisms in wireless networks.	K1, K2, K3
CO5	Evaluate different types of cyber crimes and web-based security threats.	K2, K3, K4, K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	2	-	-	1	3	3	3
CO2	3	2	3	2	2	3	2	-	-	1	3	3	3
CO3	3	3	3	3	3	3	2	-	-	1	3	3	3
CO4	3	3	2	3	2	3	2	-	-	1	3	3	3
CO5	3	3	2	3	3	3	2	-	-	1	3	3	3

COURSE DESCRIPTORS

Title of the Course	FINANCIAL ANALYTICS	**Total Hours**	04
Course Code	AUEDS55B	**Credits**	03
Category	ELECTIVE - V	**Year & Semester**	III & V
Prerequisites	Basic knowledge of statistics, mathematics, and data analysis	**Regulation**	2024-2025

Objectives of the course:

- To analyze and model financial data.
- To construct and optimize asset portfolios.
- To evaluate and model Risk on various financial assets.
- To use the most powerful and sophisticated routines in R for analytical finance.
- To acquire logical & analytical skills in financial analytics.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Financial Analytics:** Introduction: Meaning-Importance of Financial Analytics uses-Features-Documents used in Financial Analytics: Balance Sheet, Income Statement, Cash flow statement-Elements of Financial Health: Liquidity, Leverage, Profitability. Financial Securities: Bond and Stock investments - Housing and Euro crisis - Securities Datasets and Visualization - Plotting multiple series.	CO1	K3, K4, K5, K6
UNIT-II	**Descriptive Analytics:** Data Exploration, Dimension Reduction and Data Clustering Geographical Mapping, Market Basket Analysis. Predictive Analytics, Fraud Detection, Churn Analysis, Crime Mapping, Content Analytics, Sentiment Analysis. Analyzing financial data and implement financial models.	CO2	K3, K4, K5, K6
UNIT-III	**Forecasting Analytics:** Estimating Demand Curves and Optimize Price, Price Bundling, Non Linear Pricing and Price Skimming, Forecasting, Simple Regression and Correlation Multiple Regression to forecast sales. Modeling Trend and Seasonality Ratio to Moving Average Method, Winter's Method.	CO3	K2, K3, K4
UNIT-IV	**Business Intelligence &Tableau:** Definition of BI – A Brief History of BI – The Architecture of BI. The origin and Drivers of BI. Successful BI Implementation – Analytics Overview – Descriptive, Predictive and Perspective Analytics. Business reporting and Visualization – components - A brief history of data visualization – Different types of charts and graphs	CO4	K3, K4, K5

UNIT-V	**Visualizations:** Using Tableau to Summarize Data, Slicing and Dicing Financial Data, Charts to Summarize Marketing Data. Functions to Summarize Data, Pricing Analytics, Risk based pricing, Fraud Detection and Prediction, Recovery Management, Loss Risk Forecasting, Risk Profiling, Portfolio Stress Testing.	CO5	K3, K4, K5

Recommended Text Books

1. Analysis of Economic Data, Gary Koop, (4th Edition), Wiley.
2. Statistics and Data Analysis for Financial Engineering: with R examples; David Ruppert, David S. Matteson, Springers

Reference Books

1. Analyzing Financial Data and Implementing Financial Models Using „R", Ang Clifford, Springers.
2. Microsoft Excel 2013: Data Analysis and Business Modeling, Wayne L. Winston, Microsoft Publishing

Website and e-learning source

1. https://www.techtarget.com/searcherp/definition/financial-analytics

Course learning out comes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Create their own financial models with interpret the outputs of given financial models.	K3, K4, K5, K6
CO2	Create visualizations that clearly communicate financial data insights.	K3, K4, K5, K6
CO3	Analyze the data process, including data scraping, manipulation and exploratory data analysis.	K2, K3, K4
CO4	Prepared for more advanced applied financial modeling courses.	K3, K4, K5
CO5	Utilize improve leadership, teamwork and critical thinking skills for financial decision making.	K3, K4, K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	2	-	-	2	3	3	3
CO2	3	2	3	2	2	3	2	-	-	2	3	3	3
CO3	3	3	3	3	3	3	2	-	-	3	3	3	3
CO4	3	3	2	3	2	3	2	-	-	3	3	3	3
CO5	3	3	2	3	3	3	2	-	-	2	3	3	3

COURSE DESCRIPTORS

Title of the Course	Grid Computing	**Total Hours**	04
Course Code	AUEDS55C	**Credits**	03
Category	ELECTIVE - V	**Year & Semester**	III & V
Prerequisites	Basic knowledge of computer networks	**Regulation**	2024-2025

Objectives of the course:

- To provide the knowledge on the basic construction and use of Grid computing.
- To know and understand the grid computing applications.
- To assess the efficiency of the grid computing in solving large scale scientific problems

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Introduction:** Early Grid Activity, Current Grid Activity, Overview of Grid Business areas, Grid Applications, Grid Infrastructures.	CO1	K1, K2
UNIT-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.	CO2	K1, K2, K3
UNIT-III	**Grid Computing Anatomy:** The Grid Problem, The conceptual of virtual organizations, # Grid Architecture # and relationship to other distributed technology	CO3	K3, K4, K5
UNIT-IV	**The Grid Computing Road Map:** Autonomic computing, Business on demand and infrastructure virtualization, Service-Oriented Architecture and Grid, Semantic Grids.	CO4	K2, K3, K4
UNIT-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.	CO5	K1, K2, K3

Recommended Text Books

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

Reference Books

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

Website and e-learning source

1. https://www.studocu.com/in
2. https://www.scribd.com/
3. https://www.slideshare.net/slideshow/grid-computing-systems-and-resource-management/

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Understand the basic elements and concepts related to Grid computing.	K1, K2
CO2	Identify the Grid computing toolkits and Framework.	K1, K2, K3
CO3	Examine about the concepts of Virtualization	K3, K4, K5
CO4	Analyze the concept of service oriented architecture.	K2, K3, K4
CO5	Explain the grid and web service architecture.	K1, K2, K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	2	-	-	1	3	3	3
CO2	3	2	3	2	2	3	2	-	-	1	3	3	3
CO3	3	3	3	3	3	3	2	-	-	1	3	3	3
CO4	3	3	2	3	2	3	2	-	-	1	3	3	3
CO5	3	3	2	3	3	3	2	-	-	1	3	3	3

COURSE DESCRIPTORS

Title of the Course	OPERATING SYSTEM	**Total Hours**	04
Course Code	AUEDS56A	**Credits**	03
Category	ELECTIVE - VI	**Year & Semester**	III & V
Prerequisites	Basic knowledge of Data Structures and Computer Organization	**Regulation**	2024-2025

Objectives of the course:

- To understand the fundamental concepts and role of Operating System.
- To learn the Process Management and Scheduling Algorithms.
- To understand the Memory Management policies.
- To gain insight on I/O and File management techniques.
- Analyze resource management techniques

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Introduction**- views and goals – Operating System Services - User and Operating System interface - System Call- Types of System Calls – Operating System Design and Implementation - Operating System Structure. **Process Management:** Process concept- Process Scheduling - Operations on Processes- Inter process Communication	CO1	K1, K2
UNIT-II	.**Process Scheduling:** Basic Concepts-Scheduling Criteria Scheduling Algorithm Multiple Processor Scheduling CPU Scheduling. **Synchronization:** The Critical-Section Problem - Synchronization Hardware – Semaphores	CO2	K1, K2, K3, K4
UNIT-III	**Deadlocks:** Deadlock Characterization - Methods for Handling Deadlocks- Deadlock Prevention- Deadlock Avoidance - Deadlock Detection- Recovery from Deadlock.	CO3	K3, K4, K5
UNIT-IV	**Memory-Management Strategies:** Swapping - Contiguous Memory Allocation Segmentation- Paging - Structure of the Page Table. Virtual-Memory Management: Demand Paging - Page Replacement - Allocation of Frames -Thrashing.	CO4	K2, K3, K4

UNIT-V	**Storage Management:** File System- File Concept - Access Methods- Directory and Disk Structure -File Sharing- Protection. Allocation Methods - Free- Space Management - Efficiency and Performance – Recovery.	CO5	K2, K3, K4

Recommended Text Books

1. A. Silberschatz P.B. Galvin, Gange. "Operating System Concepts", Ninth Edition, 2013, Addison Wesley Publishing Co.
2. P. Rizwan Ahmed, Operating System, Margham Publications, Chennai.2018

Reference Books

1. Anderw S Tanenbaum, Albert S. Woodhull, Operating System Design and Impletation", prentice-Hall India Publication.
2. William Stallings, "Operating Systems Internals and Design Principles", Pearson, 2018, 9th Edition.
3. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition
4. Operating System Concepts (2nd Ed) by James L. Peterson, Abraham Silberschatz, Addison – Wesley.
5. Operating Systems Design & implementation Andrew S. Tanenbam, Albert S. Woodhull Pearson.

Website and e-learning source

1. https://www.guru99.com/operating-system-tutorial.html
2. https://www.mygreatlearning.com/blog/what
3. https://en.wikipedia.org/wiki/Operating_system

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Understand the operating system architecture and components.	K1, K2
CO2	Compare various CPU scheduling algorithms for process execution.	K1, K2, K3, K4
CO3	Identify occurrence of deadlock and describe ways to handle it.	K3, K4, K5
CO4	Apply various memory, I/O and disk management techniques.	K2, K3, K4
CO5	Apply the various concepts of storage management concepts.	K2, K3, K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	2	1	-	-	1	3	3	3
CO2	3	2	3	2	3	2	2	-	-	1	3	3	3
CO3	3	2	2	3	2	2	1	1	-	1	3	3	3
CO4	3	3	2	3	2	2	2	1	-	1	3	3	3
CO5	3	3	2	3	2	2	2	-	-	1	3	3	3

COURSE DESCRIPTORS

Title of the Course	SIMULATION AND MODELING	**Total Hours**	04
Course Code	AUEDS56B	**Credits**	03
Category	ELECTIVE - VI	**Year & Semester**	III & V
Prerequisites	Probability distributions and random variables	**Regulation**	2024-2025

Objectives of the course:

- In this course, modeling and simulation (M&S) methodologies considering the theoretical aspects.
- A wide range of Modeling and Simulation concepts that will lead you to develop your own M&S applications.
- Students learn the methodologies and tools for simulation and modeling of a real time problem/ mathematical model.

UNITS	Contents	COs	Cognitive Levels
UNIT-I	**Introduction To Modeling & Simulation** – What is Modeling and Simulation? – Complexity Types – Model Types – Simulation Types – M&S Terms and Definitions Input Data Analysis Simulation Input Modeling	CO1	K1, K2, K3
UNIT-II	**Random Variate Generation** – Random Numbers – Random Number Generators – General principles – Inverse Transform Method –Acceptance Rejection Method –Composition Method Relocate and Rescale Method - Specific distributions-Output Data Analysis	CO2	K2, K3, K4, K5
UNIT-III	**Comparing Systems via Simulation** – Introduction – Comparison Problems - Comparing Two Systems - Screening Problems Selecting the Best - Comparison with a Standard - Comparison with a Fixed Performance Discrete Event Simulations Introduction - Next-Event Time Advance	CO3	K2, K3, K4, K5
UNIT-IV	**Entity Modeling** – Entity Body Modeling – Entity Body Visualization – Entity Body Animation – Entity Interaction Modeling – Building Modeling Distributed Simulation – High Level Architecture (HLA) – Federation Development and Execution Process (FEDEP)	CO4	K2, K3, K4

UNIT-V	Optimization Algorithms – Genetic Algorithms – **Simulated Annealing Examples:** Sensor Systems Modeling – Human Eye Modeling – Optical Sensor Modeling – Radar Modeling.	CO5	K2, K3, K4

Recommended Text Books

1. Jerry Banks, "Handbook of Simulation: Principles, Methodology, Advances, Applications, and Practice", John Wiley & Sons, Inc., 1998.
2. George S. Fishman, "Discrete-Event Simulation: Modeling, Programming and Analysis", Springer-Verlag New York, Inc., 2001.

Reference Books

1. Andrew F. Seila, Vlatko Ceric, Pandu Tadikamalla, "Applied Simulation Modeling", Thomson Learning Inc., 2003.

Website and e-learning source

1. https://www.tutorialspoint.com/modelling_and_simulation/index.htm

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Identify the fundamental concepts and terminology of modeling and simulation.	K1, K2, K3
CO2	Evaluate simulation outputs using appropriate statistical analysis techniques.	K2, K3, K4, K5
CO3	Examine system behavior and performance through simulation experiments.	K2, K3, K4, K5
CO4	Apply entity modeling techniques to represent real-world systems	K2, K3, K4
CO5	Apply optimization techniques in optical and sensor system modeling.	K2,K3,K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	2	1	-	-	1	3	3	3
CO2	3	2	3	2	3	2	2	-	-	1	3	3	3
CO3	3	2	2	3	2	2	1	1	-	1	3	3	3
CO4	3	3	2	3	2	2	2	1	-	1	3	3	3
CO5	3	3	2	3	2	2	2	-	-	1	3	3	3

COURSE DESCRIPTORS

Title of the Course	QUANTITATIVE APTITUDE	**Total Hours**	04
Course Code	AUEDS56C	**Credits**	03
Category	ELECTIVE - VI	**Year & Semester**	III & V
Prerequisites	Knowledge of Mathematics	**Regulation**	2024-2025

Objectives of the course:

- To improve the quantitative skills of the students
- To prepare the students for various competitive exams

UNITS	Contents	COs	Cognitive Levels
UNIT-I	Numbers- HCF and LCM of numbers-Decimal fractions- Simplification-Square roots and cube roots- Average- problems on Number	CO1	K1, K2, K3
UNIT-II	Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion-partnership- Chain rule.	CO2	K2, K3, K4, K5
UNIT-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.	CO3	K3, K4, K5
UNIT-IV	Permutation and combination-probability-True Discount Bankers Discount Height and Distances-Odd man out & Series.	CO4	K1, K2, K3
UNIT-V	Calendar - Clocks - stocks and shares - Data representation - Tabulation – Bar Graphs- Pie charts-Line graphs	CO5	K2, K3, K4

Recommended Text Books

1. "Quantitative Aptitude", R.S.AGGARWAL.,S.Chand& Company Ltd., Web resources: Authentic Web resources related to Competitive examinations

Website and e-learning source

1. https://www.geeksforgeeks.org/aptitude/quantitative-aptitude/
2. https://www.scribd.com/document/867695460/Quantitative-Aptitude-Notes

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Identify basic number concepts including HCF, LCM, and decimal fractions.	K1, K2, K3
CO2	Examine quantitative problems involving percentage, ratio, and partnership concepts.	K2, K3, K4, K5
CO3	Interpret problems related to races and games of skill.	K2, K3, K4
CO4	Recognize patterns in number and letter series.	K1, K2, K3
CO5	Demonstrate solutions for calendar and clock problems.	K2, K3, K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	2	1	-	-	1	3	3	3
CO2	3	2	3	2	3	2	2	-	-	1	3	3	3
CO3	3	2	2	3	2	2	1	1	-	1	3	3	3
CO4	3	3	2	3	2	2	2	1	-	1	3	3	3
CO5	3	3	2	3	2	2	2	-	-	1	3	3	3

COURSE DESCRIPTORS

Title of the Course	Project with Viva voce	**Total Hours**	05
Course Code	AUPDS54	**Credits**	04
Category	CORE - 12	**Year & Semester**	II & V
Prerequisites	Basic knowledge of programming and fundamental computer science concepts	**Regulation**	2024-2025

Objectives of the course:

- Advance from an intellectually curious student to a creator/maker and an industry professional
- Apply verbal and written communication skills to explain technical problem solving techniques and solutions to an increasingly diverse and global audience
- Collaborate within and across disciplinary boundaries to solve problems
- Apply mathematical and/or statistical methods to facilitate problem solving.
- Exercise computational thinking over the entire software life cycle

S.NO	Area of Work	Marks
1	PROJECT WORK: (i) Project Proposal and Plan	10
2	(ii) Execution of the Project Proposal and Plan / Collection of data, Documentation and Presentation of the report.	40
3	Viva Voce Examination	25
	TOTAL	75

* CIA Marks =25 marks (Project Review 1, Project Review2 and Project Review 3)

* **Project can be done Individual/ Group of 3 members.**

Annexure - I

(A typical Specimen of Cover Page & Title Page)

TITLE OF PROJECT

<Font Size 22> <BOLD> <Centralized>
A Project Report

< Font Size 14> <BOLD> <Centralized>
Submitted by:

< Font Size 14> <Italic> <BOLD> <Centralized>

NAME OF THE STUDENT (<University Roll Number>)

< Font Size 16> <BOLD> <Centralized>

in partial fulfillment for the award of the degree
of

< Font Size 14> <1.5 line spacing> <Italic> <BOLD> <Centralized>

< Font Size 14> <BOLD> <Centralized>
BACHELOR OF SCIENCE
< Font Size 16> <BOLD> <Centralized>
IN
DATA SCIENCE
< Font Size 14> <BOLD> <Centralized>
Under the Supervision of
<NAME OF THE SUPERVISOR(s)>

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COLLEGE

Emblem

COLLEGE NAME

DEPARTMENT NAME

MONTH & YEAR

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Annexure - 2

CANDIDATE'S DECLARATION

I hereby certify that the project entitled "_____ submitted by" (Student name) & (University Roll no) in partial fulfillment of the requirement for the award of degree of the B. Sc. (Data Science) submitted at _____ (College Name) is an authentic record of my own work carried out during a period from _____ to _____ under the guidance of Mr./Dr._____ (Guide name, Designation, Department of Data Science). The matter presented in this project has not formed the basis for the award of any other degree, diploma, fellowship or any other similar titles.

Signature of the Student

Place:

Date:

Annexure – 3

CERTIFICATE

This is to certify that the project titled "_____" is the bona fide work carried out by (Student name) & (University Roll no) in partial fulfillment of the requirement for the award of degree of the B.Sc. (Data Science) submitted at _____ (College Name) is an authentic record his/her work carried out during a period from _____ to _____under the guidance of Mr./Dr._____Guide name, Designation, Department of Data Science . The Major Project Viva-Voce Examination on has been held on _____ (DD/MM/YYYY).

Signature of the Guide

Signature of the HOD

Internal Examiner

External Examiner

COURSE DESCRIPTORS

Title of the Course	Internship / Industrial Training	**Total Hours**	-
Course Code	AUIDS57	**Credits**	2
Category	COMPULSORY PAPER	**Year &Semester**	III/V
Prerequisites	Communication skill	**Regulation**	2024-2025

Objectives of the course:

- Advance from an intellectually curious student to a creator/maker and an industry professional
- Apply verbal and written communication skills to explain technical problem solving techniques and solutions to an increasingly diverse and global audience
- Collaborate within and across disciplinary boundaries to solve problems
- Apply mathematical and/or statistical methods to facilitate problem solving.
- Exercise computational thinking over the entire software life cycle

Internship / Industrial Training:

- The students to undergo 2 weeks of Internship / Industrial Training in the Industry

S.No	Area of Work	Marks
1	a) Work Related performance – Work Attitude/ Academic preparation/ problem solving ability/ Adaptability / Overall Attendance / Progress towards learning goals	10
	b) Organizational skills – Time management skills / Planning skills/ communication skills	20
	c) Relationship with others – Willingness to cooperate with co-works/ Ability to work with supervisor / Acceptance of constructive comments / Ability to take direction	20
2	Internship Report / Viva Voce Examination	25
	TOTAL	75

* CIA Marks =25 marks (Internship Review 1, Review2 and Review 3)