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	Internal	External	Total
							Maximum Marks		
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 -Python Lab	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 Lab	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 / AULU 30	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	Data Science Lab	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 Science	2	2	25	75	100
				Semester Total	**30**	**24**			
SEMESTER - IV	I	Language	AULT40 / AULU 40	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	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	Machine Learning Lab	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	Cryptography					
		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) (30hours)	-	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	IoT and Cloud Technologies Lab	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	Cyber Forensics	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",2ndEdition.

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 required things 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 and applications of software.	K1,K2,K5
CO5	Read the usage of Operating system in information technology which really acts 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	12thStandard 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	12thStandard 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, $\nabla$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