

**STUDY SCHEME &
SYLLABUS
FOR
B.SC Artificial Intelligence &
Machine Learning

BATCH-2026**

B.SC Artificial Intelligence & Machine Learning

First Semester								
Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks
			L	T	P	Internal	External	
26C2AIU-101	Core Theory	Mathematics	3	1	0	40	60	100
26C2AIU-102	Core Theory	Fundamentals of Information Technology	3	1	0	40	60	100
26C2AIU-103	Core Theory	Programming in Python	3	1	0	40	60	100
26C2AIU-111	Core Practical/Laboratory	Workshop on Multimedia Tools	0	0	4	60	40	100
26C2AIU-113	Core Practical/Laboratory	Programming in Python Laboratory	0	0	4	60	40	100
26C2AIU-112	Core Practical/Laboratory	Fundamentals of Information Technology Laboratory	0	0	4	60	40	100
26C2AIU-104	Ability Enhancement Compulsory Course (AECC)-I	English	1	0	0	20	30	50
26C2AIU-114	Ability Enhancement Compulsory Course (AECC)	English Practical/Laboratory	0	0	2	30	20	50
26C2CCU-103	Value Added Course	Human Values, De-addiction and Traffic Rules	3	0	2	40	60	100
26C2AIU-116	Skill Enhancement Course	Career and Placement Planning - 1	0	0	2	50	-	50
26C2AIU-117	Value Added Course (NCC)	*MOOC	0	0	2	-	-	S/US
TOTAL			13	3	20	440	410	850

B.SC Artificial Intelligence & Machine Learning

<u>Second Semester</u>								
Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks
			L	T	P	Internal	External	
26C2AIU-201	Core Theory	Fundamentals of Statistics	3	1	0	40	60	100
26C2AIU-202	Core Theory	Operating Systems	3	1	0	40	60	100
26C2AIU-203	Core Theory	Data Structures	3	1	0	40	60	100
26C2AIU-213	Core Practical/Laboratory	Data Structures Laboratory	0	0	4	60	40	100
26C2AIU-212	Core Practical/Laboratory	Operating Systems Laboratory	0	0	4	60	40	100
26C2AIU-211	Core Practical/Laboratory	Fundamentals of Statistics Laboratory	0	0	4	60	40	100
26C2CCU-203	Multidisciplinary	Environmental Science and Sustainability	3	0	0	40	60	100
26C2AIU-214	Ability Enhancement	Design Thinking	0	0	4	60	40	100
26C2AIU-215	Skill Enhancement Course	Career and Placement Planning - 2	0	0	2	50	-	50
26C2AIU-216	Value Added Course (NCC)	*MOOC	0	0	2	-	-	S/US
	TOTAL		12	3	20	450	400	850

B.SC Artificial Intelligence & Machine Learning

Third Semester								
Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks
			L	T	P	Internal	External	
26C2AIU-301	Core Theory	Artificial Intelligence	3	1	0	40	60	100
26C2AIU-302	Core Theory	Design and Analysis of Algorithms	3	1	0	40	60	100
26C2AIU-303	Core Theory	Database Management Systems	3	1	0	40	60	100
26C2AIU-312	Core Practical/Laboratory	Design and Analysis of Algorithms Lab	0	0	4	60	40	100
26C2AIU-313	Core Practical/Laboratory	Database Management Systems Lab	0	0	4	60	40	100
26C2AIU-311	Core Practical/Laboratory	Artificial Intelligence Lab	0	0	4	60	40	100
26C2AIU-304	Skill Enhancement Course-I	Internet Tools and Applications	1	0	0	20	30	50
26C2AIU-314	Skill Enhancement Course- Laboratory	Internet Tools and Application Lab	0	0	4	60	40	100
26C2AIU-315	Skill Enhancement Course	Career and Placement Planning - 3	0	0	2	50	-	50
26C2AIU-316	Value Added Course (NCC)	*MOOC	0	0	2	-	-	S/US
	TOTAL		10	3	20	430	370	800

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Fourth Semester								
Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks
			L	T	P	Internal	External	
26C2AIU-401	Core Theory	Data Science & Machine Learning	3	1	0	40	60	100
26C2AIU-402	Core Theory	Software Engineering	3	1	0	40	60	100
26C2AIU-403	Core Theory	Cloud Computing	3	1	0	40	60	100
26C2AIU-411	Core Practical/Laboratory	Data Science & Machine Learning Lab	0	0	4	60	40	100
26C2AIU-412	Core Practical/Laboratory	Cloud Computing Lab	0	0	4	60	40	100
26C2AIU-404	Skill Enhancement Course-II	Advance Python Programming	3	0	0	20	30	50
26C2AIU-413	Skill Enhancement Course- Laboratory	Advance Python Programming Lab	0	0	2	30	20	50
26C2AIU-414	Skill Enhancement Course	Career and Placement Planning - 4	0	0	2	50	-	50
26C2AIU-415	Value Added Course (NCC)	*MOOC	0	0	2	-	-	S/US
Total			12	3	18	340	310	650

Students will undergo 45 days Industrial Training after 4th semester. Examination will be conducted along with 5th semester practical.

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Fifth Semester								
Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks
			L	T	P	Internal	External	
26C2AIU-501	Skill Enhancement Course-III	R Programming	3	0	0	40	60	100
26C2AIU-511	Skill Enhancement Course-Laboratory	R Programming Laboratory	0	0	2	30	20	50
	Open Elective-I		3	0	0	40	60	100
	Elective-I		3	0	0	40	60	100
	Elective-II		3	1	0	40	60	100
	Elective-I Laboratory		0	0	4	60	40	100
	Elective-II Laboratory		0	0	4	60	40	100
26C2AIU-512	Project	Project 1	0	0	4	60	40	100
26C2AIU-513	Industrial Training	Industrial Training	0	0	4	60	40	100
26C2AIU-514	Skill Enhancement Course	Career and Placement Planning - 5	0	0	2	50	-	50
26C2AIU-515	Value Added Course (NCC)	*MOOC	0	0	2	-	-	S/US
Total			12	1	22	480	420	900

Elective – I		Elective-II	
Course Code	Course Title	Course Code	Course Title
26C2AIU-PE1-01	Natural Language Processing	26C2AIU-PE2-01	Modelling and Simulation
26C2AIU-PE1-02	Image Processing	26C2AIU-PE2-02	Neural Network
26C2AIU-PE1-03	Web Mining & Recommender System	26C2AIU-PE1-03	IOT & Blockchain Technology

Elective – I Laboratory		Elective-II Laboratory	
Course Code	Course Title	Course Code	Course Title
26C2AIU-PE1-11	Natural Language Processing Lab	26C2AIU-PE2-11	Modelling and Simulation Lab
26C2AIU-PE1-12	Image Processing Lab	26C2AIU-PE2-12	Neural Network Lab
26C2AIU-PE1-13	Web Mining & Recommender System Lab	26C2AIU-PE1-13	IOT & Blockchain Technology Lab

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Sixth Semester								
Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks
			L	T	P	Internal	External	
26C2AIU-601	Skill Enhancement Course-III	Weka- Open Source Software Tool	3	0	0	40	60	100
26C2AIU-611	Skill Enhancement Course-Laboratory	Weka- Open Source Software Tool Lab	0	0	4	60	40	100
	Open Elective-II		3	0	0	40	60	100
	Elective-III		3	1	0	40	60	100
	Elective-IV		3	1	0	40	60	100
	Elective-I II Laboratory		0	0	4	60	40	100
	Elective-IV Laboratory		0	0	4	60	40	100
26C2AIU-602	Project	Project 2	0	0	4	60	40	100
26C2AIU-612	Skill Enhancement Course	Career and Placement Planning - 6	0	0	2	50	-	50
26C2AIU-613	Value Added Course (NCC)	*MOOC	0	0	2	-	-	S/US
TOTAL			12	2	20	450	400	850

Elective – III	
Course Code	Course Title
26C2AIU-PE3-01	Business Intelligence
26C2AIU-PE3-02	Intelligent Systems
26C2AIU-PE3-03	Geographic Information Systems
26C2AIU-PE3-04	Data Mining & Warehousing

Elective – IV	
Course Code	Course Title
26C2AIU-PE4-01	Social Network Analysis
26C2AIU-PE4-02	Big Data Analytics
26C2AIU-PE4-03	Computer Vision
26C2AIU-PE4-04	Deep Learning

Elective – III Laboratory	
Course Code	Course Title
26C2AIU-PE3-11	Business Intelligence Lab
26C2AIU-PE3-12	Intelligent Systems Lab
26C2AIU-PE3-13	Geographic Information Systems Lab
26C2AIU-PE3-14	Data Mining & Warehousing Lab

Elective – IV Laboratory	
Course Code	Course Title
26C2AIU-PE4-11	Social Network Analysis Lab
26C2AIU-PE4-12	Big Data Analytics Lab
26C2AIU-PE4-13	Computer Vision Lab
26C2AIU-PE4-14	Deep Learning Lab

Semester I

Course Code	Course Type	Course Title	Cd	Load Allocation			Marks Distribution		Total Marks
				L	T	P	Internal	External	
26C2AIU-101	Core Theory	Mathematics	4	3	1	0	40	60	100

Prerequisites : Student must have the knowledge of Maths

Course Outcomes (COs):

At the end of the course, the student will be able to	
CO1	Classify types of sets and perform set operations
CO2	Analyze logical statements using propositional logic
CO3	Identify different types of matrices and perform matrix operations
CO4	Solve problems related to arithmetic and Geometric progressions
CO5	Apply sets, logic, matrices and progressions to real world problems.

Detailed Syllabus

Unit 1

Introduction to Sets & Objectives. Representation: Roster Method, Set Builder Method. Types: Null, Singleton, Finite, Infinite, Equal, Equivalent, Disjoint, Subset, Proper Subset, Power Set, Universal Set. Set Operations: Union, Intersection, Difference, Symmetric Difference, Complement of a Set.

(Hours 11)

Unit 2

Statements and Connectives. Basic Logic Operations: Conjunction ($\wedge$), Disjunction ($\vee$), Negation ($\neg$). Logical Equivalence and Equivalent Statements. Tautologies and Contradictions — definition, identification, and truth table verification.

(Hours 10)

Unit 3

Introduction to Matrices. Types: Row, Column, Rectangular, Square, Diagonal, Scalar, Unit (Identity), Null, Comparable, Equal Matrices. Matrix Operations: Scalar Multiplication, Negative of a Matrix, Addition, Subtraction, Matrix Multiplication, Transpose of a Matrix.

(Hours 10)

Unit 4

Introduction to Progressions. Arithmetic Progression (A.P.): nth term, sum of finite terms, Arithmetic Mean. Geometric Progression (G.P.): nth term, sum of finite terms, Geometric Mean comparison between A.P. and G.P., and real-world applications.

(Hours 10)

Unit 5

Integrated Applications: applying set theory to database and logic design; using propositional logic in digital circuits; matrix applications in computer graphics and data transformation; progressions in algorithm complexity and financial modelling. Problem-solving sessions and case studies.

(Hours 11)

Text Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Discrete Mathematics and Its applications	Kenneth H. Rosen	McGraw Hill	9th (2025)
2	College Mathematics	Margie Hobbs and Cheryl Cleaves	Pearson	4th (2019)

Reference Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Elementary Mathematics	V. Lidsky, L. Ovsyannikov, A. Tulaikov, M. Shabunin	McGraw Hill Education	1st (2025)
2	Comprehensive Mathematics	Parmanand Gupta	BPB Publications	Revised Edition

Course Code	Course Type	Course Title	Cd	Load Allocation			Marks Distribution		Total Marks
				L	T	P	Internal	External	
26C2AIU-102	Core Theory	Fundamentals of Information Technology	4	3	1	0	40	60	100
Prerequisites : Student must have the knowledge of Language									

Course Outcomes (COs):

At the end of the course, the student will be able to	
CO1	Describe the functional units of a computer system including CPU, registers, system bus, and memory components.
CO2	Explain the concept of computing, types of programming languages, the role of the operating system as a user interface, word processing features, and applications of Information Technology in everyday and professional contexts.
CO3	Utilize spreadsheet and presentation graphics software to organize data, apply various editing functions, and develop effective slide presentations.
CO4	Analyze the impact of the Internet on society along with the description of various electronic payment systems, digital signatures, and secure transaction mechanisms used in digital financial services.
CO5	Elaborate the concepts, features, and real-world applications of mobile computing, cloud computing, big data, the Internet of Things (IoT) etc

Detailed Syllabus
Unit 1

Human Computer Interface: concepts of hardware and software, data and information. Functional Units: CPU, registers, system bus, main memory, cache memory, SMPS, motherboard, ports, interfaces, expansion cards, ribbon cables, memory chips, processors. Devices: Input/Output devices — keyboard, mouse, joystick, scanner, OCR, OMR, barcode reader, webcam, monitor, printer, plotter. Memory: Primary, secondary, auxiliary, RAM, ROM, cache, hard disks, optical disks. Data Representation: Bit, byte, binary, decimal, hexadecimal, octal systems, conversions, binary arithmetic (addition, subtraction, multiplication). (Hours 11)

Unit 2

Concept of Computing. Types of Languages: machine language, assembly language, high-level language. Operating System as user interface; utility programs. Word Processing: editing and formatting features, saving and printing, table handling, page settings, spell-checking, macros, mail-merge, equation editors. Applications of IT in everyday and professional contexts. (Hours 10)

Unit 3

Spreadsheet: workbook and worksheets, data types, operators, cell formats, freeze panes, editing and formatting, creating and using formulas, cell references, replication, sorting, filtering, functions, charts and graphs. Presentation Graphics Software: templates, views, formatting slides, slides with graphs, animation, special features, presenting slide shows. (Hours 10)

Unit 4

Impact of Computing and the Internet on Society. Secure Electronic Transaction (SET). Types of Payment Systems: digital cash, electronic cheque, smart card, credit/debit card, e-money, bitcoins and cryptocurrency. Electronic Fund Transfer (EFT), Unified Payment Interface (UPI), Immediate Payment System (IMPS). Digital Signature and Certification Authority. (Hours 10)

Unit 5

Mobile Computing: concepts, features, and applications. Cloud Computing: service models (IaaS, PaaS, SaaS), deployment models, advantages. Big Data: characteristics (5 Vs), tools, and use cases. Internet of Things (IoT): architecture, smart devices, real-world applications. Integrated case studies on digital transformation and technology adoption. (*Contact hours to be specified by the institution)

(Hours 11)

Text Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Introduction to Information Technology	V. Rajaraman	Prentice Hall of India	3rd (2018)
2	Fundamentals of Computers	Vishal Soni	BPBPublishers	6th (2017)

Reference Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Computer Fundamentals	P. K. Sinha, Priti Sinha	BPB Publications	8th (2020)
2	Problem Solving Cases in Microsoft Excel	Ellen Monk, Joseph Brady, Gerard S. Cook	Cengage Learning	16th(2020)

Course Code	Course Type	Course Title	Cd	Load Allocation			Marks Distribution		Total Marks
				L	T	P	Internal	External	
26C2AIU-103	Core Theory	Programming in Python	4	3	1	0	40	60	100
Prerequisites : Student must have the knowledge of Language									

Course Outcomes (COs):

At the end of the course, the student will be able to	
CO1	Explain the input/output functions and the import command in Python programming.
CO2	Experiment with decision-making statements, control statements, list indexing, and slicing, for data manipulation.
CO3	Make use of built-in functions, user-defined functions, importing modules, module path searching, and the use of Python packages & standard library modules.
CO4	Construct different types of exceptions and built-in exceptions in Python programming.
CO5	Design Python programs using object-oriented programming concepts such as encapsulation, inheritance, polymorphism, and abstraction

Detailed Syllabus
Unit 1

Introduction: programming languages, history and origin of Python, features, limitations, major applications, installation, setting up path and environment variables, running Python, first Python program, interactive help, differences from other languages. Data Types & I/O: keywords, identifiers, statements, indentation, documentation, variables, multiple assignment, data types, type conversion, input/output functions, import command. Operators & Expressions: operators in Python, expressions, precedence, associativity, non-associative operators.

(Hours 11)

Unit 2

Control Structures: decision-making statements (if, if-else, elif), Python loops (while, for), control statements (break, continue, pass). Python Native Data Types: Numbers, Lists (creation, indexing, slicing, methods), Tuples (immutability, operations), Sets (set operations and methods), Dictionary (creation, functions and methods). Strings: string creation, indexing, slicing, string methods and operations in detail.

(Hours 10)

Unit 3

Python Functions: definition and advantages, built-in functions, user-defined functions, anonymous (lambda) functions, pass by value vs. pass by reference, recursion, scope and lifetime of variables (local, global, nonlocal). Python Modules: module definition, need and creation of modules, importing modules, path searching, module reloading, standard library modules, Python packages and `__init__.py`.

(Hours 10)

Unit 4

Exception Handling: exceptions and their types, built-in exceptions, try-except-else-finally blocks, raising exceptions, user-defined exceptions in Python. File Management: opening files and modes, file attributes, encoding, closing files, `read()` and `write()` methods, `tell()` and `seek()` methods, renaming and deleting files, working with directories in Python.

(Hours 10)

Unit 5

Classes and Objects: OOP concepts in Python (encapsulation, inheritance, polymorphism, abstraction), designing classes with __init__ and methods, creating and accessing objects, accessing and editing class attributes. Advanced OOP: built-in class attributes (__doc__, __name__, __module__, __dict__), garbage collection mechanism, destroying objects, operator overloading, and class-level applications.

(Hours 11)

Text Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Programming in Python	Pooja Sharma	BPB Publications	1st (2017)
2	Core Python Programming	R. NageswaraRao	Dreamtech	2nd (2018)

Reference Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Python, The complete Reference	Mark Summerfield	Addison-Wesley Professional	2nd (2009)
2	Python in a NutshellA. Martelli	Dr. R. Nageswara Rao	Wiley India / Dreamtech Press	3rd (2021)

Course Code	Course Type	Course Title	Cd	Load Allocation			Marks Distribution		Total Marks
				L	T	P	Internal	External	
26C2AIU-111	Core Practical/Laboratory	Workshop on Multimedia Tools	2	0	0	4	60	40	100

Prerequisites : Student must have the knowledge of Language

Course Outcomes (COs):

At the end of the course, the student will be able to	
CO1	Explain multimedia concepts, hardware requirements, operating systems, and system architecture
CO2	Make use of tools and features of GIMP to create and edit graphics.
CO3	Apply transform and color tools in GIMP for image enhancement.
CO4	Create animations and optimize images for web using GIMP.
CO5	Develop a multimedia project using advanced features of GIMP

Detailed Syllabus

Unit 1

Introduction to Multimedia: objectives, history and evolution of multimedia, multimedia market landscape, content copyright and licensing. Resources for multimedia developers: types of producers, evaluation criteria. Hardware Architecture: multimedia hardware requirements and components. OS and Software: multimedia operating system considerations, software library, device drivers. Multimedia Architecture: overview of the multimedia software stack and system architecture.

(Hours 11)

Unit 2

Getting Started with GIMP: downloading and installing the free open-source tool, understanding the workspace — toolbox, menus, panels, layers, and dialogs. Paint Tools: common features, dynamics, brush tools (Pencil, Paintbrush, Airbrush), Bucket Fill, Blend, Eraser, Ink, Clone, Heal, Perspective Clone, Blur/Sharpen, Smudge, Dodge/Burn. Applying fills and outlines, creating default fills and outlines, gradient fill, gradient types, custom fill, copy, clone, mesh, and gradient mesh

(Hours 10)

Unit 3

Transform Tools: common features, Align, Move, Crop, Rotate, Scale, Shear, Perspective, Flip, The Cage Tool — practical usage and transformations. Color Tools: overview of color correction in GIMP, Color Balance, Hue-Saturation, Colorize, Brightness-Contrast, Threshold, Levels, Curves, Posterize, Desaturate — theory and hands-on application. Practical exercises: retouching and color grading images using a combination of transform and color tools.

(Hours 10)

Unit 4

Animation: text animation methods, building an animated GIF in GIMP, animating a still image, morphing techniques, re-synthesizer tool for texture and content-aware fill. Designing for the Web: web design tools and principles, variable vs. fixed-sized designs, responsive design considerations. Optimizing Images for Web: file formats (JPEG, PNG, GIF, WebP), compression techniques, resolution and colour depth, exporting web-ready assets from GIMP.

(Hours 10)

Unit 5

Capstone Workshop Project: students design and develop a complete multimedia artifact — combining graphics creation, image editing, animation, and web optimization — using skills from all units. Advanced GIMP Features: scripting with Script-Fu, batch processing, working with paths and vectors, advanced layer blending modes. Presentation and Peer Review: presenting multimedia projects, evaluating peer work, industry best practices, and portfolio development. (*Contact hours to be specified by the institution)

(Hours 11)

Text Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Multimedia: Making It Work	Tay Vaughan	McGraw-Hill / Osborne	9th (2014)
2	Multimedia Systems Design	Prabhat K. Andleigh, Kiran Thakrar	Prentice Hall India	1st (2009)

Reference Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	The GIMP Book: A Complete Guide for Linux, Unix, and Windows	Olivier Lecarme, Karine Delvare	No Starch Press	1st (2013)
2	Multimedia Communications: Applications, Networks, Protocols and Standards	Fred Halsall	Pearson Education / Addison-Wesley	1st (2001)

Course Code	Course Type	Course Title	Cd	Load Allocation			Marks Distribution		Total Marks
				L	T	P	Internal	External	
26C2AIU-113	Core Practical/Laboratory	Programming in Python Laboratory	2	0	0	4	60	40	100
Prerequisites : Student must have the knowledge of Language									

Course Outcomes (COs):

At the end of the course, the student will be able to	
CO1	Apply Python programming concepts to solve simple computational problems.
CO2	Analyze programming problems by interpreting Python data types and control structures to understand their logical flow.
CO3	Implement knowledge of data structure to implement them in python programs..
CO4	Design modular programming techniques to design and functions & modules in python
CO5	Identify object oriented design principles and apply them to implement classes, objects and file handling operations in python.

List of assignments:

1.	Compute sum, subtraction, multiplication, division and exponent of given variables input by the user.
2.	Compute area of following shapes: circle, rectangle, triangle, square, trapezoid and parallelogram.
3.	Compute volume of following 3D shapes: cube, cylinder, cone and sphere
4.	Compute and print roots of quadratic equation $ax^2+bx+c=0$, where the values of a, b, and c are input by the user.
5.	Print numbers up to N which are not divisible by 3, 6, 9,, e.g., 1, 2, 4, 5, 7,....
6.	Write a program to determine whether a triangle is isosceles or not?
7.	Print multiplication table of a number input by the user.
8.	Compute sum of natural numbers from one to n number.
9.	Print Fibonacci series up to n numbers e.g. 0 1 1 2 3 5 8 13.....n
10.	Compute factorial of a given number.
11.	Count occurrence of a digit 5 in a given integer number input by the user.
12.	Print Geometric and Harmonic means of a series input by the user.
13.	Evaluate the following expression: a. $x-x^2/2!+x^3/3!- x^4/4!+\dots x^n/n!$ b. $x-x^3/3!+x^5/5!- x^7/7!+\dots x^n/n!$
14.	Print all possible combinations of 4, 5, and 6.
15.	Determine prime numbers within a specific range.
16.	Count number of persons of age above 60 and below 90.
17.	Compute transpose of a matrix.
18.	Perform following operations on two matrices. 1) Addition 2) Subtraction 3) Multiplication
19.	Count occurrence of vowels.
20.	Count total number of vowels in a word.
21.	Determine whether a string is palindrome or not.

22.	Perform following operations on a list of numbers: 1) Insert an element 2) delete an element 3) sort the list 4) delete entire list
23.	Display word after Sorting in alphabetical order.
24.	Perform sequential search on a list of given numbers.
25.	Perform sequential search on ordered list of given numbers.
26.	Maintain practical note book as per their serial numbers in library using Python dictionary.
27.	Perform following operations on dictionary 1) Insert 2) delete 3) change
28.	Check whether a number is in a given range using functions.
29.	Write a Python function that accepts a string and calculates number of upper case letters and lower case letters available in that string.
30.	To find the Max of three numbers using functions.
31.	Multiply all the numbers in a list using functions.
32.	Solve the Fibonacci sequence using recursion.
33.	Get the factorial of a non-negative integer using recursion.
34.	Write a program to create a module of factorial in Python.
35.	Design a Python class named <i>Rectangle</i> , constructed by a length & width, also design a method which will compute the area of a rectangle.
36.	Design a Python class named <i>Circle</i> constructed by a radius and two methods which will compute the area and the perimeter of a circle.
37.	Design a Python class to reverse a string 'word by word'.
38.	Write a Python program to read an entire <i>text file</i> .
39.	Design a Python program to read first n lines of a <i>text file</i> .
40.	Construct a Python program to write and append text to a file and display the text.

Text Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Programming in Python	Reema Thareja	Oxford University Press	2nd (2018)
2	Core Python Programming	Dr. R. Nageswara Rao.	Wiley India	2nd (2018)

Reference Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Python, The complete Reference	Martin C. Brown	McGraw Hill Education.	3rd (2018)
2	Python in a Nutshell	Alex Martelli, Anna Ravenscroft, Steve Holden	O'Reilly Media	4th (2017)

Course Code	Course Type	Course Title	Cd	Load Allocation			Marks Distribution		Total Marks
				L	T	P	Internal	External	
26C2AIU-112	Core Practical/ Laboratory	Fundamentals of Information Technology Laboratory	2	0	0	4	60	40	100
Prerequisites : Student must have the knowledge of Language									

Course Outcomes (COs):

At the end of the course, the student will be able to	
CO1	Demonstrate the basic features of a word processor and steps to create documents such as resumes, assignments, newsletters, and feedback forms using formatting, tables, images, and mail merge in MS Word.
CO2	Explain the use of spreadsheet features to create schedulers, perform calculations using formulas and functions, and demonstrate data analysis using sorting, logical operators, and conditional formatting.
CO3	Utilize PowerPoint tools and features to develop interactive and well-designed presentations using layouts, multimedia elements, animations, and presentation views.
CO4	Analyze the use of internet services such as e-mail, blogging platforms, torrent downloads, and online banking systems for communication and digital financial transactions.
CO5	Explore multimedia tools and techniques

List of assignments:
Word Orientation:

The instructor needs to give an overview of word processor.

Details of the four tasks and features that would be covered Using word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.

1.	Using word to create Resume Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.
2.	Creating an Assignment Features to be covered: - Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
3.	Creating a Newsletter Features to be covered :- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs
4.	Creating a Feedback form Features to be covered :- Forms, Text Fields, Inserting objects, Mail Merge in Word.

Excel Orientation:

The instructor needs to tell the importance of Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered Excel – Accessing, overview of toolbars, saving excel files

1.	Creating a Scheduler Features to be covered :- Gridlines, Format Cells, Summation, auto fill, Formatting Text
2.	Calculations Features to be covered: - Cell Referencing, Formulae in excel – average, std.deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP
3.	Performance Analysis Features to be covered :- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting
4.	Game (like Cricket, badminton) Score Card Features to be covered :- Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation

Presentation Orientation:

1.	Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered includes: - PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows
2.	This session helps students in making their presentations interactive. Topics covered includes : Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts
3.	Concentrating on the in and out of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation. Topics covered includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides. Auto content wizard, Slide Transition, Custom Animation, Auto Rehearsing
4.	Power point test would be conducted. Students will be given model power point presentation which needs to be replicated
Internet and its Applications: The instructor needs to tell the how to configure Web Browser and to use search engines by defining search criteria using Search Engines	
1..	To learn to setup an e-mail account and send and receive e-mails
2.	To learn to subscribe/post on a blog and to use torrents for accelerated downloads
3.	Hands on experience in online banking and Making an online payment for any domestic bill

Text Book

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	IT Tools	Alexis Leon, Mathew Leon	Khanna Publishing House	2nd (2019)
2	Introduction to Information Technology	V. Rajaraman	Pearson Education	3rd (2018)

Reference Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	IT Tools	R.K. Jain	Khanna Publishing House	1st (2018)
2	Introduction to Information Technology	ITL Education Solutions limited	Pearson Education	1st (2005)

Course Code	Course Type	Course Title	Cd	Load Allocation			Marks Distribution		Total Marks
				L	T	P	Internal	External	
26C2CCU-103	Value Added Course	Human Values, De-addiction and Traffic Rules	4	3	0	2	40	60	100
Prerequisites : Student must have the knowledge of Language									

Course Outcomes (COs):

At the end of the course, the student will be able to	
CO1	Explain the concept of value education, with respect to an individual's understanding of self, ambitions, happiness and prosperity.
CO2	Interpret the need of self and body to ensure harmony in a human being.
CO3	Construct a holistic view towards family and society as a whole and the role of human-to-human interaction in it.
CO4	Analyze harmony in the nature and existence.
CO5	Elaborate the knowledge on ethical human values and its implication on modern day professional requirement.

Detailed Syllabus

Unit-I

Introduction to Value Education: Introduction to Value Education, need for value education, Self-exploration as the Process for Value Education, Right Understanding, Relationship and Physical Facility, Continuous Happiness and Prosperity- A look at basic Human.

(Hours 11)

Unit 2

Harmony in the Human Being: Understanding Human being as the Co-existence of the Self and the Body, The Body as an Instrument of the Self. Distinguishing between the Needs and activities of the Self and the Body, Practice Session on exploring the difference of Needs of Self and Body.

(Hours 10)

Unit 3

Harmony in the Family and Society: Harmony in the Family – the Basic Unit of Human Interaction, the Foundational and complete Value in Relationship, Understanding the meaning of Samman ,Difference between respect and differentiation; Justice in Human-to-Human Relationship, Understanding Harmony in the Society

(Hours 11)

Unit 4

Harmony in the Nature/Existence: Understanding Harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature, The Holistic Perception of Harmony in Existence, Practice Session on Self-Reflection and Group Discussion

(Hours 10)

Unit 5

Holistic Understanding and Professional Ethics: Holistic Technologies, Ethical Human Conduct, A Basis for Manviya Shiksha, Manviya Samvidhan, Natural Acceptance of Human Values, and Universal Human Order ,Competence in Professional Ethics, Production Systems and Management Models-Typical Case Studies.

(Hours 10)

One each seminar will be organized on Drug De-addiction and Traffic Rules. Eminent scholar and experts of the subject will be called for the Seminar atleast once during the semester. It will be binding for all the students to attend the seminar.

Text Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Foundation Course in Human Values and Professional Ethics,	R R Gaur, R Asthana, G P Bagaria	Excel Books, New Delhi	3rd Revised Edition (2023)
2	Professional Ethics and Human Values	Govindarajan M	Prentice Hall India Learning Private Limited	3rd Edition (2020)

Reference Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Foundation Course In Universal Human Values And Professional Ethics	Rishabh Anand	CBS Publishers & Distributors Pvt. Ltd.	1 st Edition 2025
2	Ethics Universal Human Values	Mr. Durgesh S pagar, Mrs Savita j jadhav	Jec publication	1 st Edition 2025

Course Code	Course Type	Course Title	Cd	Load Allocation			Marks Distribution		Total Marks
				L	T	P	Internal	External	
26C2AIU-104	Ability Enhancement Compulsory Course (AECC)	English	1	1	0	0	20	30	50
Prerequisites : Student must have the knowledge of Language									

Course Outcomes (COs):

At the end of the course, the student will be able to	
CO1	Explain the concepts, types, and modes of communication used in personal, social, and professional contexts.
CO2	Apply verbal and non-verbal communication techniques in spoken and written forms for effective interaction.
CO3	Analyze different communication contexts including intra-personal, inter-personal, and group communication to improve message delivery and interpretation.
CO4	Evaluate and interpret written texts through close reading, summarization, paraphrasing, translation, and comprehension strategies.
CO5	Develop structured documents such as reports, notes, and letters for academic and professional communication.

Detailed Syllabus
Unit 1: Fundamentals of Communication

- Theory of Communication
- Types of Communication
- Modes of Communication

(Hours 3)

Unit 2: Language of Communication

- Verbal Communication
- Non-Verbal Communication
- Spoken Communication
- Written Communication

(Hours 2)

Unit 3: Contexts and Processes of Communication

- Personal Communication
- Social Communication
- Business Communication
- Intra-personal Communication
- Inter-personal Communication
- Group Communication

(Hours 3)

Unit 4: Writing and Documentation Skills

- Documenting Information
- Report Writing
- Note Making
- Letter Writing

(Hours 2)

Text Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Communication Skills for Business Professionals	Angela Freekery, Shawn Michael	Cambridge University Press	3rd (2025)
2	Business Communication	P. D. Chaturvedi, Mukesh Chaturvedi	Pearson India	4th (2024)

Reference Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Management Communication: Strategic Insights and Practical Skills for Modern Business Communication Leaders	Elizabeth A. Dixon, Lisa Thomas	Open Textbook Library	5th (2025)
2	Crucial Conversations: Tools for Talking When Stakes Are High	Kerry Patterson, Joseph Grenny, Ron McMillan, Al Switzler	McGraw-Hill	3rd (2022)

Course Code	Course Type	Course Title	Cd	Load Allocation			Marks Distribution		Total Marks
				L	T	P	Internal	External	
26C2AIU-114	Ability Enhancement Compulsory Course (AECC)	English Practical/ Laboratory	1	0	0	2	30	20	50
Prerequisites : Student must have the knowledge of Language									

Course Outcomes (COs):

At the end of the course, the student will be able to	
CO1	Explain the principles of effective communication and identify causes of miscommunication in everyday and workplace interactions..
CO2	Apply listening comprehension skills to interpret conversations, dialogues, and monologues in common communication situations.
CO3	Analyze communication strategies used in interviews, group discussions, and role-play activities to improve professional interaction.
CO4	Evaluate verbal and non-verbal communication techniques used in workplace communication and formal presentations.
CO5	Design and deliver effective public speaking presentations and self-introductions for academic and professional contexts..

1	ListeningComprehension
2	Self Introduction, Group Discussion and RolePlay
3	Common Everyday Situations: Conversations andDialogues
4	Communication atWorkplace
5	Interviews
6	FormalPresentations
7	Monologue
8	Effective Communication/ Mis-Communication
9	PublicSpeaking

Text Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Communication Skills for Engineers and Scientists	Sangeeta Sharma, Binod Mishra	PHI Learning	3rd (2023)
2	Business Communication	P.D.Chaturvedi,Mukesh Chaturvedi	Pearson India	4th (2024)

Reference Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Communicating at Work: Strategies for Success in Business and the Professions	Ronald B. Adler, Jeanne Marquardt Elmhorst, Kristen Lucas	McGraw-Hill	13th (2023)
2	The Art of Public Speaking	Stephen E. Lucas	McGraw-Hill	3rd (2022)

Course Code	Course Type	Course Title	Load Allocation				Marks Distribution		
			Cd	L	T	P	Internal	External	Total Marks
26C2AIU-116	Skill Enhancement Course	Career and Placement Planning	1	0	0	2	50	0	50
Prerequisite: -Basic understanding of English grammar, vocabulary, and communication skills									

Course Outcomes:

At the end of the course the student will be able to: -	
CO1	Explain the importance of professional communication, career planning, and workplace expectations for campus recruitment.
CO2	Apply grammar, vocabulary, and verbal reasoning skills to solve employability test questions.
CO3	Demonstrate effective presentation skills, interpersonal communication, and professional etiquette.
CO4	Analyse different interview situations and apply appropriate response strategies.
CO5	Develop professional documents such as resumes, cover letters, emails, and structured self-introductions for interviews.

Detailed Syllabus
Unit 1: Career Awareness & Professional Development

Icebreakers & Introduction to CPP, Importance of Placement & Career Counselling, Revision of Core Employability Skills (Resume & Visume/ Group Discussion/ Case Study), Professional Development: Professionalism, Grooming, Professional Dress Sense//**Activity:** Visume Building and professional introduction practice.

(Hours 3)

Unit 2: Employability Test Preparation & Verbal Ability

Overview of employability assessments, Writex Module (Overview & Strategy), Error Correction based on: Noun/ Pronoun/ Verb, Sentence Rearrangement, Synonyms & Antonyms, Sentence Completion, Reading Comprehension strategies.

(Hours 2)

Unit 3: Presentation, Personality Development & Corporate Skills

Presentation Skills: Fundamentals of effective presentation skills, Johari Window: Self-awareness in Professional Context, Personality Development: Interpersonal Skills and Corporate Communication, Workplace Etiquettes (Netiquettes, Meeting Etiquette, Telephonic Etiquette) // **Activity:** Product Launch Presentation, Role Play: Board Room Meeting, Panel Interview.

(Hours 3)

Unit 4: Personal Interview Skills & Interview Rounds: Structure & Expectations, Common Interview Questions & Answer Framing Techniques, Types of Interview Rounds: Resume-Based Interview, Stress Interview, Cultural Fit Interview, Managerial Interview, HR Interview, Virtual Interview Platforms (Skype/ Zoom/ Google Meet/ Telephonic Interview), Panel Interview// **Activity:** Art of Framing PI Introduction.

(Hours 2)

Unit 5: Professional Writing & Placement Readiness

Professional Writing Skills: Professional Email Writing, Essay Writing, Cover Letter Writing, Additional Rounds in Placement Drives: Elevator Pitch, Make Your Mark Round, Psychometric Test, Conflict management and emotional intelligence, Important placement documentation, Final revision and placement readiness session // **Activity:** Peer Review – 3P Model.

(Hours 2)

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Verbal Ability book	TPP Dept.	TPP	6th Edition
2	Interviews and Group Discussions	T. S. Jain & Gupta	Upkar Publications	2 nd (2008)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Pub.Yr.)
1	Word Power Made Easy	Norman Lewis	Goyal Publishers	4th (2012)
2	Communication Skills for Engineers	Sunita Mishra & C.Muralikrishna	Pearson Education	1st(2011)

Course Code	Course Type	Course Title	Cd	L	T	P	Marks		
							Internal	External	Total
26C2CAP-117	Value Added Course (NCC)	MOOC	0	0	0	2	-	-	S/US

Course Outcomes:

Defined by the online platform for the specific course chosen.

The Departmental committee shall select a MOOC available on any reputed platform. However, the selected MOOC should not be similar to the regular courses offered as a part of the department curriculum.
course

The overall monitoring of the MOOC course will be under the supervision of the teacher In-charge of the department. The Departmental Academic Committee shall assess the student work based on the relevant course completion certificate.

S= Satisfactory

US=Unsatisfactory

Semester II

Course Code	Course Type	Course Title	Load Allocation				Marks Distribution		
			Cd	L	T	P	Internal	External	Total Marks
26C2AIU-201	Core Theory	Fundamentals of Statistics	4	3	1	0	40	60	100
Requisites : Students must have the basic knowledge of mathematical terms.									

Course Outcomes (COs):

At the end of the course, the student will be able to

CO1	Demonstrate the use of statistical tools to compute maximum, minimum, averages and range of the data.
CO2	Represent statistical data in tabular forms (simple table, two way table and higher order tables).
CO3	Calculate the measures of tendency (mean, median and mode) using grouped and ungrouped data.
CO4	Analyze the statistical data using appropriate graphical techniques such as histogram, frequency polygon, frequency curve and ogives.
CO5	Implement spreadsheet techniques to maintain grading sheets and analyze placement data

Detailed Syllabus
Unit I

Introduction to Statistics: Origin of Statistics, Features of Statistics, Scope of Statistics, Functions of Statistics, Uses and Importance of Statistics, Limitations of Statistics, Distrust of Statistics. Introduction to Collection of Data, Primary and Secondary Data, Methods of Collecting Primary Data, Methods of Secondary Data, Statistical Errors, Rounding off Data (Approximation).

(Hours 11)

Unit II

Classification and Frequency Distribution: Introduction to Classification of Data, Objectives of Classification, Methods of Classification, Ways to Classify Numerical Data or Raw Data, Frequency Distribution.

(Hours 10)

Unit III

Tabular, Diagrammatic and Graphical Presentation of Data : Introduction to Tabular Presentation of Data, Objectives of Tabulation, Components of a Statistical Table, General Rules for the Construction of a Table, Types of Tables. Introduction to Diagrammatic Presentation of Data, Advantages and Disadvantages of Diagrammatic Presentation, Types of Diagrams. Introduction to Graphic Presentation of Data, Advantages and Disadvantages of Graphic Presentation, Types of Graphs.

(Hours 10)

Unit IV

Measures of Central Tendency: Introduction to Central Tendency, Purpose and Functions of Average, Characteristics of a Good Average, Types of Averages. Arithmetic Mean – Meaning, Calculation, Merits and Demerits. Median – Meaning, Calculation, Merits and Demerits. Mode – Meaning, Calculation, Merits and Demerits. Harmonic Mean – Properties, Merits and Demerits.

(Hours 10)

Unit V

Measures of Dispersion: Meaning of Dispersion, Objectives of Dispersion, Properties of a Good Measure of Dispersion, Methods of Measuring Dispersion. Range – Meaning, Calculation, Merits and Demerits. Mean Deviation – Meaning, Calculation, Merits and Demerits. Standard Deviation – Meaning, Calculation, Merits and Demerits. Coefficient of Variation – Calculation, Merits and Demerits.

(Hours 11)

Text Book

S.No.	Name of the Books	Author	Publisher	Edition(Pub. Yr.)
1	Statistics and Data Analysis	Ajit C. Tamhane, Dorothy D. unlopDaniels, J. W. McKean	Pearson	3rd (2019)
2	Statistics	Robert S. Witte, John S. Witte	Wiley	12th (2021)

Reference Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Web-based Statistical Analysis	David M. Lane	Foundation for Open Access Statistics (FOAS)	1st (2020)
2	Statistical Concepts and Methods	Richard A. Johnson, Gouri K. Bhattacharyya	John Wiley & Sons	6th 2021

Course Code	Course Type	Course Title	Load Allocation				Marks Distribution		
			Cd	L	T	P	Internal	External	Total Marks
26C2AIU-211	Core Practical/ Laboratory	Fundamentals of Statistics Laboratory	2	0	0	4	60	40	100

Prerequisite: Students must have the knowledge of Spreadsheet.

Course Outcomes:

After studying this course, students will be able to:

CO1	Demonstrate the use of statistical tools to compute maximum, minimum, averages, and range of data.
CO2	Construct and represent statistical data in tabular and graphical forms such as histograms, frequency polygons, frequency curves, and ogives.
CO3	Test and calculate measures of central tendency (mean, median, and mode) using grouped and ungrouped data.
CO4	Develop frequency distributions and analyze statistical data using appropriate graphical techniques.
CO5	Make use of spreadsheet tools to calculate grades, analyze placement records, and present statistical information effectively.

Instructions: Sample exercises are given below and Instructor can increase or decrease the experiments as per the requirement.

1	Display the Maximum and Minimum market data.
2	Display year wise strength of the students of a college in Tabular form & Graphical form.
3	Calculate the average marks of the students of your College.
4	Print measure of Central Tendency using grouped and ungrouped data.
5	Construct & print frequency distribution using data with the following Techniques: a) Histogram b) Frequency Polygon c) Frequency Curve c) Ogive curves.
6	Find out & display the Median and Mode from the following series by using suitable method: Class 156-158 158-160 160-162 162-164 164-166 Frequency 4 8 28 51 89
7	Calculate an appropriate measure of dispersion using grouped and ungrouped data
8	Make an array and calculate the range of the data.
9	Represent the placement record of the students of your college.
10	Calculate & display Letter Grade using spreadsheet.
11	Represent the following data by suitable graphs, determine therefrom the number of children having IQ (i) Below 105 (ii) Above 124. IQ 75-84 85-94 95-104 105-114 115-124 125-134 No.ofChildren 8 20 45 54 28 16

Reference Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Statistics for Economics	D.N. Gujarati, Dawn C. Porter	VK Global Publications Pvt. Ltd.	3rd (2021)
2	Statistics and Data Analysis	Ajit C. Tamhane, Dorothy D. Dunlop	Western Michigan University	3rd (2019)

Course Code	Course Type	Course Title	Load Allocation				Marks Distribution		
			Cd	L	T	P	Internal	External	Total Marks
26C2AIU-202	Core Theory	Operating Systems	4	3	1	0	40	60	100
Prerequisite: Basic understanding of computer system									

Course Outcomes:

After completing this course, students will be able to:

CO1	Explain the basic concepts of an Operating System, including its functions, role as a resource manager, structure (kernel and shell), different views, evolution, and types of operating systems.
CO2	Define the concepts of process, scheduling and thread management to illustrate the differences between program and process.
CO3	Analyze different CPU scheduling algorithms such as FCFS, SJF, Round Robin, and Multilevel Queue based on scheduling criteria and CPU-I/O burst cycles.
CO4	Differentiate the memory management techniques such as address binding, relocation, paging, segmentation, and virtual memory to determine their role in efficient memory utilization and protection in operating systems.
CO5	Compare the mechanisms of I/O device management, file management, and advanced operating system types including distributed, multiprocessor, and real-time systems.

Detailed Syllabus
Unit I

Fundamentals of Operating System: Introduction to Operating System, Functions of an Operating System, Operating System as a Resource Manager, Structure of Operating System (Role of Kernel and Shell), Views of Operating System, Evolution and Types of Operating Systems.

(Hours 11)

Unit II

Process & Thread Management: Program vs. Process, PCB, State Transition Diagram, Scheduling Queues, Types of Schedulers, Concept of Thread, Benefits, Types of Threads, Synchronization Issues.

(Hours 10)

Unit III

CPU Scheduling: Need of CPU Scheduling, CPU I/O Burst Cycle, Preemptive vs. Non-Preemptive Scheduling, Different Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, Round-Robin, Multilevel Queue).

(Hours 10)

Unit IV

Memory Management: Introduction, Address Binding, Relocation, Loading, Linking, Memory Sharing and Protection, Paging and Segmentation, Virtual Memory: Basic Concepts of Demand Paging, Page Replacement Algorithms.

(Hours 10)

Unit V

I/O Device Management and Advanced Operating Systems:I/O Devices and Controllers, Device Drivers, Disk Storage. File Management: Basic Concepts, File Operations, Access Methods, Directory Structures and Management, Remote File Systems, File Protection. Advanced Operating Systems: Introduction to Distributed Operating System, Characteristics, Architecture, Issues, Communication & Synchronization; Introduction to Multiprocessor Operating System, Architecture, Structure, Synchronization & Scheduling; Introduction to Real-Time Operating System, Characteristics, Structure & Scheduling.

(Hours 11)

Text Book

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Operating System Principles	Abraham Silberschatz, Peter B. Galvin, Greg Gagne	Wiley	10th (2021)
2	Principles of Operating System	William Stallings	Pearson	3rd (2018)

Reference Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Operating Systems	William Stallings	Pearson Education	9th (2019)
2	Operating Systems: Internals and Design Principles	William Stallings	Pearson	9th (2019)

Course Code	Course Type	Course Title	Load Allocation				Marks Distribution		
			Cd	L	T	P	Internal	External	Total Marks
26C2AIU-212	Core Practical/Laboratory	Operating Systems Laboratory	2	0	0	4	60	40	100
Prerequisite: -Basic Knowledge of Computer Fundamentals									

Course Outcomes:

After going through the practical, student will be able to:	
CO1	Demonstrate the process of installations & configuration of the Microsoft Windows and Linux operating systems and describe the concept of dual boot installation of operating systems on a computer system.
CO2	Summarize the working principles of FCFS, SJF, and Round-Robin CPU scheduling algorithms and interpret their role in process scheduling within an operating system.
CO3	Apply Vi Editor navigation & editing commands to create, edit, save, and manage text files in a Unix/Linux environment.
CO4	Analyze the use of shell commands and shell scripting constructs including variables, input/output operations, and data types .
CO5	Construct the shell scripts using arithmetic operators and control structures such as if, while, and for to handle decision-making..

Instructions:

1	Installation of windows OS.
2	Installation of Linux OS.
3	Dual boot installation of Operating systems.
4	Implementation of FCFS Scheduling algorithm
5	Implementation of SJF Scheduling algorithm
6	Implementation of Round-Robin Scheduling algorithm
7	Vi Editor & its commands
8	Shell Commands
9	Shell Scripting- Using variables
10	Shell Scripting- Input & Output
11	Shell Scripting- Data types
12	Shell Scripting- Use of arithmetic operators

13	Shell Scripting- if control statement programs
14	Shell Scripting- while control statement
15	Shell Scripting- for control statement

Text Book

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Operating System Concepts	Abraham Silberschatz, Peter B. Galvin, Greg Gagne	Wiley	10th (2021)
2	Operating Systems: Design and Implementation	Andrew S. Tanenbaum, Albert S. Woodhull	Pearson	3rd (2006)

Reference Book

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Linux: The Complete reference	Richard Petersen	McGraw-Hill Education	9th (2020)
2	Operating System Principles	Abraham Silberschatz, Peter B. Galvin, Greg Gagne	Wiley	10th (2021)

Course Code	Course Type	Course Title	Load Allocation				Marks Distribution		
			Cd	L	T	P	Internal	External	Total Marks
26C2AIU-203	Core Theory	Data Structures	4	3	1	0	40	60	100

Prerequisite: -Programming Fundamentals

Course Outcomes:

going through the practical, student will be able to:

CO1	Explain the basic concepts of static and dynamic memory allocation by the use of algorithms and flowcharts used in real world problem solving.
CO2	Apply the concept of arrays, pointer, string library functions in program development.
CO3	Compare different stack and queue implementations based on their operations and applications.
CO4	Analyze various types of linked lists, Trees, traversal techniques based on their properties and applications.
CO5	Elaborate various graph representations, sorting algorithms such as Quick Sort, Bubble Sort, Merge Sort, and Selection Sort based on performance parameters.

Detailed Syllabus

Unit-I

Introduction to Data Structures: Algorithms and Flowcharts, Basics Analysis on Algorithm, Complexity of Algorithm, Introduction and Definition of Data Structure, Classification of Data, Various Types of Data Structure, Static and Dynamic Memory Allocation, Function, Recursion.

(Hours 11)

Unit-II

Arrays, Pointers and Strings: Introduction to Arrays, Definition, One Dimensional Array and Multi-Dimensional Arrays, Pointer, Pointer to Structure, Various Programs for Array and Pointer. Strings: Introduction to Strings, Definition, Library Functions of Strings.

(Hours 10)

Unit-III

Stacks and Queue: Introduction to Stack, Definition, Stack Implementation, Operations of Stack, Applications of Stack and Multiple Stacks, Implementation of Multiple Stack.

Queues: Introduction to Queue, Definition, Queue Implementation, Operations of Queue, Circular Queue, De-queue and Priority Queue.

(Hours 10)

Unit-IV

Linked Lists and Trees: Linked Lists: Introduction, Representation and Operations of Linked Lists, Singly Linked List, Doubly Linked List, Circular Linked List, Circular Doubly Linked List.

Trees: Introduction to Tree, Tree Terminology, Binary Tree, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree, Tree Traversal, Threaded Binary Tree, AVL Tree, B Tree, B+ Tree.

(Hours 10)

Unit-V

Graphs, Searching, Sorting and Hashing: Graphs: Introduction, Representation of Graphs, Graph Traversals, Shortest Path Algorithms.

Searching and Sorting: Searching, Types of Searching, Sorting, Types of Sorting like Quick Sort, Bubble Sort, Merge Sort, Selection Sort.

Hashing: Hash Function, Types of Hash Functions, Collision, Collision Resolution Technique (CRT), Perfect Hashing.

(Hours 11)

Text Book

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Data Structures and Algorithms Implementation through C	Ashok N. Kamthane	Pearson Education	2nd (2018)
2	Data Structures and Program Design in C	Robert L. Kruse, Alexander J. Ryba, Clovis L. Tondo	Pearson Education	2nd (2012)

Reference Books

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Fundamentals of Data Structures	Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed	GalgotiaPublishers	2nd (2008)
2	Understanding Pointers in C	.Yashavant Kanetkar	BPB Publications.	1st (2015)

Course Code	Course Type	Course Title	Load Allocation				Marks Distribution		
			Cd	L	T	P	Internal	External	Total Marks
26C2AIU-213	Core Practical/ Laboratory	Data Structures Laboratory	2	0	0	4	60	40	100
Prerequisite: -Control Structures									

Course Outcomes:

going through the practical, student will be able to:

CO1	Apply appropriate programming constructs, coding standards and problem-solving techniques using programming languages such as C/C++/Python/Java.
CO2	Develop programs to perform operations on arrays, matrices and strings using user defined functions and recursion.
CO3	Make use of searching and sorting algorithms such as linear search, selection sort, insertion sort, quick sort and merge sort.
CO4	Design Programs of linear data structures such as stack, queue, circular queue, dequeue and priority queue to solve real world problems.
CO5	Identify non-linear data structures and graph traversal techniques including linked lists, binary search trees, Breadth First Search (BFS) and Depth First Search (DFS).

Instructions: Programs may be developed in C/C++/Python/Javalanguage.

List of assignments

1	Program for using Dynamic Functions (malloc(), calloc(), realloc() and free()).
2	Program to insert, delete and traverse an element from an array.
3	Program to merge one dimensional arrays.
4	Program for addition and subtraction of two matrices.
5	Program for implementing multiplication of two matrices.
6	Implement linear search using one and two dimensional array.
7	Program for implementing selection sort.
8	Program for implementing insertion sort.
9	Program for implementing quick sort.
10	Program for implementing merge sort.
11	Program to calculate length of the string using user defined function.
12	Program to concatenate and compare two strings using user defined function.
13	Program for using the concept of pointer to string.
14	Program to reverse a sentence by recursion.
15	Program to delete all repeated words in string.
16	Program to find the number of vowels, consonants, digits and white space in a string.

17	Program to find the length of the longest repeating sequence in a string.
18	Program to find highest and lowest frequency character in a string.
19	Program for implementing Stack using array.
20	Program for implementing Stack using pointer.
21	Program for implementing multiple stack.
22	Program for converting infix to postfix form.
23	Program for implementing Queue using array.
24	Program for dynamic implementation of queue.
25	Program for implementing circular queue.
26	Program for implementing dequeue.
27	Program for implementing priority queue.
28	Program for implementing Singly Linked list.
29	Program for implementing Doubly Linked list.
30	Program for implementing Binary Search Tree.
31	Program for Breadth First Search (BFS) for graph traversal.
32	Program for Depth First Search (DFS) for graph traversal.

Text Book

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Data Structures and Algorithms Made Easy	Narasimha Karumanchi	CareerMonk Publications	1st (2011)
2	Data Structures Using C	Reema Thareja	Oxford University Press	2nd (2018)

Reference Book

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Data Structures and Algorithms Implementation through C	Ashok N. Kamthane	Pearson Education India	2nd (2018)
2	Data Structures and Algorithms	Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman	Pearson	4th (2012)

Course Code	Course Type	Course Title	Load Allocation				Marks Distribution		
			Cd	L	T	P	Internal	External	Total Marks
26C2CCU-203	Multidisciplinary	Environmental Science and Sustainability	3	3	0	0	40	60	100
Prerequisite: -Basic understanding of natural and social surroundings.									

Course Outcomes:

going through the practical, student will be able to:	
CO1	Outline the fundamental aspects of environmental systems and sustainable natural resource management.
CO2	Identify the concepts of natural sources and sustainable development for environmental conservation.
CO3	Analyze the basic phenomenon of structure and function of ecosystem.
CO4	Categorize the environmental mitigation techniques and disaster management strategies for the environment.
CO5	Explain the social issues and environmental laws for sustainable development.

Detailed Syllabus
Unit-I

Environmental Concepts and Sustainability :Fundamental environmental concepts and components of environment, Segments of environment (biotic & abiotic),Man and environment relationship, Historical environmental movements, Concept and principles of sustainability, Intergenerational and intergenerational equity, Importance of environmental awareness and education. Circular Economy-meaning, principle, advantages and challenges.

(Hours 8)

Unit-II

Natural Resources and Sustainable Management Classification of natural resources, Overexploitation and depletion of resources, Conservation strategies, Deforestation and forest conservation, Water conservation and energy security, Food security issues, Sustainable resource management practices.

(Hours 7)

Unit-III

Ecosystems and Biodiversity Structure and functions of ecosystems, types of ecosystems (natural and urban), ecosystem resilience, homeostasis, and carrying capacity, biodiversity: levels and importance, threats to biodiversity, in situ and ex situ conservation methods, India as a mega-diverse nation.

(Hours 7)

Unit-IV

Environmental Pollution and Disaster Management Types of pollution: air, water, soil, noise, marine, Causes and effects of pollution, Climate change, greenhouse effect, ozone depletion, acid rain, Pollution episodes in India, Cleaner technologies, Solid waste management, Natural and man-made disasters and their management, Role of businesses in disaster mitigation.

(Hours 7)

Unit-V

Social Issues, Environmental Ethics, and Legislation Sustainable development and environmental ethics, Role of businesses in sdgs and responsible consumption Environmental justice and environmental refugees Resettlement and rehabilitation issues, Ecological economics, Population growth and demographic changes in India, Environmental laws: Water Act, 1974, Air Act, 1981, Environment Protection Act, 1986, Role of judiciary in environmental protection.

(Hours 10)

Text Book

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Environmental science	Dhameja, suresh k.	S.K. Kataria & Sons	5 th Edition 2025
2	Environmental studies	Kaushik, anubha	New age international	6 th Edition 2018

Reference Book

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Environmental science	Pandey, g. N.	Anmol Publications Pvt. Ltd	1 st Edition 2022
2	Environmental studies	Singh, sanjeev kumar	Bharti Publications	11 th Edition 2021

Course Code	Course Type	Course Title	Load Allocation				Marks Distribution	
			Cd	L	T	P	Internal	Total Marks
26C2AIU-214	Ability Enhancement	Design Thinking	2	0	0	4	40	100
Prerequisite: - NA								

Course Outcomes

At the end of the course the student will be able to	
CO1	Articulate the fundamentals of the Design Thinking Framework for problem-solving.
CO2	Examine the needs and challenges of different stakeholders in the given problem domain.
CO3	Apply design thinking framework and strategies to develop innovative solutions.
CO4	Evaluate the financial viability of the proposed solution (product/service).
CO5	Develop teamwork work to validate and test the solution.

Detailed Syllabus

Unit I: Design Thinking: Introduction of Design Thinking; Principles of Design Thinking; Framework: 5 Phase Design i.e. Empathize, Define, Ideate, Prototype, and Test; Design Thinking in the organization.

(9 Hours)

Unit II: Empathize Phase: Discover design problems; Overview of the empathize phase; Define project stakeholders; Methods within empathize phase; Define Phase - Frame the design problems, Overview of the define phase, Methods within the Define phase.

(9 Hours)

Unit III: Ideate Phase: Introduction to Ideation; Come up with multiple solutions; Overview of the Ideate phase; Methods within the Ideate phase – Brainstorming, Mind Mapping, SCAMPER Technique, Six Thinking Hats, Double Diamond, Storyboarding, Worst Possible Idea.

(10 Hours)

Unit IV: Project Proposal: Project Identification - Developing Business Idea, Preparing Feasibility Report; Project Formulation - Feasibility Analysis Techno – Market Analysis, Technical Analysis, Economic Analysis, Operational Analysis; Significance of a business plan; components of a business plan.

(9 Hours)

Unit V: Prototype

phase: Concept of Prototyping; Design the solutions; Overview of the Prototype phase; Methods within Prototype phase; Test phase - Validate the solutions, overview of the Test phase, methods within the test phase.

(8 Hours)

Textbooks

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Designing for growth	Liedtka and Tim Ogilvie	Columbia University Press	1st(2011)
2	The design thinking playbook	Michael Lewrick, Patrick Link, Larry Leifer	Wiley	1st(2018)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Presumptive design	Leo Frish berg and Charles Lambdin	Morgan Kaufmann	1st(2016)

Course Code	Course Type	Course Title	Load Allocation				Marks Distribution		
			Cd	L	T	P	Internal	External	Total Marks
26C2AIU-215	Skill Enhancement Course	Career and Placement Planning - 2	1	0	0	2	50	0	50
Prerequisite: -Basic understanding of English grammar, vocabulary, and communication skills									

Course Outcomes:

At the end of the course the student will be able to: -	
CO1	Explain the importance of professional communication, career planning, and workplace expectations for campus recruitment.
CO2	apply grammar, vocabulary, and verbal reasoning skills to solve employability test questions.
CO3	Demonstrate effective presentation skills, interpersonal communication, and professional etiquette.
CO4	Analyse different interview situations and apply appropriate response strategies.
CO5	Develop professional documents such as resumes, visume, cover letters, emails, and structured self-introductions for interviews.

Detailed Syllabus
Unit 1: Career Awareness & Professional Development

Icebreakers & Introduction to CPP, Importance of Placement & Career Counselling, Revision of Core Employability Skills (Resume & Visume/ Group Discussion/ Case Study), Professional Development: Professionalism, Grooming, Professional Dress Sense//**Activity:** Visume Building and professional introduction practice.

(5 Hours)

Unit 2: Employability Test Preparation & Verbal Ability

Overview of employability assessments, Writex Module (Overview & Strategy), Error Correction based on: Noun/ Pronoun/ Verb, Sentence Rearrangement, Synonyms & Antonyms, Sentence Completion, Reading Comprehension strategies.

(5 Hours)

Unit 3: Presentation, Personality Development & Corporate Skills

Presentation Skills: Fundamentals of effective presentation skills, Johari Window: Self-awareness in Professional Context, Personality Development: Interpersonal Skills and Corporate Communication, Workplace Etiquettes (Netiquettes, Meeting Etiquette, Telephonic Etiquette) // **Activity:** Product Launch Presentation, Role Play: Board Room Meeting, Panel Interview.

(5 Hours)

Unit 4: Personal Interview Skills & Interview Rounds: Structure & Expectations, Common Interview Questions & Answer Framing Techniques, Types of Interview Rounds: Resume-Based Interview, Stress Interview, Cultural Fit Interview, Managerial Interview, HR Interview, Virtual Interview Platforms (Skype/ Zoom/ Google Meet/ Telephonic Interview), Panel Interview//**Activity:** Art of Framing PI Introduction.

(5 Hours)

Unit 5: Professional Writing & Placement Readiness

Professional Writing Skills: Professional Email Writing, Essay Writing, Cover Letter Writing, Additional Rounds in Placement Drives: Elevator Pitch, Make Your Mark Round, Psychometric Test, Conflict management and emotional intelligence, Important placement documentation, Final revision and placement readiness session // **Activity:** Peer Review – 3P Model.

(5 Hours)

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Verbal Ability book	TPP Dept.	TPP	6th Edition
2	Interviews and Group Discussions	T. S. Jain & Gupta	Upkar Publications	2 nd (2008)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Pub.Yr.)
1	Word Power Made Easy	Norman Lewis	Goyal Publishers	4th (2012)
2	Communication Skills for Engineers	Sunita Mishra & Muralikrishna	Pearson Education	1st(2011)

Course Code	Course Type	Course Title	Cd	L	T	P	Marks		
							Internal	External	Total
26C2AIU-216	Value Added Course (NCC)	MOOC	0	0	0	2	-	-	S/US

Course Outcomes:

Defined by the online platform for the specific course chosen.

The Departmental committee shall select a MOOC available on any reputed platform. However, the selected MOOC should not be similar to the regular courses offered as a part of the department curriculum.
course

The overall monitoring of the MOOC course will be under the supervision of the teacher In-charge of the department. The Departmental Academic Committee shall assess the student work based on the relevant course completion certificate.

S= Satisfactory

US=Unsatisfactory