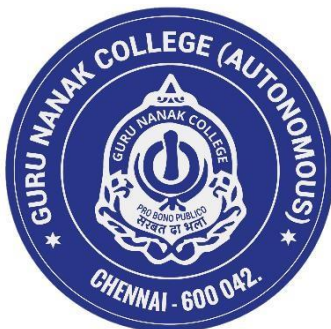


GURU NANAK COLLEGE (AUTONOMOUS)

(Affiliated to University of Madras and Accredited at 'A++' Grade by NAAC)

Guru Nanak Salai, Velachery, Chennai - 600042



SCHOOL OF INFORMATION TECHNOLOGY

B.Sc. Computer Science with Artificial Intelligence

LEARNING OUTCOME BASED CURRICULUM FRAMEWORK

(For the UG batch of 2025-28 and thereafter)

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LEARNING OUTCOME BASED CURRICULUM FRAMEWORK

(For the UG batch of 2025-28 and thereafter)

PREAMBLE

Bachelor of Computer Science with Artificial Intelligence (AI) is a 3 - Year Undergraduate Programme spread over six semesters. The course is designed to achieve a high degree of technical skills in Problem solving and Modern application development. The course develops requisite professional skills and problem solving along with developing the analytical abilities for pursuing a successful career in software industry and forms the required basics for further higher studies in Computer Science specifically in the area of Artificial Intelligence. The program is designed to foster a deep understanding of how computer systems operate, from fundamental hardware and software interactions to complex algorithmic problem-solving techniques. Alongside this, students are introduced to the rapidly expanding domain of AI, where they explore the creation and application of intelligent systems capable of learning, reasoning, and making decisions autonomously. The integration of theoretical knowledge and hands-on practice ensures that students gain the skills needed to design and implement cutting-edge AI solutions that address real-world challenges across various domains, including healthcare, finance, transportation, and entertainment.

This multidisciplinary course is structured to provide students with the essential technical, mathematical, and analytical tools needed to excel in the fast-evolving field of AI while maintaining a robust grounding in traditional computer science principles. The program aligns with the growing need for AI-driven solutions in industries such as healthcare (diagnostic tools and personalized medicine), autonomous vehicles (self-driving technology), smart cities (IoT and automation), and financial services (fraud detection and risk assessment). The Specialized AI Topics covers areas such as machine learning, neural networks, natural language processing, robotics, and computer vision with Practical Experience includes coding labs, software development workshops, AI toolkits, and collaboration on real-world projects. The innovation and creativity encourage problem-solving through creativity and innovation, fostering the ability to design AI systems that adapt and evolve. Finally, ethics and social responsibility focuses on the ethical implications of AI, highlighting issues like data privacy, fairness, transparency, and societal impact. According to BLOOM's Taxonomy, the curriculum, instructional strategies, and evaluation techniques are matched with suitable cognitive levels. The assessment of students' cognitive abilities and the evaluation of the attainment of expected course outcomes will be made possible by the OBE based evaluation methodologies.

The B.Sc. in Computer Science with Artificial Intelligence aims to nurture tech-savvy, innovative graduates who are prepared to lead and adapt in an ever-evolving digital landscape. It provides the tools to harness the potential of AI for societal advancement, addressing global challenges and shaping the future.

Vision

To lead in academic excellence by fostering innovation, ethics, and transformative AI advancements, empowering students to shape technology and benefit society

Mission

To deliver comprehensive and innovative education seamlessly integrates foundational computer science knowledge with advanced artificial intelligence techniques. The program aims to foster innovation and emphasizes the ethical development with the deployment of AI technologies, ensuring graduates are socially responsible and conscious of the broader implications of their work

Programme Educational Outcomes

PEO 1: Values of Life, Ethics & Social Concern

The graduates exhibit truth, loyalty, and love as integral moral principles, thereby contributing to a society characterized by enhanced well-being and fundamental goodness in behavior

PEO 2: Employability & Entrepreneurship

The graduates apply analytical, logical, and critical problem-solving skills in professional contexts, elevating employability and cultivating entrepreneurial capabilities through upskilling

PEO 3: Regional/National/Global Relevance & Competency

The graduates foster advanced analytical skills and a heightened appreciation for current Regional/National/Global perspectives, enabling informed and sustainable decision-making in a dynamic environment

PEO 4: Skill Enhancement, Self-Directed & Lifelong Learning

The graduates independently engage in skill-based learning, utilizing infrastructure and opportunities for continuous upskilling, enabling self-evaluation and lifelong excellence attainment

PEO 5: Research Skills & Innovation

The graduates proficiently apply scientific reasoning, fostering creativity, strategic thinking, and effective problem-solving skills. They demonstrate a core competency in generating innovative ideas for advancements and inventions

Program Outcomes

- PO 1:** Having the ability to develop software that aids society to minimize the effort.
- PO 2:** Having the ability to employ techniques, skills, and modern hardware and software tools necessary to meet the current demand of the IT Industry.
- PO 3:** Having Regional/National/Global Competency and being employable.
- PO 4:** Have the ability to independently engage in Self-directed learning and an inclination to life-long learning and upskilling.
- PO 5:** Demonstrate competency in generating innovative ideas for advancements and inventions.

Program Specific Outcomes

- PSO1:** To Understand the key of AI concepts such as machine learning, natural language processing, robotics, and computer vision to create solutions for real-world problems
- PSO2:** To analyse large datasets using AI and data science techniques, enabling them to derive meaningful insights, make informed decisions, and solve complex problems
- PSO3:** Ability to design and implement intelligent systems that adapt and learn from data.
- PSO4:** To optimize and evaluate AI systems, ensuring they are scalable, efficient, and effective, while continuously improving system performance
- PSO5:** To assess the Ethical implications of AI applications, ensuring responsible development of AI systems with respect to privacy, security, fairness, and social impact

PEO – PO mapping

	PEO 1	PEO2	PEO3	PEO4	PEO5
PO 1	1	3	3	3	3
PO 2	1	2	1	3	2
PO3	1	3	1	3	2
PO 4	2	1	3	1	3
PO 5	3	2	1	3	2

PO – PSO mapping

	PO 1	PO2	PO3	PO4	PO5
PSO 1	1	3	2	1	3
PSO 2	2	2	3	2	3
PSO3	3	1	3	3	2
PSO 4	2	2	2	3	1
PSO 5	3	1	1	2	2

CHOICE BASED CREDIT SYSTEM (CBCS)

The College follows the CBCS with Grades under the Semester pattern. Each course is provided with a credit point based on the quantum of subject matter, complexity of the content and the hours of teaching allotted. This is done after a thorough analysis of the content of each subject paper by the members of the Board of Studies and with the approval of the Academic Council. Students are also offered a variety of Job oriented Elective, Multidisciplinary skill-based courses as part of the curriculum. Students can earn extra credits by opting for Massive Open Online Courses (MOOCs) and Certificate Courses.

The evaluation method under CBCS involves a more acceptable grading system that reflects the personality of the student. This is represented as Cumulative Grade Point Average (CGPA) and Grade Point Average (GPA) which are indicators of the Academic Performance of the student. It provides

students with a scope for horizontal mobility and empowers them with the flexibility of learning at their convenience.

ELIGIBILITY FOR ADMISSION

Candidates admitted to the first year of the UG programme should have passed the higher Secondary Examinations (Academic or Vocational Stream) conducted by the Government of Tamil Nadu or an examination accepted as equivalent thereof by the Syndicate of the University of Madras. Students applying for the PG programme should have taken the UG degree in the relevant subject from a recognized university as per the norms of the University of Madras.

For B.Com. (Hons): Candidates admitted to the first year of the B.Com. (Hons.) programme should have passed the higher secondary examinations conducted by the Government of Tamil Nadu or an examination accepted as equivalent thereof by the Syndicate of the University of Madras with 75 % cut-off in Commerce/Business studies, Accountancy, Economics and Business Mathematics/ Mathematics.

For MBA: The basic requirement for admission to the MBA programme is a Bachelor's degree in any discipline with a minimum of 50% marks in aggregate and satisfactory test score in MAT Entrance Test conducted by AIMA, New Delhi / TANCET for MBA conducted by Government of Tamil Nadu / CAT / XAT or any other approved MBA Entrance Tests.

For MCA: Only those candidates who have passed B.C.A/B.Sc. in Computer Science or any other equivalent degree OR passed B.Sc./B.Com/BA with Mathematics at 10 + 2 level or at graduation level (with Optional bridge course in Mathematics), provided they have undergone the course under 10+2+3 pattern and obtained at least 50% of marks (45 % marks in case of candidates belonging to reserved category) in the qualifying examination shall be eligible for admission to the M.C.A. Programme.

DURATION OF THE COURSE

The UG programme is of three years duration with six semesters and the PG programme is of two years duration with four semesters. The period from June to November is termed as the odd semester and the period from December to April is referred to as the even semester. Each semester must compulsorily have 90 working days before the students appear for the final End Semester Exam.

COURSE OF STUDY

The main course of study for the Bachelor's Degree shall consist of the following:

FOUNDATION COURSES

PART - I: Tamil/ Hindi /Sanskrit/French

PART - II: English

CORE COURSES

PART - III: Consisting of (a) Main subject (b) Allied Subjects (c) Elective subjects related to the main subject of study and project work.

PART – IV: Those who have not studied Tamil up to XII standard and have taken a non- Tamil language under Part – I, shall opt for Basic Tamil in the first two semesters.

Those who have studied Tamil up to XII standard, and taken a non -Tamil language under Part – I, shall opt for Advanced Tamil in the first two semesters.

Others, who do not come under either of the clauses mentioned above, can choose a Non-Major Elective (NME) in the first two semesters.

Soft Skills (I, II, III & IV Semesters)

Self-Study (Compulsory) Course (III Semester)

Environmental Studies (IV Semester)

Value Education (V Semester)

Summer Internship (After IV Semester)

PART - V: Compulsory Extension Services

A Student shall be awarded one credit for compulsory extension service. A student must enrol in NSS / NCC /Sports & Games/ Citizen Consumer Club / Enviro Club or any other service organization in the College and should put in compulsory minimum attendance of 40 hours, which shall be duly certified by the Principal of the College. If a student lacks 40 hours compulsory minimum attendance in the extension services in any Semester, s/he shall have to compensate the same, during the subsequent Semesters.

COURSE STRUCTURE

The UG programme consists of 15-19 Core courses with 3-4 credits for each paper, 3 Elective courses and 4 Allied courses with 4-5 credits for each paper in addition to 4 Soft Skill courses with two credits each. Internship as a compulsory component carries 2 credits. The B.Com. (Hons) course has 31 core courses of 4 credits each and project with 8 credits.

The MBA programme has 15 core courses including project work with 4 credits, 6 elective courses with 3 credits, 2 extra disciplinary courses with 3 credits, Four Soft Skill courses with two credits each.

The MCA programme has 15 core courses of 2-4 credits, 5 Elective courses of 3 credits, 2 Extra-disciplinary courses of 3 credits and a project work of 17 credits.

Internship training is a compulsory component for all the UG & PG programmes.

The details of the course structure are given in the following table:

B.Sc. Computer Science with Artificial Intelligence

Credit distribution for each semester

Semester I		Subject	Hrs/Week	Credit	Marks		Total
Course Component					Internals	Externals	
Part I	Language	Language – I	6	3	50	50	100
Part II	English	English – I	4	3	50	50	100
Part III	Core - I	Data Structures using Python	6	4	50	50	100
	Core-II	Practical – I: Data Structures using Python	4	4	50	50	100
	Allied-I	Mathematics - I	6	5	50	50	100
	Non-Major Elective-I	Basic Tamil-I/ Advanced Tamil-I/ Artificial Intelligence for Beginners	2	2	50	50	100
	Soft Skills-I	Communication Skills and Personality Development Skills	2	2	50	50	100
	Total		30	23			
Semester II		Subject	Hrs/Week	Credit	Marks		Total
Course Component					Internals	Externals	
Part I	Language	Language – II	6	3	50	50	100
Part II	English	English – II	4	3	50	50	100
Part III	Core -III	Java Programming	5	4	50	50	100
	Core-IV	Practical – II: Java Programming	5	4	50	50	100
	Allied-II	Mathematics - II	6	5	50	50	100
Part IV	Non Major Elective-II	Basic Tamil-II/ Advanced Tamil-II/ Design using Generative AI and Open-Source Tools	2	2	50	50	100
	Soft Skills-II	Interview Skills and Resume Writing	2	2	50	50	100
	Total		30	23			

Semester III		Subject	Hrs/Week	Credit	Marks		Total
Course Component					Internals	Externals	
Part I	Language	Language – III	6	3	50	50	100
Part II	English	English – III	4	3	50	50	100
Part III	Core-V	Relational Database Management System	6	4	50	50	100
	Core-VI	Practical – III: PL/SQL	6	5	50	50	100
	Allied-III	Statistics – I	6	5	50	50	100
Part IV	Soft Skills-III	Adobe UX Foundation	2	2	50	50	100
	Self- Study (Compulsory) Course	Indian Heritage and Knowledge System/Contemporary World and Sustainable	-	2	-	100	100
	Total		30	24			
Semester IV		Subject	Hrs/Week	Credit	Marks		Total
Course Component					Internals	Externals	
Part I	Language	Language – IV	6	3	50	50	100
Part II	English	English – IV	4	3	50	50	100
Part III	Core -VII	Introduction to Artificial Intelligence	5	4	50	50	100
	Core-VIII	Practical IV - Prolog Lab	5	4	50	50	100
	Allied-IV	Statistics - II	6	5	50	50	100
Part IV	Soft Skills - IV	Foundations of Quantitative Aptitude	2	2	50	50	100
	EVS	Environmental Studies	2	2	50	50	100
	Total		30	23			

Semester V		Subject	Hrs/Week	Credit	Marks		Total
Course Component					Internals	Externals	
Part III	Core –IX	Computer Vision	5	3	50	50	100
	Core –X	Practical – V: Computer Vision	4	3	50	50	100
	Core-XI	Natural Language Processing (NLP)	5	3	50	50	100
	Core-XII	Practical – VI: Natural Language Processing (NLP)	5	3	50	50	100
	Elective-I (Interdisciplinary Elective)	Ethics of Artificial Intelligence	5	5	50	50	100
	Elective-II	Computer Networks / Software Engineering / Big Data Analytics	5	5	50	50	100
Part IV	Value Education	Value Education	1	2	50	50	100
Part V	Internship	Internship	-	2	-	-	-
	Total		30	26			
Semester VI		Subject	Hrs/Week	Credit	Marks		Total
Course Component					Internals	Externals	
Part III	Core –XIII	Operating Systems	5	3	50	50	100
	Core-XIV	Internet of Things	4	3	50	50	100
	Core-XV	Machine Learning	5	4	50	50	100
	Core -XVI	Practical – VII: Machine Learning Lab	6	4	50	50	100
	Core - XVII	Mini Project	4	3	50	50	100
	Elective-III	Information Security / Robotics & its Applications / Artificial Neural Networks	6	5	50	50	100
Part V	Extension Activity	Participation in NSS/NCC/ROTRACT etc.	-	1	-	-	-
	Total		30	23			
Grand Total			180	142			

Total credit distribution for all the 3 years

		No. of Paper	Credits
Part I	Language	4	12
Part II	English	4	12
Part III	Core	17	62
	Allied	4	20
	Elective	3	15
Part IV	NME	2	4
	Soft Skills	4	8
	Self-Study (Compulsory) Course	1	2
	EVS	1	2
	Value Education	1	2
	Internship	1	2
Part V	Extension activity	1	1
Total			142

EXAMINATION

Continuous Internal Assessment (CIA) will be for 50 percent and

End Semester Examination (ESE) will be for 50 percent.

CONTINUOUS INTERNAL ASSESSMENT (CIA)

Every semester will have a mid-semester examination which will be conducted on completion of 45 working days in each semester. A Model exam for three hours duration will be conducted on completion of 80 working days in each semester. For the courses coming under Part IV, ESE will be conducted in MCQ pattern. Internship credits will be given in semester V after verification of documents by the respective Heads.

The schedule for these tests is as follows:

CIA	Schedule	Syllabus Coverage
Mid Semester Examination	After 45 working days of the Semester	60%
Model Examination	After 80 working days of the Semester	95%

The components for the CIA (Theory & Practical's) are as follows:

Internal Components			
Assessment Type	Nature	Maximum Marks	% of Weightage
CIA	Mid Semester Examination	50	10
Model	Model Examination	100	10
	Assignment		10
	Class activities		15
	Attendance		5
Total			50

The class activity relates to a programme of accepted innovative techniques such as Seminar, Quiz, Portfolio creation, PowerPoint presentation, Objective tests, Role play, Group discussion, Case Study etc. The mode of evaluation of the class activity will be fixed before the commencement of the semester and an approval will be obtained from the Head of the programme/wing. The students will be informed of the various methods of evaluation once the semester begins.

A record of all such assessment procedures will be maintained by the department and is open for clarification. Students will have the right to appeal to the Principal in case of glaring disparities in marking. CIA marks for practical subjects will be awarded by the respective faculty based on the performance of the student in the model practical examination, observation notebook, submission of record books, regularity and attendance for the practical classes. The attendance particulars for practical classes will be maintained by the concerned faculty. The marks for attendance will be awarded as per the following:

% of General Attendance	Marks Awarded
90-100	5
75-89	4
60-74	3
<60	0

END SEMESTER EXAMINATIONS (ESE)

After the completion of a minimum of 90 working days each semester, the End Semester Examinations will be conducted. Examinations for all UG and PG programmes will be held for all courses in November/December and April/May. Practical examinations will be conducted only during the end of the odd / even semester before, during or after the commencement of the theory exam. The schedule for ESE Practicals will be notified by the Controller of Examinations in consultation with the Dean (Academics)

Mode of Evaluation

METHODS OF EVALUATION		
Internal Evaluation	Mid Sem Exam (10)	50 Marks
	Model Exam (10)	
	Assignment (10)	
	Class activity (15)	
	Attendance (5)	
External Evaluation	End Semester Examination	50 Marks
Total		100 Marks

Method of assessment

Remembering (K1)	• The lowest level of questions requires students to recall information from the course content • Knowledge questions usually require students to identify information in the textbook. • Suggested Keywords: Choose, Define, Find, How, Label, List, Match, Name, Omit, Recall, Relate, Select, Show, Spell, Tell, What, When, Where, Which, Who, Why
Understanding (K2)	• Understanding of facts and ideas by comprehending organizing, comparing, translating, interpolating and interpreting in their own words. • The questions go beyond simple recall and require students to combine them altogether • Suggested Keywords: Classify, Compare, Contrast, Demonstrate, Explain, Extend, Illustrate, Infer, Interpret, Outline, Relate, Rephrase, Show, Summarize, Translate

Application (K3)	• Students have to solve problems by using / applying a concept learned in the classroom. • Students must use their knowledge to determine a exact response. • Suggested Keywords: Apply, Build, Choose, Construct, Develop, Experiment with, Identify, Interview, Make use of, Model, Organize, Plan, Select, Solve, Utilize
Analyze (K4)	• Analyzing the question is one that asks the students to breakdown something into its component parts. • Analyzing requires students to identify reasons causes or motives and reach conclusions or generalizations. • Suggested Keywords: Analyze, Assume, Categorize, Classify, Compare, Conclusion, Contrast, Discover, Dissect, Distinguish, Divide, Examine, Function, Inference, Inspect, List, Motive, Relationships, Simplify, Survey, Take part in, Test for, Theme
Evaluate (K5)	• Evaluation requires an individual to make judgment on something. • Questions to be asked to judge the value of an idea, a character , a work of art, or a solution to a problem. • Students are engaged in decision-making and problem–solving. • Evaluation questions do not have single right answers. • Suggested Keywords: Agree, Appraise, Assess, Award, Choose, compare, Conclude, Criteria, Criticize, Decide, Deduct, Defend, Determine, Disprove, Estimate, Evaluate, Explain, Importance, Influence, Interpret, Judge, Justify, Mark, Measure, Opinion, Perceive, Prioritize, Prove, Rate, Recommend, Rule on, Select, Support, Value
Create (K6)	• The questions of this category challenge students to get engaged in creative and original thinking. • Developing original ideas and problem solving skills • Suggested Keywords: Adapt, Build, Change, Choose, Combine, Compile, Compose, Construct, Create, Delete, Design, Develop, Discuss, Elaborate, Estimate, Formulate, Happen, Imagine, Improve, Invent, Make up, Maximize, Minimize, Modify, Original, Originate, Plan, Predict, Propose, Solution, Solve, Suppose, Test, Theory

SEMESTER - I

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARTIFICIAL INTELLIGENCE	BATCH: 2025 -2028
PART: III	COURSE COMPONENT: CORE – III
COURSE NAME:DATA STRUCTURES USING PYTHON	COURSE CODE:
SEMESTER: I	MARKS:100
CREDITS: 4	TOTAL HOURS: 75
THEORY	

COURSE OBJECTIVE:

To introduce Python programming with high-level data structures, building foundational skills in computing and problem-solving, enabling students to use data structures to solve real-life problems

COURSE OUTCOMES:

1. To develop Python program using basic syntactical constructs
2. To Perform operations on sequence structures in Python
3. To Implement Modules, Packages in Python for given problem
4. To Implement Linear Data Structure in Python
5. To develop Python program to implement tree data structure

UNIT 1

(15 HOURS)

Introduction and Control Flow statements in Python

Features of Python - interactive, object oriented, interpreted, platform independent. Python building blocks - identifiers, keywords, indentation, variables, comments. Python data types: numbers, string, tuples, lists, dictionary. Basic operators: arithmetic, comparison/ relational, assignment, logical, bitwise, membership, identity operators, Python operator precedence. Control flow: conditional statements (if, if else, nested if), looping in python (while loop, for loop, nested loops) loop manipulation using continue, pass, break, else.

UNIT II

(15 HOURS)

Python specific Data Structures and functions

Lists: Defining lists, accessing values in list, deleting values in list, updating lists, basic list operations, built - in list functions. Tuples: Accessing values in tuples, deleting values in tuples, and updating tuples, basic tuple operations, built - in tuple functions. Sets: Accessing values in set, deleting values in set and updating sets, basic set operations, built - in set functions. Dictionaries: Accessing values in dictionary, deleting values in dictionary and updating dictionary, basic dictionary operations, built- in dictionaries functions. Use of Python built- in functions (e.g.type/ data conversion functions, math functions etc.)

User defined functions: Function definition, function calling, function arguments and parameter passing, return statement, scope of variables: global variable and local variable.

UNIT III**(15 HOURS)****Python Modules and Packages**

Modules: writing modules, importing modules, importing objects from modules, Python built-in modules (e.g. numeric and mathematical module, functional programming module). Python packages: introduction, writing Python packages. Using standard Numpy: methods in Numpy, creating arrays and initializing, reading arrays from files, special initializing functions, slicing and indexing, reshaping arrays, combining arrays, NumPy maths.

UNIT IV**(15 HOURS)****Linear Data Structure Arrays, Link List, Stack and Queues using Python**

Data Structures – definition, linear data structures, non-linear data structures arrays - overview, types of arrays, operations on arrays, arrays vs list. Searching -linear search and binary search, sorting bubble sort, insertion sort. Linked Lists – singly linked list, doubly linked list, circular linked lists, implementation using Python packages for link list. Stacks: introduction to stacks, stack applications expression evaluation, backtracking, traversal - infix, prefix and postfix concepts. Queues: introduction to queues, queue applications- breadth first search, depth first search.

UNIT V**(15 HOURS)****Non-Linear Data Structure**

Trees - tree Terminology, binary trees: implementation, tree traversals, binary search trees. Applications of trees - spanning tree, BST, tree traversal – inorder, preorder and postorder concepts.

PRESCRIBED BOOKS:

1. “Python Programing” by Rao, K. Nageswara Shaikh Akbar, Scitech Publications (India) Pvt. Ltd. ISBN: 9789385983450
2. “Data Structures and Algorithms in Python”, Michael T. Goodrich, Roberto Tamassia, Wiley publication New Delhi 2016 ISBN: 978-81- 265-5423-2

REFERENCE BOOKS:

1. “Python Essential Reference”, Beazley, David, 4th Edition, Addison-Wesley Professional, ISBN: 9780672329784
2. “Hands-On Data Structures and algorithms with Python”, Dr.Basant Agarwal, 3rd Edition, Packt publisher, ISBN : 9781801073448

E-LEARNING RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_cs26/preview
2. <https://www.geeksforgeeks.org/graph-data-structure-and-algorithms>
3. <https://www.freecodecamp.org/news/object-oriented-programmin g-in-python/>
4. <https://realpython.com/python3-object-oriented-programming/>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERNQUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
C	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	2	1	1
III	3	2	1
IV	2	1	2
V	2	2	1
TOTAL	12	7	6
SECTION A - 12		SECTION B - 7	SECTION C - 6

PSO-CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	2	2	3
CO 5	3	2	2	3	3
Ave.	2.8	2.6	2.6	2.6	3

PSO-CO-question paper mapping

CO No:	COUSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To develop Python program using basic syntactical constructs	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K3, K6
CO2	To Perform operations on sequence structures in Python	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K5, K6
CO3	To Implement Modules, Packages in Python for given problem	PSO1, PSO2, PSO3, PSO4, PSO5	K3, K4, K5, K6
CO4	To Implement Linear Data Structure in Python	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K4, K6
CO5	To develop Python program to implement tree data structure	PSO1, PSO2, PSO3, PSO4, PSO5	K3, K4, K5, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARTIFICIAL INTELLIGENCE	BATCH: 2025 -2028
PART: III	COURSE COMPONENT: CORE – IV
COURSE NAME: PRACTICAL - I: DATA STRUCTURES USING PYTHON	COURSE CODE:
SEMESTER: I	MARKS: 100
CREDITS: 4	TOTAL HOURS:75
PRACTICAL	

COURSE OBJECTIVE:

An ability to develop Python program using basic syntactical constructs, Modules, Packages in Python for given problem and Implement Linear Data Structure in Python

COURSE OUTCOMES:

1. Use different types of operators for writing arithmetic expressions with control flow
2. To Develop Python program to manipulate lists, tuples, sets and dictionaries for the given problem.
3. Create Python module and develop Python package for the given problem.
4. Develop Python code using arrays, implement link list and queues
5. Implement various types of trees, operations on trees using Python code

LAB EXERCISES:

1. Install Python integrated development environment

- a) Install and configure Python IDE
- b) Write Python program to display message on screen

2. Implement basic operators in Python

Write simple Python program using operators: a) Arithmetic operators b) Logical operators c) Relational operators d) Conditional operators e) Bitwise operators f) Ternary operator

3. Implement control flow operations for solving given task

Write simple Python program to demonstrate use of conditional statements:

- i) if ii) if...else iii) Nested if iv) Switch case

4. Implement while control loop for solving iterative problems

Develop a simple Python program to demonstrate use of control loop: while

5. Implement for loop for solving iterative problems

Create a simple program to demonstrate use of for loop in Python (e.g : various pattern building, printing multiplication table, checking palindrome number etc.)

6. Perform basic operations on the lists

Write Python program to perform following operations on lists: a) Create b) Access c) Update d) Delete elements in list

7. Execute various tuple operations

Develop Python program to perform following operations on tuples: a) Create b) Access c) Update d) Delete tuple elements

8. Implement various set operations

Write Python program to perform following operations on set : a) Create b) Access c) Update d) Delete access set elements

9. Execute various operations on dictionaries

Create a program to perform following operations on dictionaries in Python: a) Create b) Access c) Update d) Delete e) Looping through dictionary

10. Use built-in math functions in Python

Apply math built - in function in Python

11. Create user-defined functions to solve the given task

Develop user defined Python function for given problem: write a function with minimum 2 arguments

12. Apply built-in mathematical modules from python

Create a program to demonstrate use of built-in module (e.g. numeric, mathematical functional and programming module) in Python

13. Write user-defined module in Python

Write program to create a user - defined module (e.g : building calculator) in Python

14. Apply built-in packages from Python

Develop Python program to demonstrate use of NumPy packages for creating, accessing and performing different array operations

15. Create user-defined packages in Python

Write a program to create user defined packages in Python

16. Implement the concept of polymorphism in Python

Write program in Python to demonstrate following operations:
a) Method overloading b) Method overriding

17. Implement the concept of inheritance in Python

Develop program in Python to demonstrate following operations: a) Single inheritance b) Multilevel inheritance c) Multiple inheritance d) Hybrid inheritance e) Hierarchical inheritance

18. Execute the array operations using Python.

Write a program in Python for handling array to demonstrate following operations:

a) Array declaration b) Insertion c) Deletion d) Append e) Index f) Reverse

19. Implement the linked list operations using Python.

Write a program in Python for linked list to demonstrate following operations:

a) Insertion b) Deletion c) Updating d) Merging to list

20. Implement the queue operations using Python.

Write a program in Python to demonstrate queue data structure operations:

a) Enqueue b) Dequeue c) Display

21. Implement searching techniques in Python

Use the searching techniques in data structures: a) Linear Search b) Binary Search

22. Implement sorting techniques in Python.

Write a Python program to implement following sorting techniques: a) Bubble Sort

b) Insertion Sort

23. Implement stack data structure in Python.

Write a program in Python to evaluate an expression

24. Implement sorting techniques in Python.

Write a program to create binary tree from the given list using binary tree module in Python.

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
Ave.	3	3	3	3	3

PSO-CO-question paper mapping

CO No:	COUSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Use different types of operators for writing arithmetic expressions with control flow	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K3, K6
CO2	To Develop Python program to manipulate lists, tuples, sets and dictionaries for the given problem.	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K5, K6
CO3	Create Python module and develop Python package for the given problem.	PSO1, PSO2, PSO3, PSO4, PSO5	K3, K5, K6
CO4	Develop Python code using arrays, implement link list and queues	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K4, K6
CO5	Implement various types of trees, operations on trees using Python code	PSO1, PSO2, PSO3, PSO4, PSO5	K3, K4, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARTIFICIAL INTELLIGENCE	BATCH: 2025-2028
PART: III	COURSE COMPONENT: ALLIED – I
COURSE NAME: MATHEMATICS - I	COURSE CODE:
SEMESTER: I	MARKS: 100
CREDITS: 5	TOTAL HOURS: 90
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To improve basics in mathematical and analytical skills.

COURSE OUTCOMES:

1. Recall the basic concepts of summation of series, matrices, finite difference, trigonometry and differentiation.
2. Understand the types of summation of series, matrices, interpolation of unknown values, expansion of trigonometric functions and higher order derivatives.
3. Apply operations to find sum of the series, properties of the matrix, interpolation formula, expansion of sine series and Jacobian function.
4. Analyze the series, verification of Cayley Hamilton, interpolation for equal intervals, and hyperbolic functions.
5. Evaluate sum of series, inverse using Cayley Hamilton, interpolation for unequal intervals, inverse hyperbolic and maximum and minimum of a function.

UNIT I

(18 HOURS)

Summation of series: Binomial series - Exponential series - Logarithmic series - Simple Problem

Chapter 2: Sections: 2.1.3, 2.2, 2.2.1, 2.3, 2.3.3.

UNIT II

(18 HOURS)

Matrices: Symmetric, Skew-Symmetric, Hermitian, Skew- Hermitian, Orthogonal and Unitary matrices, Cayley - Hamilton theorem (without proof) – Verification- Computation of inverse of matrix using Cayley - Hamilton theorem.

Chapter 4: Sections: 4.1.1– 4.1.6, 4.5.2 and 4.5.3.

UNIT III

(18 HOURS)

Numerical Methods: Newton's method to find a root approximately.

Finite Differences: Interpolation: Operators Δ , ∇ , E , E^{-1} difference tables. Interpolation formulae: Newton's forward and backward interpolation formulae for equal intervals, Lagrange's interpolation formula.

Chapter 3: Sections 3.4.1. and Chapter 5: Sections: 5.1 and 5.2.

UNIT IV**(18 HOURS)**

Trigonometry: Expansions of $\sin^n \theta$, $\cos^n \theta$ in a series of powers of $\sin \theta$ and $\cos \theta$, Expansions of $\sin(n\theta)$ and $\cos(n\theta)$ in a series sines and cosines of multiples of “ θ ”, Expansions of $\sin \theta$, $\cos \theta$ and $\tan \theta$ in a series of powers of “ θ ”, Hyperbolic and inverse hyperbolic functions .

Chapter 6: Section 6.1– 6.3

UNIT V**(18 HOURS)**

Differential Calculus: Successive differentiation, n^{th} derivatives, Leibnitz theorem (without proof) and applications, Jacobians, maxima and minima of functions of two variables- Simple problems.

Chapter 1: Section 1.1 to 1.3.1.

PRESCRIBED BOOK:

Treatment and content as in “Allied mathematics” – P. Durai Pandian, Dr.S. Udayabaskaran, Volume I & II, S.Chand and company limited, Reprint 2018

REFERENCE BOOKS:

1. Allied Mathematics, S.G.Venkatachalapathy.
2. P. Kandasamy and K. Thilagavathi, Allied Mathematics Volume I and Volume II -- 2004, S.Chand and Co, New Delhi.
3. Ancillary Mathematics Volume 1 and 2 by Balasubramanian & K.G.Subramanian.

E - LEARNING RESOURCES:

1. https://ia801306.us.archive.org/5/items/MIT18.01JF07/ocw-18.01-f07-lec11_300k.mp4
2. <https://nptel.ac.in/courses/111107107>
3. <https://nptel.ac.in/courses/111106146>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions	1 - 12	3	30
B	Answer any 5 out of 7 questions	13 - 19	6	30
C	Answer any 4 out of 6 questions	20 - 25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	2	2	1
III	2	1	2
IV	2	2	1
V	3	1	1
TOTAL	12	7	6
SECTION A - 12		SECTION B - 7	SECTION C - 6

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	2	2	3
CO 2	3	2	2	3	2
CO 3	3	2	3	3	2
CO 4	2	3	2	2	3
CO 5	2	3	3	3	2
Ave.	2.4	2.6	2.4	2.6	2.4

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Recall the basic concepts of summation of series, matrices, finite difference, trigonometry and differentiation.	1-5	K1
CO2	Understand the types of summation of series, matrices, interpolation of unknown values, expansion of trigonometric functions and higher order derivatives.	1-5	K1,K2
CO3	Apply operations to find sum of the series, properties of the matrix, interpolation formula, expansion of sine series and Jacobian function.	1-5	K3
CO4	Analyze the series, verification of Cayley-Hamilton, interpolation for equal intervals, and hyperbolic functions.	1-5	K3,K4
CO5	Evaluate sum of series, inverse using Cayley Hamilton, interpolation for unequal intervals, inverse hyperbolic and maximum and minimum of a function.	1-5	K4,K5

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

PROGRAMME:OPEN TO ALL PROGRAMMES EXCEPT B.Sc., COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE	BATCH: 2025 -2028
PART: IV	COURSE COMPONENT: NON-MAJOR ELECTIVE - I
COURSE NAME: ARTIFICIAL INTELLIGENCE FOR BEGINNERS	COURSE CODE:
SEMESTER: I	MARKS:100
CREDITS: 2	TOTAL HOURS:30
THEORY	

COURSE OBJECTIVE:

The course provides a comprehensive understanding of AI, covering key concepts, project workflows, applications, societal impacts, and advanced techniques for effective AI implementation.

COURSE OUTCOMES:

1. To Understand the basics of AI and Machine Learning and role of data
2. To learn the AI project lifecycle, from data collection to deployment
3. To examine AI's impact on industry, business and understanding AI team roles and challenges
4. To assess the societal effects of AI, focusing on ethics, security risks, and its impact on developing nations.
5. To explore advanced AI techniques and future trends, with an emphasis on ethical development

UNIT I

Understanding the Basics of AI and ML: What is AI?- Machine Learning Overview - The Terminology of AI - What is Data? - Intuitive Introduction to Deep Learning

UNIT II

The AI Project Lifecycle - Machine Learning Project Workflow - Role of Data in Every Job Function - Choosing an AI Project - Collaborating with an AI Team - Tools for AI Teams

UNIT III

AI in Industry and Business - AI Case Study: Smart Speakers, Self-Driving Cars. Roles of an AI Team, AI Transformation Playbook, Pitfalls to Avoid in AI Projects, Survey of Major AI Applications, Survey of Major AI Techniques

UNIT IV

AI's Societal Impact - A Realistic View of AI - Discrimination & Bias in AI - Adversarial Attacks - Adverse Uses of AI - AI and Developing Nations - AI and the Future of Jobs - Preparing for an AI-Driven Future

UNIT V

Advanced Concepts and Future Directions in AI - Exploring Advanced AI Techniques - Ethics in AI Development - The Future of AI in Society - Practical AI Implementation - Preparing for AI Integration

PRESCRIBED BOOK:

1. Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig. Fourth Edition, Pearson, ISBN-13: 978-0134610993.
2. AI Superpowers: China, Silicon Valley, and the New World Order" by Kai-Fu Lee. First Edition, Houghton Mifflin Harcourt, ISBN-13: 978-1328546395

REFERENCE BOOKS:

1. Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy" by Cathy O'Neil,: First Edition 2016, Crown Publishing Group, ISBN-13: 978-0553418811
2. Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville, First Edition 2016, MIT Press, ISBN-13: 978-0262035613

E - LEARNING RESOURCES:

1. https://ia801306.us.archive.org/5/items/MIT18.01JF07/ocw-18.01-f07-lec11_300k.mp4
2. <https://nptel.ac.in/courses/111107107>
3. <https://nptel.ac.in/courses/111106146>

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	2	3	2
CO 2	3	1	1	3	1
CO 3	2	1	1	2	1
CO 4	2	2	1	2	2
CO 5	2	1	1	2	1
Ave.	2.6	2.6	2.6	3	2.6

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To Create and understand AI generated Images from prompting	PSO1,PSO2,PSO3, PSO4,PSO5	K1,K3,K5
CO2	To design posters and create social media posts	PSO1,PSO2,PSO3, PSO4,PSO5	K2,K5,K6
CO3	To Create and edit videos online	PSO1,PSO2,PSO3, PSO4,PSO5	K1,K3,5
CO4	To Formulate and customize logo designs.	PSO1,PSO2,PSO3, PSO4,PSO5	K2,K4,K5
CO5	To Develop effective slide shows using GEN AI tools	PSO1,PSO2,PSO3, PSO4,PSO5	K3,K5,K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

SEMESTER – II

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARTIFICIAL INTELLIGENCE	BATCH: 2025 -2028
PART: III	COURSE COMPONENT: CORE – V
COURSE NAME: JAVA PROGRAMMING	COURSE CODE:
SEMESTER: II	MARKS:100
CREDITS: 4	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To provide fundamental knowledge of object-oriented programming, programming knowledge in Core Java from the basics up with the usage of AWT controls, Event Handling and Swing for GUI.

COURSE OUTCOMES:

1. To Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.
2. To Implement inheritance, packages, interfaces and exception handling of Core Java.
3. To Implement multi-threading and I/O Streams of Core Java.
4. To Implement AWT and Event handling.
5. To use of Swing concept and to create GUI.

UNIT 1

(18 HOURS)

Introduction: Review of Object-Oriented concepts - Java buzzwords (Platform independence, Portability, Threads)- JVM architecture –Java Program structure - Java main method - Java Console output(System.out) - simple java program - Data types - Variables - type conversion and casting- Java Console input: Buffered input - operators - control statements - Static Data - Static Method - String and String Buffer Classes

UNIT II

(18 HOURS)

Java user defined Classes and Objects: Arrays - constructors - Inheritance: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword -Packages: Definition - Access Protection - Importing Packages - Interfaces: Definition - Implementation - Extending Interfaces

UNIT III

(18 HOURS)

Exception Handling: try – catch - throw - throws – finally – Built-in exceptions - Creating own Exception classes - garbage collection, finalise -Multithreaded Programming: Thread Class - Runnable interface – Synchronization – Using synchronized methods – Using synchronized statement - Interthread Communication – Deadlock.

UNIT IV

(18 HOURS)

The AWT class hierarchy - Swing: Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton - JToggleButton - JCheckBox - JRadioButton - JLabel, JTextField - JTextArea - JList - JComboBox – JScrollPane - Event Handling: Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events.

UNIT V

(18 HOURS)

Adapter classes - Inner classes -Java Util Package / Collections Framework:Collection & Iterator Interface- Enumeration- List and ArrayList- Vector- Comparator.

PRESCRIBED BOOKS:

1. Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.
- Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999.

REFERENCE BOOKS:

1. Head First Java, O’Rielly Publications, Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010.
2. Hands-On Data Structures and algorithms with Python”, Dr.Basant Agarwal, 3rd Edition, Packt publisher, ISBN : 9781801073448

E-LEARNING RESOURCES:

1. <https://www.javatpoint.com/java-tutorial>
2. <https://www.coursera.org/specializations/java-programming>
3. <https://leetcode.com/problemset/>
4. <https://www.hackerrank.com/domains/java>
5. <https://www.w3schools.com/java/>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
C	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	1
II	3	1	1
III	2	1	1
IV	2	2	2
V	2	1	1
TOTAL	12	7	6
SECTION A - 12		SECTION B - 7	SECTION C - 6

PSO-CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	2	2	2
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
Ave.	3	2.8	2.8	2.8	2.8

PSO-CO-question paper mapping

CO No:	COUSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K3, K6
CO2	To Implement inheritance, packages, interfaces and exception handling of Core Java.	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K5, K6
CO3	To Implement multi-threading and I/O Streams of Core Java.	PSO1, PSO2, PSO3, PSO4, PSO5	K3, K4, K5, K6
CO4	To Implement AWT and Event handling.	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K4, K6
CO5	To use of Swing concept and to create GUI.	PSO1, PSO2, PSO3, PSO4, PSO5	K3, K4, K5, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARTITIFICIAL INTELLIGENCE	BATCH: 2025 -2028
PART: III	COURSE COMPONENT: CORE – VI
COURSE NAME: PRACTICAL – II: JAVA PROGRAMMING	COURSE CODE:
SEMESTER: II	MARKS:100
CREDITS: 5	TOTAL HOURS:90
PRACTICAL	

COURSE OBJECTIVE:

To provide fundamental knowledge of object-oriented programming, programming knowledge in Core Java from the basics up with the usage of AWT controls, Event Handling and Swing for GUI.

COURSE OUTCOMES:

1. To Understand the basic constructs in Java.
2. To Implement inheritance, packages, interfaces and exception handling of Core Java.
3. Create packages and handle exceptions.
4. Develop Java Applications for multithreading, file handling and displaying Applet.
5. To use of Swing concept and to create GUI Design simple GUI applications to demonstrate layout managers.

LAB EXERCISES:

1. Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer?
2. Write a Java program to multiply two given matrices.
3. Write a Java program that displays the number of characters, lines and words in a text?
4. Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.
5. Write a program to do String Manipulation using Character Array and perform the following string operations: a) String length b) Finding a character at a particular position c) Concatenating two strings
6. Write a program to perform the following string operations using String class: a) String Concatenation b) Search a substring c) To extract substring from given string
7. Write a program to perform string operations using String Buffer class: a) Length of a string b) Reverse a string c) Delete a substring from the given string
8. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread

computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.

9. Write a threading program which uses the same method asynchronously to print the numbers 1 to 10 using Thread1 and to print 90 to 100 using Thread2.
10. Write a program to demonstrate the use of following exceptions. a) Arithmetic Exception b) Number Format Exception c) Array Index Out of Bound Exception d) Negative Array Size Exception
11. Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes?
12. Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.
13. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes).
14. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.
15. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “stop” or “ready” or “go” should appear above the buttons in a selected color. Initially there is no message shown.

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
Ave.	3	3	3	3	3

PSO-CO-question paper mapping

CO No:	COUSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To Understand the basic constructs in Java.	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K3, K6
CO2	To Implement inheritance, packages, interfaces and exception handling of Core Java.	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K5, K6
CO3	Create packages and handle exceptions.	PSO1, PSO2, PSO3, PSO4, PSO5	K3, K5, K6
CO4	Develop Java Applications for multithreading, file handling and displaying Applet.	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K4, K6
CO5	To use of Swing concept and to create GUI Design simple GUI applications to demonstrate layout managers.	PSO1, PSO2, PSO3, PSO4, PSO5	K3, K4, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARITIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: ALLIED – II
COURSE NAME: MATHEMATICS - II	COURSE CODE:
SEMESTER: II	MARKS:100
CREDITS: 5	TOTAL HOURS: 90
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To improve basics in mathematical and analytical skills.

COURSE OUTCOMES:

1. Recall the basics of Integrals, differentiation and Laplace transform and vector differentiation.
2. Understand the concept of Integral Calculus, Fourier series, differential equations, Laplace transform and vector differentiation.
3. Apply the concepts of Integral Calculus, Fourier series, differential equations, Laplace transform and vector differentiation in different methods.
4. Analyze the concepts of Integral Calculus, Fourier series, differential equations, Laplace transform and vector differentiation in multiple ways.
5. Evaluate different methods of Integral Calculus, Fourier series, differential equations, Laplace transform and vector differentiation in problems.

UNIT I

(18 HOURS)

Integral calculus: Bernouli's Formula, Reduction Formula $\sin^n \theta$, $\cos^n \theta$, $\sin^m \theta \cos^n \theta$ – Simple problems

UNIT II

(18 HOURS)

Fourier Series: Fourier series for functions $(0, 2\pi)$, $(-\pi, \pi)$.

Chapter 4: Section: 4.1, 4.1.1.

UNIT III

(18 HOURS)

Differential Equations: Ordinary Differential Equations: second order non- homogeneous differential equations with constant coefficients of the form $ay'' + by' + cy = X$ where X is of the Form $\cos$ and $\sin$ – Related problems only.

Partial Differential Equations: Formation, complete integrals and general integrals, four standard types and solving Lagrange's linear equation $Pp + Qq = R$.

Chapter 5: Section 5.2.1, Chapter 6: Section 6.1 to 6.4.

UNIT IV

(18 HOURS)

Laplace Transforms: Laplace transformations of standard functions and simple properties, inverse Laplace transforms.

Chapter 7: Section 7.1.1 to 7.1.4 & 7.2 to 7.2.3.

UNIT V

(18 HOURS)

Vector Differentiation: Introduction, Scalar point functions, Vector point functions, vector differential operator Gradient, Divergence, Curl, Solenoidal, irrotational, identities.

Chapter 8: Section 8.1 to 8.4.4.

PRESCRIBED BOOK:

Treatment and content as in “Allied mathematics” – P. Durai Pandian, Dr.S. Udayabaskaran, Volume II, S.Chand and company limited, Reprint 2018

REFERENCE BOOKS:

1. Allied Mathematics, S.G. Venkatachalapathy.
2. P. Kandasamy and K. Thilagavathi, Allied Mathematics Volume II - 2004, S.Chand and Co, New Delhi.
3. Ancillary Mathematics Volume II by Balasubramanian & K. G. Subramanian.

E - LEARNING RESOURCES:

1. <http://www.themathpage.com>
2. <http://nptel.ac.in>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions	1 - 12	3	30
B	Answer any 5 out of 7 questions	13 - 19	6	30
C	Answer any 4 out of 6 questions	20 - 25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	2	2	1
III	2	1	2
IV	3	1	1
V	2	2	1
TOTAL	12	7	6
SECTION A - 12		SECTION B - 7	SECTION C - 6

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	2	2	3
CO 2	3	2	2	3	2
CO 3	3	2	3	3	2
CO 4	2	3	2	2	3
CO 5	2	3	3	3	2
Ave.	2.4	2.6	2.4	2.6	2.4

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Recall the basics of Integrals, differentiation and Laplace transform and vector differentiation.	1-5	K1
CO2	Understand the concept of Integral Calculus, Fourier series, differential equations, Laplace transform and vector differentiation.	1-5	K1, K2
CO3	Apply the concepts of Integral Calculus, Fourier series, differential equations, Laplace transform and vector differentiation in different methods.	1-5	K3
CO4	Analyze the concepts of Integral Calculus, Fourier series, differential equations, Laplace transform and vector differentiation in multiple ways.	1-5	K3, K4
CO5	Evaluate different methods of Integral Calculus, Fourier series, differential equations, Laplace transform and vector differentiation in problems.	1-5	K4, K5

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME:OPEN TO ALL PROGRAMMES EXCEPT B.Sc. COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE	BATCH: 2025 -2028
PART: IV	COURSE COMPONENT: NON-MAJOR ELECTIVE - II
COURSE NAME: DESIGN USING GENERATIVE AI AND OPEN-SOURCE TOOLS	COURSE CODE:
SEMESTER: II	MARKS:100
CREDITS: 2	TOTAL HOURS:30
PRACTICAL	

COURSE OBJECTIVE:

Generative AI tools help in creating new content or data, such as images, videos, music and text without human intervention. This course helps to maximize the productivity and boost creativity effortlessly with free and open AI generative tools.

COURSE OUTCOMES:

1. To Create and understand AI generated Images from prompting
2. To design posters and create social media posts
3. To Create and edit videos online
4. To Formulate and customize logo designs.
5. To Develop effective slide shows using GEN AI tools

LAB EXERCISES:

1. IMG2GO

- ArtGenerator: prompting – transform text to AI gen images
- Work with photo editor:crop and resize images
- Watermark images, convert image to documents, Convert videos to animated gif

2. DESIGNAI

- Create posters, Resize, Design cards, face book posts and Instagram posts, download and share designs

3. KAPWING AND AI STUDIOS

- Create videos from text – images, URLs
- Edit Videos Online.
- Text to Speech features – Choose languages.

4. LOGOMAKER

- Make a Logo – Add Slogans – Customize Designing – download zip files of various logo designs.

5. FREEPIK AND SLIDEGPT

- AI generated Images, Vectors, Icons, Editing and downloading Images
- SlidesGPT: create decks, convert text requests into finished slideshows, download presentations.

E-RESOURCES

Web links

1. <https://www.img2go.com/ai-creator-studio>
2. <https://www.img2go.com/convert-video-to-gif>
3. [https://designs.ai/designmaker/start/search? Category=5d503d6cf8ead94a97909b23
&query=Poster](https://designs.ai/designmaker/start/search?Category=5d503d6cf8ead94a97909b23&query=Poster)
4. <https://www.kapwing.com/>
5. <https://v3.aistudios.com/dashboard>
6. <https://logo.com/>
7. <https://www.freepik.com/ai/images>
8. <https://www.freepik.com/photo-editor/new-artboard>
9. <https://slidesgpt.com/>

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	2	3	2
CO 2	3	1	1	3	1
CO 3	2	1	1	2	1
CO 4	2	2	1	2	2
CO 5	2	1	1	2	1
Ave.	2.6	2.6	2.6	3	2.6

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To Create and understand AI generated Images from prompting	PSO1,PSO2,PSO3, PSO4,PSO5	K1,K3,K5
CO2	To design posters and create social media posts	PSO1,PSO2,PSO3, PSO4,PSO5	K2,K5,K6
CO3	To Create and edit videos online	PSO1,PSO2,PSO3, PSO4,PSO5	K1,K3,5
CO4	To Formulate and customize logo designs.	PSO1,PSO2,PSO3, PSO4,PSO5	K2,K4,K5
CO5	To Develop effective slide shows using GEN AI tools	PSO1,PSO2,PSO3, PSO4,PSO5	K3,K5,K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

SEMESTER - III

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARTIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: CORE – V
COURSE NAME: RELATIONAL DATABASE MANAGEMENT SYSTEM	COURSE CODE:
SEMESTER: III	MARKS:100
CREDITS: 4	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To gain an understanding of the architecture, functioning of Database Management Systems, Apply Normalization techniques to normalize a database, understand the need of transaction processing, learn techniques for controlling the consequences of concurrent data access and understand the use of Structured Query Language (SQL) and its syntax.

COURSE OUTCOMES:

1. To describe basic concepts of database system.
2. To design a Data model and Schemas in RDBMS.
3. To analyze functional dependencies for designing robust Database.
4. To competent in use of SQL.
5. To understand the PL/SQL structure and its elements.

UNIT I

(15 HOURS)

Introduction to DBMS– Data and Information - Database – Database Management System – Objectives - Advantages – Components - Architecture. ER Model: Building blocks of ER Diagram – Relationship Degree – Classification – ER diagram to Tables – ISA relationship – Constraints – Aggregation and Composition – Advantages

UNIT II

(15 HOURS)

Relational Model: CODD's Rule- Relational Data Model - Key - Integrity – Relational Algebra Operations – Advantages and limitations – Relational Calculus – Domain Relational Calculus - QBE. UNIT - III Structure of Relational Database. Introduction to Relational Database Design - Objectives – Tools – Redundancy and Data Anomaly – Functional Dependency - Normalization – 1NF – 2NF – 3NF – BCNF. Transaction Processing – Database Security

UNIT III

(15 HOURS)

Structure of Relational Database. Introduction to Relational Database Design - Objectives – Tools – Redundancy and Data Anomaly – Functional Dependency - Normalization – 1NF – 2NF – 3NF – BCNF. Transaction Processing – Database Security.

UNIT IV**(15 HOURS)**

SQL: Commands – Data types – DDL - Selection, Projection, Join and Set Operations – Aggregate Functions – DML – Modification - Truncation - Constraints – Subquery.

UNIT V**(15 HOURS)**

PL/SQL: Structure - Elements – Operators Precedence – Control Structure – Iterative Control - Cursors - Procedure - Function - Packages – Exceptional Handling - Triggers.

PRESCRIBED BOOKS:

1. S. Sumathi, S. Esakkirajan, “Fundamentals of Relational Database Management System”, Springer International Edition 2007.

REFERENCE BOOKS:

1. Abraham Silberchatz, Henry F. Korth, S. Sudarshan, “Database System Concepts”, McGrawHill 2019, 7th Edition.
2. Alexis Leon & Mathews Leon, “Fundamentals of DBMS”, Vijay Nicole Publications 2014, 2nd Edition

E-LEARNING RESOURCES:

1. <https://logicinaction.org/docs/ch2.pdf>
2. <https://nptel.ac.in/courses/106106093/>
3. <https://cloud.google.com/learn/what-is-a-relational-database>
4. <https://www.oracle.com/in/database/what-is-a-relational-database/>
5. <https://celerdata.com/glossary/relational-database-management-system>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
C	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	2	1	1
III	3	2	1
IV	2	1	2
V	2	2	1
TOTAL	12	7	6
SECTION A – 12		SECTION B – 7	SECTION C – 6

PSO-CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	2	2	3
CO 5	3	2	2	3	3
Ave.	2.8	2.6	2.6	2.6	3

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To implement the various DDL commands.	PSO3, PSO4, PSO5	K3, K5, K6
CO2	To implement the various DML commands.	PSO1, PSO3, PSO4	K1, K2, K3, K5
CO3	To implement queries in SQL to retrieve information from data base.	PSO1, PSO3, PSO4, PSO5	K3, K5, K6
CO4	To implement PL/SQL statements: Exception Handling, Cursors, Triggers.	PSO1, PSO2, PSO4, PSO5	K3, K4, K5, K6
CO5	To develop database applications using front-end tools and back-end.	PSO2, PSO3, PSO4	K3, K5, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARITIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: CORE – VIII
COURSE NAME: PRACTICAL - IV: PL/SQL	COURSE CODE:
SEMESTER: IV	MARKS:100
CREDITS: 4	TOTAL HOURS:75
PRACTICAL	

COURSE OBJECTIVE:

To understand the SQL essentials: DDL, DML, queries, PL/SQL, and database app development.

COURSE OUTCOMES:

1. To implement the various DDL commands.
2. To implement the various DML commands.
3. To implement queries in SQL to retrieve information from data base.
4. To implement PL/SQL statements: Exception Handling, Cursors, Triggers.
5. To develop database applications using front-end tools and back-end.

LAB EXERCISES:

1. DDL commands with constraints.
2. DML Commands with constraints.
3. SQL Queries: Queries, sub queries, Aggregate function
4. PL/SQL: Exceptional Handling
5. PL/SQL: Cursor
6. PL/SQL: Trigger
7. PL/SQL: Packages
8. Design and Develop Application for Library Management
9. Design and Develop Application for Student Mark Sheet Processing
10. Design and Develop Application for Pay Roll Processing

PSO-CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	2	2	3
CO 5	3	2	2	3	3
Ave.	2.8	2.6	2.6	2.6	3

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To implement the various DDL commands.	PSO3, PSO4, PSO5	K3, K5, K6
CO2	To implement the various DML commands.	PSO1, PSO3, PSO4	K1, K2, K3, K5
CO3	To implement queries in SQL to retrieve information from data base.	PSO1, PSO3, PSO4, PSO5	K3, K5, K6
CO4	To implement PL/SQL statements: Exception Handling, Cursors, Triggers.	PSO1, PSO2, PSO4, PSO5	K3, K4, K5, K6
CO5	To develop database applications using front-end tools and back-end.	PSO2, PSO3, PSO4	K3, K5, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARITIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: ALLIED – III
COURSE NAME: STATISTICS – I	COURSE CODE:
SEMESTER: III	MARKS:100
CREDITS: 5	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To provide the Basic Statistical Concept, data Collection and Organization, Probability and Distributions, Data Analysis, Inferential Statistics

COURSE OUTCOMES:

1. To know the uses of statistics in society
2. To organize, manage and present data
3. To analyze the statistical data graphically using frequency distribution and cumulative frequency distribution.
4. To analyze statistical data using measures of central tendency, dispersion and location.
5. To understand correlation between continuous variables and association between categorical variables.

UNIT I

(18 HOURS)

Methods of collection: Complete enumeration – Sample Survey - Primary data - Secondary data sources - Types of variables. Nominal, ordinal and scale data. Presentation of Data: Presentation of data by tables - construction of tables (Univariate and Bivariate) – frequency table and contingency table

UNIT II

(18 HOURS)

Diagrammatic presentation: Line diagram, Bar diagrams: Simple, multiple, subdivided and Percentage-Pie chart, comparative pie chart - Graphical representation of a frequency distribution by histogram and frequency polygon and Ogives

UNIT III

(18 HOURS)

Analysis of Data (Univariate): Measures of central tendency: Arithmetic mean- Median and Mode choice of an average-characteristic of a good average

UNIT IV**(18 HOURS)**

Measures of dispersion: Range-Quartile deviation-mean deviation - standard deviation - relative measures of dispersion - Coefficient of Variance

UNIT V**(18 HOURS)**

Analysis of Data (Bivariate): Correlation- Scatter plot-coefficient of correlation- Pearson's Correlation Coefficient, Spearman's rank correlation coefficient correlation coefficient for bivariate frequency table- Association of attributes: Chi square test of independence of attributes

PRESCRIBED BOOKS:

1. Gupta, S.C and Kapoor, V. K (2002), Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.
2. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.

REFERENCE BOOKS:

1. Irwin Miller, Marylees Miller (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Prentice Hall International INC.
2. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd

E-LEARNING RESOURCES:

1. <https://www.khanacademy.org/math/statistics-probability>
2. <https://www.statcrunch.com/>
3. <https://www.statisticshowto.com/>
4. <https://www.wolframalpha.com/>
5. <https://quizlet.com/>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
C	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	1
II	3	1	1
III	2	1	1
IV	2	2	2
V	2	1	1
TOTAL	12	7	6
SECTION A – 12		SECTION B - 7	SECTION C - 6

PSO-CO MAPPING

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	2	2	2	2
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
Ave.	3	2.8	2.8	2.8	2.8

PSO-CO-question paper mapping

CO No:	COUSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To know the uses of statistics in society	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K3, K6
CO2	To organize, manage and present data.	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K5, K6
CO3	To analyze the statistical data graphically using frequency distribution and cumulative frequency distribution.	PSO1, PSO2, PSO3, PSO4, PSO5	K3, K4, K5, K6
CO4	To analyze statistical data using measures of central tendency, dispersion and location.	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K4, K6
CO5	To understand correlation between continuous variables and association between categorical variables.	PSO1, PSO2, PSO3, PSO4, PSO5	K3, K4, K5, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

SEMESTER - IV

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARITIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: CORE – I
COURSE NAME: INTRODUCTION TO ARTIFICIAL INTELLIGENCE	COURSE CODE:
SEMESTER: IV	MARKS:100
CREDITS: 4	TOTAL HOURS: 90
THEORY	

COURSE OBJECTIVE:

This course introduces foundations of AI and its foundations, basic principles of AI toward problem solving, inference, perception, Knowledge representation, and learning

COURSE OUTCOMES:

1. Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
2. To Apply basic principles of AI in solutions that require problem solving, write, compile and debug programs in AI development tools such as anProlog
3. To Demonstrate awareness and a fundamental understanding of various applications of AI techniques
4. To demonstrate proficiency developing applications in Prolog
5. Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications

UNIT I

(18 HOURS)

Introduction, growth and Applications of AI

What Is Artificial Intelligence? Brain Science and Problem Solving, The Turing Test and Chatterbots-The History of AI: The First Beginnings, Logic Solves (Almost) All Problems, The New Connectionism, Reasoning Under Uncertainty, distributed; Autonomous and Learning Agents, AI Grows Up-The AI Revolution: AI and Society, Does AI Destroy Jobs? - Agents Knowledge - Based Systems

UNIT II

(18 HOURS)

Propositional logic: Reasoning in Daily Life-Inference Patterns, Validity, and Invalidity-Classification, Consequence, and Update-The Language of Propositional Logic: From natural language to logical notation, Inclusive and exclusive disjunction, implications, Double implications, Ambiguity - Semantic Situations, Truth Tables, Binary Arithmetic, Tautology, Contradiction, conjunctive normal form, equivalence of propositions

UNIT III**(18 HOURS)**

First-Order Predicate Logic Inference rules: Modus Ponens, Modus Tollens, Hypothetical Syllogism, Disjunctive Syllogism, Addition, Simplification, Resolution - Quantifiers in First-order logic - Properties of Quantifiers-Free and Bound Variables-Inference in First-Order Logic: FOL inference rules for quantifier: Universal Generalization, Universal Instantiation, Existential Instantiation, Existential introduction - Unification: Conditions for Unification, Unification Algorithm- Resolution: Steps for Resolution - Forward Chaining and backward chaining

UNIT IV**(18 HOURS)**

Prolog: Why prolog for AI- Rules- Syntax- Constants- variables- characters - operators- Equality & unification -Arithmetic's - Satisfying goals

UNIT V**(18 HOURS)**

Data structures in Prolog: Trees- lists- Recursive search- Mapping- Recursive Comparison- Joining Structures - Accumulators (VS)Difference structures - Backtrack: Multiple solutions- The 'Cut': Uses of Cut- problems with Cut

PRESCRIBED BOOKS:

1. Introduction to Artificial Intelligence, Wolfgang Erte, Springer, Cham
2. Programming in Prolog, W.F. Clocksin, C.S. Mellish. -5th edition Springer

REFERENCE BOOKS:

1. Artificial Intelligence for Dummies, John Paul Mueller, Luca Massaron: Dummies
2. Artificial Intelligence: A Modern Approach.Stuart Russell, Peter Norvig;Prentice Hall
3. PROLOG: Programming for Artificial Intelligence, BRATKO,Pearson
4. Prolog by Example: by Helder Coelho, Jose C. Cotta, Springer
5. Artificial Intelligence for Humans, Volume 1: Fundamental Algorithms, Jeff Heaton,

E-LEARNING RESOURCES:

1. <https://logicinaction.org/docs/ch2.pdf>
2. <https://www.computer.org/resources/ai-resources>
3. <https://or.niscpr.res.in/index.php/ALIS/article/view/9071>
4. <https://jpl-nasa.libguides.com/subject-guides/artificial-intelligence-ai/ebooks>
5. <https://soas.libguides.com/c.php?g=704522&p=5135027>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
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C	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	2	1	1
III	3	2	1
IV	2	1	2
V	2	2	1
TOTAL	12	7	6
SECTION A - 12		SECTION B - 7	SECTION C – 6

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	2	2	3
CO 5	3	2	2	3	3
Ave.	2.8	2.6	2.6	2.6	3

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.	PSO1, PSO2, PSO3 PSO4, PSO5	K1, K2, K3
CO2	To Apply basic principles of AI in solutions that require problem solving, write, compile and debug programs in AI development tools such as anProlog	PSO1, PSO2, PSO3 PSO4, PSO5	K2, K3, K4, K5
CO3	To Demonstrate awareness and a fundamental understanding of various applications of AI techniques	PSO1, PSO2, PSO3 PSO4, PSO5	K3, K4, K5, K6
CO4	To demonstrate proficiency developing applications in Prolog	PSO1, PSO2, PSO3 PSO4, PSO5	K4, K5, K6
CO5	Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications	PSO1, PSO2, PSO3 PSO4, PSO5	K2, K3, K4, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARITIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: CORE - II
COURSE NAME: PRACTICAL - IV: PROLOG	COURSE CODE:
SEMESTER: II	MARKS:100
CREDITS: 4	TOTAL HOURS:60
PRACTICAL	

COURSE OBJECTIVE:

This course gives a formal logic, associated forms of programming, Reasoning modelling, Interpret the logical consequences, validity of formulae using the rules of propositional and predicate logic

COURSE OUTCOMES:

1. Demonstrate Logic Programming Paradigm, Prolog execution models, Prolog's basic and advanced prolog concepts such as LIST, CUT, and Fail using illustrative programming examples
2. Convert world knowledge into FOPL formula and construct well-crafted prolog programmes of moderate size
3. Apply truth functional propositional Logic (PL) and first order predicate logic (FOPL) to world knowledge
4. Describe the basic predicates to manipulate list data structure and sorting algorithms using PROLOG programming
5. To assess the completeness of Resolution Procedure, Soundness and completeness of Linear Resolution, Unification and Selective Linear Definite Resolution

LAB EXERCISES:

1. Check if the predicate functor Term, F, A) succeeds if Term has functor F and arity A by defining a functor
2. Find the number of elements of a list (with size >1) and remove the middle element (at position size//2)
3. Create a list containing all integers within a given range and reverse the list
4. Write a function append to concatenate elements of two lists into a third list
5. Write a predicate table/3 which prints the truth table of a given logical expression in two variables
6. Write a Prolog program using (;) operator to decide whether or not any number was between two other numbers (i.e., to check if number N is between two numbers N1 and N2 if either N is greater than N1 and N is less than N2 or N is less than N1 or N is greater than N2.)
7. Write a Prolog function to find the factorial of a number

8. Query if an element is a member of a list, (using member predicate). To the in-built select function pass a member of the list and return the remainder of the list
9. Demonstrate the use of built-in predicate function find all in a program
10. Evaluate mathematical expressions involving power(**), integer division(/), mod, sqrt and the other basic math operations(+, -, *, %)
11. Use conditions to check the greatest of given two numbers in the stdin/input (not using the max operator)
12. Check the negation of the goal using \+ operator
13. Define a new infix operator is bigger to compare the size of two animals mentioned in the facts

PSO-CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	2	3	3
CO 2	2	2	2	2	3
CO 3	2	3	3	3	3
CO 4	2	3	3	2	2
CO 5	3	3	3	3	3
Ave.	2.4	2.8	2.6	2.6	2.8

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Demonstrate Logic Programming Paradigm, Prolog execution models, Prolog's basic	PSO3, PSO4, PSO5	K3, K5, K6
CO2	Convert world knowledge into FOPL formula and construct well-crafted prolog programmes	PSO1, PSO3, PSO4	K1, K2, K3, K5
CO3	Apply truth functional propositional Logic (PL) and first order predicate logic (FOPL) to world knowledge	PSO1, PSO3, PSO4, PSO5	K3, K5, K6
CO4	Describe the basic predicates to manipulate list data structure and sorting algorithms	PSO1, PSO2, PSO4, PSO5	K3, K4, K5, K6
CO5	To assess the completeness of Resolution Procedure, Soundness and completeness of Linear Resolution	PSO2, PSO3, PSO4	K3, K5, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARITIFICAL INTELLIGENCE	BATCH: 2025 – 2028
PART: III	COURSE COMPONENT: ALLIED – IV
COURSE NAME: STATISTICS - II	COURSE CODE:
SEMESTER: IV	MARKS:100
CREDITS: 5	TOTAL HOURS: 90
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To improve basics in mathematical and analytical skills.

COURSE OUTCOMES:

1. Understand Probability and its properties.
2. Learn characteristics of different discrete and continuous distributions.
3. Know situation to which different distributions can be applied.
4. Comprehend the Sampling distributions.
5. Learn how to apply statistical tests to get information from data.

UNIT I

(18 HOURS)

Basic concepts of Probability: Random Experiments, Sample space, Trial, Events, - Classical and empirical approach to probability and their limitations –Types of events: Exhaustive, mutually exclusive, equally likely and independent events - Axiomatic approach to probability - Basic theorems on probability using axiomatic approach. Bayes Theorem (statement only)

UNIT II

(18 HOURS)

Discrete probability mass function, cumulative distribution function - Theory and problems based on it. Bernoulli distribution, Binomial Distribution and Poisson Distribution

UNIT III

(18 HOURS)

Continuous probability density function, cumulative distribution function - Theory and problems based on it. Normal Distribution and its properties, Standard Normal distribution, Problems based on it. Exponential Distribution

UNIT IV

(18 HOURS)

Introduction of Sampling distributions- student's t and chi-square distributions, distribution of sample means from normal distribution. Density function and Properties only

UNIT V**(18 HOURS)**

Testing of Hypothesis, Single mean test and double means test based on normal distribution and students t-distribution. Proportion test, Chi-square test, ANOVA test

PRESCRIBED BOOK:

1. Gupta S. C. and Kapoor, V. K. (2002), *Fundamentals of Mathematical Statistics*, Sultan Chand and Sons, New Delhi.
2. Goon A. M., Gupta M. K. and Dasgupta B. (2002): *Fundamentals of Statistics*, Vol. I & II, 8th Edn. The World Press, Kolkata.

REFERENCE BOOKS:

1. Irwin Miller, Marylees Miller (2006): *John E. Freund's Mathematical Statistics with Applications*, (7th Edn.), Prentice Hall International INC
2. Mood, A. M., Graybill, F. A. and Boes, D. C. (2007): *Introduction to the Theory of Statistics*, 3rd Edition., (Reprint), Tata McGraw-Hill Pub. Co. Ltd
3. Saxena H. C.: *Elementary Statistics*. S. Chand & Co., 2009.

E - LEARNING RESOURCES:

1. https://ia801306.us.archive.org/5/items/MIT18.01JF07/ocw-18.01-f07-lec11_300k.mp4
2. <https://nptel.ac.in/courses/111107107>
3. <https://nptel.ac.in/courses/111106146>

GUIDELINES TO THE QUESTION PAPER SETTERS**QUESTION PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions	1 - 12	3	30
B	Answer any 5 out of 7 questions	13 - 19	6	30
C	Answer any 4 out of 6 questions	20 - 25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	1
II	3	1	1
III	2	1	2
IV	3	1	1
V	2	2	1
TOTAL	12	7	6
SECTION A - 12		SECTION B - 7	SECTION C - 6

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	2	2	3
CO 2	3	2	2	3	2
CO 3	3	2	3	3	2
CO 4	2	3	2	2	3
CO 5	2	3	3	3	2
Ave.	2.4	2.6	2.4	2.6	2.4

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Understand Probability and its properties.	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K3, K6
CO2	Learn characteristics of different discrete and continuous distributions.	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K5, K6
CO3	Know situation to which different distributions can be applied.	PSO1, PSO2, PSO3, PSO4, PSO5	K3, K4, K5, K6
CO4	Comprehend the Sampling distributions.	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K4, K6
CO5	Learn how to apply statistical tests to get information from data.	PSO1, PSO2, PSO3, PSO4, PSO5	K3, K4, K5, K6

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

COURSE OBJECTIVE:

PROGRAMME: ALL UG	BATCH: 2025 - 2028
PART: IV	COURSE COMPONENT: EVS
COURSE NAME: ENVIRONMENTAL STUDIES	COURSE CODE:
SEMESTER: IV	MARKS:100
CREDITS: 2	TOTAL HOURS: 30
THEORY	

To make students realize the importance of Environmental Studies.

COURSE OUTCOMES:

1. Understand the multidisciplinary nature, scope, and importance of environmental studies, emphasizing public awareness.
2. Recognize the challenges associated with natural resources and propose sustainable management solutions.
3. Comprehend the structure and function of ecosystems and identify different types of ecosystems.
4. Appreciate biodiversity, its value, threats, and conservation strategies, with a focus on India.
5. Gain insight into environmental pollution, its causes, effects, and mitigation measures, including disaster management.

UNIT 1:

The Multidisciplinary nature of environmental studies Definition; Scope and importance, Need for public awareness.

UNIT 2:

Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems.

a) Forest resources: Use and Over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water dams benefits and problems.

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. - Role of an individual in conservation of natural resources. - Equitable use of resources for sustainable lifestyles.

UNIT 3:

Ecosystems - Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem.

- Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem: -

a. Forest ecosystem

b. Grassland ecosystem

c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT 4:

Biodiversity and its Conservation

- Introduction-Definition: genetic, species and ecosystem diversity.
- Biogeographical classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT 5: Environmental Pollution: Definition - Causes, effects and control measures of: -

a. Air pollution

b. Water pollution

c. Soil pollution

d. Marine pollution

e. Noise pollution

f. Thermal pollution

g. Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.

QUESTION PAPER PATTERN: MCQ

SEMESTER - V

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARITIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: CORE – IX
COURSE NAME: COMPUTER VISION	COURSE CODE:
SEMESTER: V	MARKS:100
CREDITS: 3	TOTAL HOURS:75
THEORY	

COURSE OBJECTIVE:

This course introduces the fundamentals of image formation ideas, methods, techniques of computer vision and pattern recognition

COURSE OUTCOMES:

1. To identify basic concepts, terminology, theories, models and methods in the field of computer vision
2. To describe known principles of human visual system
3. To describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition
4. To Suggest a design of a computer vision system for a specific problem
5. To apply active appearance and shape the models of faces Application

UNIT I

(15 HOURS)

Introduction: Image Processing, Computer Vision and Computer Graphics, what is Computer Vision - Low-level, Mid-level, High-level, Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality

UNIT II

(15 HOURS)

Digital Image Formation and low-level processing: Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing

UNIT III

(15 HOURS)

Feature Extraction & Image Segmentation: Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Gabor Filters and DWT; Image Segmentation: Contour based representation, Region based representation, Level set representations, Fourier and wavelet descriptors, Multi resolution analysis

UNIT IV**(15 HOURS)**

Pattern & Motion Analysis: Clustering: K-Means, K-Medoids, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, Dimensionality Reduction: LDA, ICA, Background Subtraction and Modeling, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation

UNIT V**(15 HOURS)**

Applications: Photo album – Face detection – Face recognition – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – tracking and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians

PRESCRIBED BOOKS:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.

REFERENCE BOOKS:

1. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003.
2. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
3. 3. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006
4. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012
5. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012
6. Mark Nixon and Alberto S. Aquado, Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.

E-LEARNING RESOURCES:

1. <https://viso.ai/blog/>
2. <https://learnopencv.com/>
3. <https://www.analyticsvidhya.com/blog/>
4. <https://www.rsipvision.com/rsip-vision-learns/>
5. <https://link.springer.com/referencework/10.1007/978-3-030-63416-2>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
C	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	2	1	1
III	3	2	1
IV	2	1	2
V	2	2	1
TOTAL	12	7	6
SECTION A - 12		SECTION B - 7	SECTION C - 6

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	2	2	3
CO 5	3	2	2	3	3
Ave.	2.8	2.6	2.6	2.6	3

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To identify basic concepts, terminology, theories, models and methods in the field of computer vision	PSO1, PSO2, PSO3 PSO4, PSO5	K1, K2, K3
CO2	To describe known principles of human visual system	PSO1, PSO2, PSO3 PSO4, PSO5	K2, K3, K4, K5
CO3	To describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition	PSO1, PSO2, PSO3 PSO4, PSO5	K3, K4, K5, K6
CO4	To Suggest a design of a computer vision system for a specific problem	PSO1, PSO2, PSO3 PSO4, PSO5	K4, K5, K6
CO5	To apply active appearance and shape the models of faces Application	PSO1, PSO2, PSO3 PSO4, PSO5	K2, K3, K4, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARITIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: CORE – X
COURSE NAME: PRACTICAL – V: COMPUTER VISION	COURSE CODE:
SEMESTER: V	MARKS:100
CREDITS: 3	TOTAL HOURS:60
PRACTICAL	

COURSE OBJECTIVE:

This course to understand a digital images, manipulating one pixel at a time, Pixel transformations, geometric operations

COURSE OUTCOMES:

1. To implement Spatial Operations in Image Processing
2. To implement the Image Gradients and Edge Detection Techniques
3. To apply extraction of desired features
4. To Implement object detection
5. To apply the Pixel Transformations, geometric Operations

LAB EXERCISES:

1. Perform the image transformations that include the geometric and morphological transformations.
2. Perform the image enhancement by applying contrast limited adaptive histogram Equalization
3. Perform the Contours and Region based segmentation in images
4. Perform the Wavelet Transforms on image using PyWavelets
5. Perform the K-Means clustering for Image segmentation using CV2 library.
6. Perform basic motion detection and tracking using python and OpenCV
7. Perform face detection using OpenCV library
8. Perform Foreground Extraction in an image
9. Perform Pedestrian Detection using OpenCV and Python

PSO-CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	2	2	3
CO 2	3	2	2	3	2
CO 3	3	2	3	3	2
CO 4	2	3	2	2	3
CO 5	2	3	3	3	2
Ave.	2.4	2.6	2.4	2.6	2.4

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To implement Spatial Operations in Image Processing	PSO3, PSO4, PSO5	K3, K5, K6
CO2	To implement the Image Gradients and Edge Detection Techniques	PSO1, PSO3, PSO4	K1, K2, K3, K5
CO3	To apply extraction of desired features	PSO1, PSO3, PSO4, PSO5	K3, K5, K6
CO4	To Implement object detection	PSO1, PSO2, PSO4, PSO5	K3, K4, K5, K6
CO5	To apply the Pixel Transformations, geometric Operations	PSO2, PSO3, PSO4	K3, K5, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARITIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: CORE - XI
COURSE NAME: NATURAL LANGUAGE PROCESSING	COURSE CODE:
SEMESTER: V	MARKS:100
CREDITS:3	TOTAL HOURS:75
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To grasp the significance of natural language processing in solving real-world problems, appropriate processing technique to a problem and implement the technique.

COURSE OUTCOMES:

1. Describe the fundamental concepts and techniques of natural language processing
2. Distinguish among the various techniques, taking into account the assumptions, strengths, and weaknesses of each
3. Use appropriate descriptions, visualizations, and statistics to communicate the problems and their solutions
4. Analyze large volume text data generated from a range of real-world applications.
5. To demonstrate required design skills for large collection sets with the theoretical formulation of the natural language processing techniques.

UNIT I

(15 HOURS)

Introduction: Overview: Origins and challenges of NLP- Theory of Language Features of Indian Languages – Issues in Font –Models and Algorithms- NLP Applications.

UNIT II

(15 HOURS)

Morphology and Parts-of-Speech: Phonology – Computational Phonology - Words and Morphemes – Segmentation – Categorization and Lemmatisation – Word Form Recognition – Valency - Agreement - Regular Expressions – Finite State Automata – Morphology- Morphological issues of Indian Languages – Transliteration.

UNIT III

(15 HOURS)

Probabilistic Models: Probabilistic Models of Pronunciation and Spelling - Weighted Automata - N- Grams - Corpus Analysis - Smoothing - Entropy - Parts-of-Speech - Taggers - Rule based - Hidden Markov Models - Speech Recognition.

UNIT IV

(15 HOURS)

Syntax: Basic Concepts of Syntax – Parsing Techniques – General Grammar rules for Indian Languages – Context Free Grammar – Parsing with Context Free Grammars – Top-Down Parser – Earley Algorithm – Features and Unification - Lexicalised and Probabilistic Parsing.

UNIT V

(15 HOURS)

Semantics and Pragmatics: Representing Meaning - Computational Representation - Meaning Structure of Language - Semantic Analysis - Lexical Semantics - WordNet - Pragmatics - Discourse - Reference Resolution - Text Coherence - Dialogue Conversational Agents

PRESCRIBED BOOK:

1. Ronald Hausser, “Foundations of Computational Linguistics”, Springer-Verleg, 1999.

REFERENCE BOOKS:

1. Daniel Jurafsky and James H. Martin “Speech and Language Processing”, Prentice Hall, 2009.
2. Christopher D.Manning and Hinrich Schutze, “Foundation of Statistical Natural Language Processing”, MIT Press, 1999.
3. James Allen, “Natural Language Understanding”, Benjamin/Cummings Publishing Co. 1995.
4. Applied Natural Language Processing with Python: Implementing Machine Learning and Deep Learning Algorithms for Natural Language Processing, By Taweh Beysolow II, September 2018

E - LEARNING RESOURCES:

1. <https://blog.algorithmia.com/introduction-natural-language-processingnlp/>
2. <https://www.udacity.com/course/natural-language-processingnanodegree--nd892>
3. <https://www.coursera.org/learn/language-processing>
4. <https://towardsdatascience.com/a-practitioners-guide-to-naturallanguage-processing-part-i-processing-understanding-text-9f4abfd13e72>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions	1 - 12	3	30
B	Answer any 5 out of 7 questions	13 - 19	6	30
C	Answer any 4 out of 6 questions	20 - 25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	12	7	6
SECTION A - 12		SECTION B – 7	SECTION C - 6

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	2	2	3
CO 2	3	2	2	3	2
CO 3	3	2	3	3	2
CO 4	2	3	2	2	3
CO 5	2	3	3	3	2
Ave.	2.4	2.6	2.4	2.6	2.4

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Describe the fundamental concepts and techniques of natural language processing	1-5	K1
CO2	Distinguish among the various techniques, taking into account the assumptions, strengths, and weaknesses of each	1-5	K1,K2
CO3	Use appropriate descriptions, visualizations, and statistics to communicate the problems and their solutions	1-5	K3
CO4	Analyze large volume text data generated from a range of real-world applications.	1-5	K3,K4
CO5	To demonstrate required design skills for large collection sets with the theoretical formulation of the natural language processing techniques.	1-5	K4,K5

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

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARITIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: CORE - XII
COURSE NAME: PRACTICAL – VI: NATURAL LANGUAGE PROCESSING	COURSE CODE:
SEMESTER: V	MARKS:100
CREDITS: 3	TOTAL HOURS:75
PRACTICAL	

COURSE OBJECTIVE:

To understand the algorithms for the processing of linguistic information, computational properties of natural languages, conceive basic knowledge on various morphological, syntactic and semantic NLP tasks

COURSE OUTCOMES:

1. To describe the concepts of morphology, syntax, semantics, discourse & pragmatics of natural language
2. To demonstrate understanding of the relationship between NLP and statistics & machine learning
3. To discover various linguistic and statistical features relevant to the basic NLP task, namely, spelling correction, morphological analysis, parts-of-speech tagging, parsing and semantic analysis
4. To develop systems for various NLP problems with moderate complexity
5. To familiarize various NLP software libraries and datasets

LAB EXERCISES:

1. How to tokenize a given text?
2. How to get the sentences of a text document?
3. How to tokenize text with stop words as delimiters?
4. How to remove stop words and punctuations in a text?
5. How to perform stemming? 6. How to lemmatize a given text?
7. How to extract usernames from emails?
8. How to find the most common words in the text excluding stop words?
9. How to do spell correction in a given text?

10. How to classify a text as positive/negative sentiment?
11. How to extract Noun and Verb phrases from a text?
12. How to find the ROOT word of any word in a sentence?
13. Write a Python program to load the iris data from a given csv file into a Data frame and print the shape of the data, type of the data and first 3 rows.
14. Write a Python NLTK program to find the sets of synonyms and antonyms of a given word.
15. Write a Python NLTK program to print the first 15 random combine labelled male and labelled female names from names corpus.

PRESCRIBED BOOKS

1. Jurafsky Dan and Martin James H. “Speech and Language Processing”,3rdEdition, 2018.

REFERENCE BOOKS:

1. Jurafsky D. and Martin J. H., “Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, 2nd Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.
2. Goldberg Yoav “A Primer on Neural Network Models for Natural LanguageProcessing”.
3. Natural Language Processing with Python, Steven Bird, Ewan Klein, and EdwardLoper

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	2	2	3
CO 2	3	2	2	3	2
CO 3	3	2	3	3	2
CO 4	2	3	2	2	3
CO 5	2	3	3	3	2
Ave.	2.4	2.6	2.4	2.6	2.4

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To describe the concepts of morphology, syntax, semantics, discourse & pragmatics of natural language	PSO1,PSO2,PSO3, PSO4,PSO5	K1,K3,K5
CO2	To demonstrate understanding of the relationship between NLP and statistics & machine learning	PSO1,PSO2,PSO3, PSO4,PSO5	K2,K5,K6
CO3	To discover various linguistic and statistical features relevant to the basic NLP task, namely, spelling correction, morphological analysis, parts-of-speech tagging, parsing and semantic analysis	PSO1,PSO2,PSO3, PSO4,PSO5	K1,K3,5
CO4	To develop systems for various NLP problems with moderate complexity	PSO1,PSO2,PSO3, PSO4,PSO5	K2,K4,K5
CO5	To familiarize various NLP software libraries and datasets	PSO1,PSO2,PSO3, PSO4,PSO5	K3,K5,K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: OPEN TO ALL PROGRAMMES EXCEPT B.Sc. COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: ELECTIVE– I (Interdisciplinary Elective)
COURSE NAME: ETHICS OF ARTIFICIAL INTELLIGENCE	COURSE CODE:
SEMESTER: V	MARKS:100
CREDITS: 5	TOTAL HOURS: 75
THEORY	

COURSE OBJECTIVE:

To grasp the significance of natural language processing in solving real-world problems, Perspectives on Ethics of AI appropriate processing technique to a problem and implement the technique.

COURSE OUTCOMES:

1. Understand the Ethical Foundations of AI
2. Apply Ethical Frameworks and Models
3. Evaluate Accountability and Social Issues in AI
4. Explore Ethical Perspectives and Approaches
5. Apply Ethical Principles to Real-World Scenarios

UNIT I

(15 HOURS)

Introduction to Ethics of AI: Role of Artificial Intelligence in Human Life, Understanding Ethics, Why Ethics in AI? Ethical Considerations of AI, Current Initiatives in AI and Ethics, Ethical Issues with our relationship with artificial Entities

UNIT II

(15 HOURS)

Framework And Models: AI Governance by Human-right centered design, Normative models, Role of professional norms, Teaching Machines to be Moral

UNIT III:

(15 HOURS)

Concepts And Issues: Accountability in Computer Systems, Transparency, Responsibility and AI. Race and Gender, AI as a moral right-holder

UNIT IV:**(15 HOURS)**

Perspectives And Approaches: Perspectives on Ethics of AI, integrating ethical values and economic value, Automating origination, AI a Binary approach, Machine learning values, Artificial Moral Agents

UNIT V:**(15 HOURS)**

Cases And Application: Ethics of Artificial Intelligence in Transport, Ethical AI in Military, Biomedical research, Patient Care, Public Health, Robot Teaching, Pedagogy, Policy, Smart City Ethics

PRESCRIBED BOOKS

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

REFERENCE BOOKS:

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

E-RESOURCES

1. <https://arxiv.org/abs/1907.07892>
2. <https://academic.oup.com/book/46748?login=false>
3. <https://www.scu.edu/ethics/all-about-ethics/>
4. <https://aiindex.stanford.edu/>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions	1 - 12	3	30
B	Answer any 5 out of 7 questions	13 - 19	6	30
C	Answer any 4 out of 6 questions	20 - 25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	12	7	6
SECTION A – 12		SECTION B - 7	SECTION C - 6

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	2	2	3
CO 2	3	2	2	3	2
CO 3	3	2	3	3	2
CO 4	2	3	2	2	3
CO 5	2	3	3	3	2
Ave.	2.4	2.6	2.4	2.6	2.4

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To describe the concepts of morphology, syntax, semantics, discourse & pragmatics of natural language	PSO1,PSO2,PSO3, PSO4,PSO5	K1,K3,K5
CO2	To demonstrate understanding of the relationship between NLP and statistics & machine learning	PSO1,PSO2,PSO3, PSO4,PSO5	K2,K5,K6
CO3	To discover various linguistic and statistical features relevant to the basic NLP task, namely, spelling correction, morphological analysis, parts-of-speech tagging, parsing and semantic analysis	PSO1,PSO2,PSO3, PSO4,PSO5	K1,K3,5
CO4	To develop systems for various NLP problems with moderate complexity	PSO1,PSO2,PSO3, PSO4,PSO5	K2,K4,K5
CO5	To familiarize various NLP software libraries and datasets	PSO1,PSO2,PSO3, PSO4,PSO5	K3,K5,K6

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

PROGRAMME: B.Sc. COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: ELECTIVE – II
COURSE NAME: COMPUTER NETWORKS	COURSE CODE:
SEMESTER: V	MARKS:100
CREDITS: 5	TOTAL HOURS:75
THEORY	

COURSE OBJECTIVE:

To understand the concept of Data communication and Computer network with a knowledge on routing algorithms, networking and inter networking devices, Security over Network communication

COURSE OUTCOMES:

1. To Understand the basics of Computer Network architecture, OSI and TCP/IP reference models
2. To gain knowledge on Telephone systems and Satellite communications
3. To impart the concept of Elementary data link protocols
4. To analyse the characteristics of Routing and Congestion control algorithms
5. To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS

UNIT I (15 HOURS)

Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP Models – Example Networks: Internet, ATM, Ethernet and Wireless LANs - Physical Layer – Theoretical Basis for Data Communication - Guided Transmission Media

UNIT II (15 HOURS)

Wireless Transmission - Communication Satellites – Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues – Error Detection and Correction.

UNIT III (15 HOURS)

Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols – Bluetooth

UNIT IV**(15 HOURS)**

Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols.

UNIT V**(15 HOURS)**

Transport Layer - Services - Connection Management - Addressing, Establishing and Releasing a Connection – Simple Transport Protocol – Internet Transport Protocols (ITP) - Network Security: Cryptography.

PRESCRIBED BOOKS

1. S. Tanenbaum, “Computer Networks”, 4th Edition, Prentice-Hall of India, 2008.

REFERENCE BOOKS

1. B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, 4th Edition, 2015.
2. F. Halsall, “Data Communications, Computer Networks and Open Systems”, Pearson Education, 2008.
3. D. Bertsekas and R. Gallager, “Data Networks”, 2nd Edition, PHI, 2008.
4. Lamarca, “Communication Networks”, Tata McGraw- Hill, 2002

E-RESOURCES

1. <https://open.umn.edu/opentextbooks/textbooks/771>
2. https://www.youtube.com/playlist?list=PLBlnK6fEyqRjN2Plz5_mq1O6Kkxrth3nG
3. <https://www.computernetworkingnotes.com/>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions	1 - 12	3	30
B	Answer any 5 out of 7 questions	13 - 19	6	30
C	Answer any 4 out of 6 questions	20 - 25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	12	7	6
SECTION A - 12		SECTION B - 7	SECTION C - 6

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	2	2	3
CO 2	3	2	2	3	2
CO 3	3	2	3	3	2
CO 4	2	3	2	2	3
CO 5	2	3	3	3	2
Ave.	2.4	2.6	2.4	2.6	2.4

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To describe the concepts of morphology, syntax, semantics, discourse & pragmatics of natural language	PSO1,PSO2,PSO3, PSO4,PSO5	K1,K3,K5
CO2	To demonstrate understanding of the relationship between NLP and statistics & machine learning	PSO1,PSO2,PSO3, PSO4,PSO5	K2,K5,K6
CO3	To discover various linguistic and statistical features relevant to the basic NLP task, namely, spelling correction, morphological analysis, parts-of-speech tagging, parsing and semantic analysis	PSO1,PSO2,PSO3, PSO4,PSO5	K1,K3,5
CO4	To develop systems for various NLP problems with moderate complexity	PSO1,PSO2,PSO3, PSO4,PSO5	K2,K4,K5
CO5	To familiarize various NLP software libraries and datasets	PSO1,PSO2,PSO3, PSO4,PSO5	K3,K5,K6

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

PROGRAMME: B.Sc. COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: ELECTIVE – II
COURSE NAME: SOFTWARE ENGINEERING	COURSE CODE:
SEMESTER: V	MARKS:100
CREDITS: 5	TOTAL HOURS: 75
THEORY	

COURSE OBJECTIVE:

To introduce the software development life cycles, concepts related to structured and objected oriented analysis & design

COURSE OUTCOMES:

1. The students should be able to specify software requirements, design the software using tools
2. To write test cases using different testing techniques
3. To introduce the software development life cycles
4. To introduce concepts related to structured and objected oriented analysis & design co
5. To provide an insight into UML and software testing techniques

UNIT I

(15 Hours)

Introduction - Evolution - Software Development projects - Emergence of Software Engineering. Software Life cycle models - Waterfall model - Rapid Application Development - Agile Model - Spiral Model

UNIT II

(15 Hours)

Requirement Analysis and Specification - Gathering and Analysis - SRS - Formal System Specification

UNIT III:

(15 Hours)

Software Design - Overview - Characteristics - Cohesion & Coupling - Layered design - Approaches. Function Oriented Design - Structured Analysis - DFD - Structured Design - Detailed design

UNIT IV:

(15 Hours)

Object Modeling using UML – OO concepts – UML – Diagrams – Use case, Class, Interaction, Activity, State Chart – Postscript

UNIT V:**(15 Hours)**

Coding & Testing - coding – Review - Documentation - Testing - Black-box, White-box, Integration, OO Testing, Smoke testing

PRESCRIBED BOOKS

1. Rajib Mall, “Fundamentals of Software Engineering”, PHI 2018, 5th Edition.

REFERENCE BOOKS

1. Roger S. Pressman, “Software Engineering - A Practitioner’s Approach”, McGraw Hill 2010, 7th Edition.

2. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Narosa Publishing House 2011, 3rd Edition.

E-RESOURCES

1. <https://www.geeksforgeeks.org/software-engineering/>
2. https://www.tutorialspoint.com/software_engineering/index.htm
3. <https://www.coursera.org/specializations/software-engineering>
4. <https://www.khanacademy.org/computing>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
C	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	2	1	1
III	3	2	1
IV	2	1	2
V	2	2	1
TOTAL	12	7	6
SECTION A - 12		SECTION B - 7	SECTION C - 6

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	2	2	3
CO 2	3	2	2	3	2
CO 3	3	2	3	3	2
CO 4	2	3	2	2	3
CO 5	2	3	3	3	2
Ave.	2.4	2.6	2.4	2.6	2.4

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	The students should be able to specify software requirements, design the software using tools	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K3, K5
CO2	To write test cases using different testing techniques	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K5, K6
CO3	To introduce the software development life cycles	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K3, K5
CO4	To introduce concepts related to structured and objected oriented analysis & design co	PSO1, PSO2, PSO3, PSO4, PSO5	K2, K4, K5
CO5	To provide an insight into UML and software testing techniques	PSO1, PSO2, PSO3, PSO4, PSO5	K3, K5, K6

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

PROGRAMME: B.Sc. COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: ELECTIVE – II
COURSE NAME: BIG DATA ANALYTICS	COURSE CODE:
SEMESTER: V	MARKS:100
CREDITS: 5	TOTAL HOURS:75
THEORY	

COURSE OBJECTIVE:

To know the fundamental concepts of big data and analytics, explore tools and practices for working with big data

COURSE OUTCOMES:

1. Work with big data tools and its analysis techniques
2. Analyze data by utilizing clustering and classification algorithms
3. Learn and apply different mining algorithms and recommendation systems for large volumes of data
4. Perform analytics on data streams
5. Learn NoSQL databases and management

UNIT I

(15 Hours)

Introduction to Big Data: Evolution of Big data - Best Practices for Big data Analytics - Big data characteristics - Validating - The Promotion of the Value of Big Data - Big Data Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value - Understanding Big Data Storage - A General Overview of High-Performance Architecture - HDFS - MapReduce and YARN - Map Reduce Programming Model

UNIT II

(15 Hours)

Clustering and Classification: Advanced Analytical Theory and Methods: Overview of Clustering - K-means - Use Cases - Overview of the Method - Determining the Number of Clusters - Diagnostics - Reasons to Choose and Cautions. Classification: Decision Trees - Overview of a Decision Tree - The General Algorithm - Decision Tree Algorithms - Evaluating a Decision Tree - Decision Trees in R - Naïve Bayes - Bayes? Theorem - Naïve Bayes Classifier

UNIT III:

(15 Hours)

Association and Recommendation System: Advanced Analytical Theory and Methods: Association Rules - Overview - Apriori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Finding Association& finding similarity - Recommendation System: Collaborative Recommendation- Content Based Recommendation - Knowledge Based Recommendation- Hybrid Recommendation Approaches

UNIT IV:**(15 Hours)**

Stream Memory: Introduction to Streams Concepts - Stream Data Model and Architecture - Stream Computing, Sampling Data in a Stream - Filtering Streams - Counting Distinct Elements in a Stream - Estimating moments - Counting oneness in a Window - Decaying Window - Real time Analytics Platform (RTAP) applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

UNIT V:**(15 Hours)**

NOSQL Data Management for Big Data And Visualization: NoSQL Databases: Schema-less Models- Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores - Tabular Stores - Object Data Stores - Graph Databases Hive - Sharding - Hbase - Analyzing big data with twitter - Big data for E-Commerce Big data for blogs - Review of Basic Data Analytic Methods using R.

PRESCRIBED BOOKS

1. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.

REFERENCE BOOKS

1. David Loshin, “Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph”, Morgan Kaufmann/El sevier Publishers, 2013.
2. EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley publishers, 2015.

E-RESOURCES

1. <https://www.youtube.com/c/TechWithTim>
2. <https://cloud.google.com/big-data>
3. <https://aws.amazon.com/big-data/>
4. <https://www.youtube.com/c/SimplilearnOfficial>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
C	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	2	1	1
III	3	2	1
IV	2	1	2
V	2	2	1
TOTAL	12	7	6
SECTION A - 12		SECTION B - 7	SECTION C – 6

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	2	2	3
CO 2	3	2	2	3	2
CO 3	3	2	3	3	2
CO 4	2	3	2	2	3
CO 5	2	3	3	3	2
Ave.	2.4	2.6	2.4	2.6	2.4

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Work with big data tools and its analysis techniques	PSO1,PSO2,PSO3, PSO4,PSO5	K1,K3,K5
CO2	Analyze data by utilizing clustering and classification algorithms	PSO1,PSO2,PSO3, PSO4,PSO5	K2,K5,K6
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data	PSO1,PSO2,PSO3, PSO4,PSO5	K1,K3,5
CO4	Perform analytics on data streams	PSO1,PSO2,PSO3, PSO4,PSO5	K2,K4,K5
CO5	Learn NoSQL databases and management	PSO1,PSO2,PSO3, PSO4,PSO5	K3,K5,K6

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

PROGRAMME: ALL UG	BATCH: 2025 - 2028
PART: IV	COURSE COMPONENT: VALUE EDUCATION
COURSE NAME: VALUE EDUCATION	COURSE CODE:
SEMESTER: V	MARKS:100
CREDITS: 2	TOTAL HOURS: 30
THEORY	

COURSE OBJECTIVE:

To teach and inculcate the importance of value based education.

COURSE OUTCOMES:

1. Explore the relationship between education and values, their origins, and their impact on societal norms.
2. Foster personal growth by instilling virtues like truthfulness and self-discipline, addressing contemporary challenges faced by adolescents.
3. Investigate the principles of human rights, including those of marginalized groups, and advocate for social cohesion.
4. Embrace a spectrum of values—constitutional, social, professional, religious, moral, and environmental—to drive national and global progress.
5. Examine the enduring relevance of Guru Nanak Devji's teachings, Sikh values, and rights in modern contexts.

UNIT 1: EDUCATION AND VALUES

Definition, Concept, Classification, Theory, Criteria and Sources of values Aims and objectives of value education Role and Need for value education in the contemporary society, Role of education in transformation of values in society Role of parents, teachers, society, peer group and mass media in fostering values

UNIT 2: VALUE EDUCATION AND PERSONAL DEVELOPMENT

Human Values: Truthfulness, Sacrifice, Sincerity, Self-Control, Altruism, Scientific Vision, relevancy of human values to good life. Character Formation towards Positive Personality

Modern challenges of adolescents: emotions and behavior Self-analysis and introspection: sensitization towards gender equality, differently abled, Respect for - age, experience, maturity, family members, neighbors, strangers, etc.

UNIT 3: HUMAN RIGHTS AND MARGINALIZED PEOPLE

Concept of Human Rights – Principles of human rights – human rights and Indian constitution – Rights of Women and children – violence against women – Rights of marginalized People – like women, children, minorities, transgender, differently abled etc.

Social Issues and Communal Harmony Social issues – causes and magnitude - alcoholism, drug addiction, poverty, unemployment – communal harmony –concept –religion and its place in public domain –secular civil society

UNIT 4: VALUE EDUCATION TOWARDS NATIONAL AND GLOBAL DEVELOPMENT

Constitutional Values :(Sovereign, Democracy, Socialism, Secularism, Equality, Justice, Liberty, Freedom, Fraternity)

Social Values: (Pity and Probity, Self-Control, Universal Brotherhood).

Professional Values :(Knowledge Thirst, Sincerity in Profession, Regularity, Punctuality, Faith).

Religious and Moral Values: (Tolerance, Wisdom, character).

Aesthetic Values: (Love and Appreciation of literature, fine arts)

Environmental Ethical Values

National Integration and international understanding.

Need of Humanistic value for espousing peace in society. Conflict of cross-cultural influences, cross-border education

UNIT 5:

Guru Nanak Devji's Teachings

Relevance of Guru Nanak Devji's teachings' relevance to Modern Society

The Guru Granth sahib

The five Ks

Values and beliefs

Rights and freedom (Right of equality, Right to Education, Right to Justice, Rights of women, Freedom of religion, Freedom of culture, Freedom of assembly, Freedom of speech)

Empowerment of women

Concept of Langar

Eminent Sikh personalities

REFERENCES BOOKS:

1. Dr. AbdulKalam. My Journey-Transforming Dreams into Actions. Rupa Publications, 2013.
2. Steven R Covey, 8th Habit of Effective People (From Effectiveness to Greatness), Free Press, NewYork, 2005.
3. Prem Singh, G.J. (2004). 'Towards Value Based Education', University News. Vol. 42 (45): P.11-12.
4. V.R. Krishna Iyer. Dialectics & Dynamics of Human Rights in India (Tagore Law Lectures) The Yesterday, Today and Tomorrow, Eastern Law House (1999, Reprint 2018)
5. <http://www.ncert.nic.in/rightside/links/pdf/framework/english/nf2005.pdf>

QUESTION PAPER PATTERN: MCQ

PROGRAMME: B.Sc. COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: IV	COURSE COMPONENT: INTERNSHIP
COURSE NAME: INTERNSHIP	COURSE CODE:
SEMESTER: V	MARKS:- --
CREDITS: 2	TOTAL HOURS: --
INTERNSHIP	

COURSE OBJECTIVE:

To provide students with practical, hands-on experience in the field of computer science, complementing their academic learning with real-world applications.

GUIDELINES:

Each student should undergo training in software industry or related field for a minimum period of 4 weeks during IV Semester summer vacation. Student has to produce his/her Internship completion certificate from the concerned organization when the college reopens for V Semester.

SEMESTER - VI

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARITIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: CORE - XIII
COURSE NAME: OPERATING SYSTEMS	COURSE CODE:
SEMESTER: VI	MARKS:100
CREDITS: 3	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To Understand and Evaluate the requirement for process synchronization and coordination handled by operating system.

COURSE OUTCOMES:

1. Describe the important computer system resources and the role of operating system in their management policies and algorithms.
2. Understand the process management policies and scheduling of processes by CPU
3. Use the knowledge of process synchronization and coordination
4. Analyze the memory management and its allocation policies
5. Evaluate the storage management policies with respect to different storage management technologies

UNIT I

(18 HOURS)

Introduction to Operating Systems: Introduction- History & evolution of OS- Types of Operating Systems- Simple Batch Systems, Multiprogramming and Time-Sharing systems. Personal Computer Systems, Parallel Systems, Distributed Systems and Real time Systems. Operating System Structures: Operating System Services, System components, system calls.

UNIT II

(18 HOURS)

Process Management: Process states, Process creation, process termination, Process Scheduling Algorithms-Non-Preemptive and Preemptive Scheduling Algorithms- Concurrent and Dependent Processes- Inter-process Communication

UNIT III

(18 HOURS)

Process Synchronization: Critical Section problem- Semaphores - Deadlock: Deadlock Characterization, Necessary and Sufficient Conditions for Deadlock, Deadlock Handling Approaches: Deadlock Prevention, Deadlock Avoidance and Deadlock Detection and Recovery.

UNIT IV

(18 HOURS)

Memory Management: Physical and Virtual Address Space; Memory Allocation Strategies– Fixed and -Variable Partitions, Paging, Segmentation, Virtual Memory. File Management: Directory Structure, File Operations, File Allocation Methods.

UNIT V

(18 HOURS)

Advanced OS: Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems–Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems.

PRESCRIBED BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012

REFERENCE BOOKS:

1. H.M. Deitel, An Introduction to Operating system, Second Edition, Addison Wesley.
2. Andrew S.Tanenbaum, Modern Operating Systems, Pearson Education, 2nd edition.

E-LEARNING RESOURCES:

1. <https://ajce.in/it/e-learning/categories/os.html>
2. <https://www.thelearningos.com/>
3. <https://www.ibm.com/docs/en/randori?topic=guidance-operating-system>
4. <https://medium.com/@algorithm2411/operating-system-os-learning-resources-515d685ad1c3>
5. <https://www.britannica.com/technology/operating-system>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
C	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	2	1	1
III	3	2	1
IV	2	1	2
V	2	2	1
TOTAL	12	7	6
SECTION A - 12		SECTION B - 7	SECTION C - 6

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	2	2	3
CO 5	3	2	2	3	3
Ave.	2.8	2.6	2.6	2.6	3

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Describe the important computer system resources and the role of operating system in their management policies and algorithms.	PSO1, PSO2, PSO3 PSO4, PSO5	K1, K2, K3
CO2	Understand the process management policies and scheduling of processes by CPU	PSO1, PSO2, PSO3 PSO4, PSO5	K2, K3, K4, K5
CO3	Use the knowledge of process synchronization and coordination	PSO1, PSO2, PSO3 PSO4, PSO5	K3, K4, K5, K6
CO4	Analyze the memory management and its allocation policies	PSO1, PSO2, PSO3 PSO4, PSO5	K4, K5, K6
CO5	Evaluate the storage management policies with respect to different storage management technologies	PSO1, PSO2, PSO3 PSO4, PSO5	K2, K3, K4, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARITIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: CORE - XIV
COURSE NAME: INTERNET OF THINGS	COURSE CODE:
SEMESTER: VI	MARKS:100
CREDITS: 3	TOTAL HOURS:60
THEORY	

COURSE OBJECTIVE:

To understand the concepts of Internet of Things and the application of IoT

COURSE OUTCOMES:

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

UNIT I

(12 HOURS)

IoT & Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.

UNIT II

(12 HOURS)

M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

UNIT III

(12 HOURS)

IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model-Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

UNIT IV

(12 HOURS)

IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT for Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

UNIT V

(12 HOURS)

Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security.

PRESCRIBED BOOKS:

1. Vijay Madiseti and Arshdeep Bahga, “Internet of Things: (A Hands-on Approach)”, Universities Press (INDIA) Private Limited 2014, 1st Edition.

REFERENCE BOOKS:

1. Michael Miller, “The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World”, kindle version.
2. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, Apress Publications 2013, 1st Edition,.
3. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice" 4..Cuno Pfister, “Getting Started with the Internet of Things”, O’Reilly Media 2011

E-LEARNING RESOURCES:

1. <https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT>
2. <https://link.springer.com/book/10.1007/978-3-030-77528-5>
3. <https://www.ibm.com/topics/internet-of-things>
4. <https://www.fracttal.com/en/blog/the-9-most-important-applications-of-the-internet-of-things>
5. <https://www.slideshare.net/slideshow/internet-of-things-and-its-applications/9816846>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
C	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	2	1	1
III	3	2	1
IV	2	1	2
V	2	2	1
TOTAL	12	7	6
SECTION A - 12		SECTION B - 7	SECTION C - 6

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	2	2	3
CO 5	3	2	2	3	3
Ave.	2.8	2.6	2.6	2.6	3

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Use of Devices, Gateways and Data Management in IoT.	PSO1, PSO2, PSO3 PSO4, PSO5	K1, K2, K3
CO2	Design IoT applications in different domain and be able to analyses their performance	PSO1, PSO2, PSO3 PSO4,PSO5	K2, K3, K4, K5
CO3	Implement basic IoT applications on embedded platform	PSO1, PSO2, PSO3 PSO4, PSO5	K3, K4, K5, K6
CO4	To gain knowledge on Industry Internet of Things	PSO1, PSO2, PSO3 PSO4, PSO5	K4, K5, K6
CO5	To Learn about the privacy and Security issues in IoT	PSO1, PSO2,PSO3 PSO4,PSO5	K2, K3, K4, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARTIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: CORE - XV
COURSE NAME: MACHINE LEARNING	COURSE CODE:
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS:60
THEORY	

COURSE OBJECTIVE:

To understand basic concepts of machine learning, to evaluate models generated from data, to discover how to build machine learning algorithms, prepare data, and use different techniques using Python

COURSE OUTCOMES:

1. To implement different machine learning algorithm techniques
2. To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models
3. To build machine learning algorithms, prepare data, and use different techniques
4. To apply appropriate data sets to the Machine Learning algorithms.
5. To identify and apply Machine Learning algorithms to solve real world problems

UNIT I

(12 HOURS)

Introduction: Machine Learning Foundations – Overview – Design of a Learning System – Types of Machine Learning – Supervised Learning and Unsupervised Learning – Applications of Machine Learning – Tools Overview for ML.

UNIT II

(12 HOURS)

Supervised Learning – I: Simple Linear Regression – Multiple Linear Regression – Polynomial Regression – Ridge Regression – Lasso Regression – Evaluating Regression Models – Model Selection – Bagging – Ensemble Methods.

UNIT III

(12 HOURS)

Supervised Learning – II: Classification – Logistic Regression – Decision Tree Regression and Classification – Random Forest Regression and Classification – Support Vector Machine Regression and Classification - Evaluating Classification Models.

UNIT IV

(12 HOURS)

Unsupervised Learning: Clustering – K-Means Clustering – Density-Based Clustering – Dimensionality Reduction – Collaborative Filtering.

UNIT V

(12 HOURS)

Association Rule Learning: Association Rule Learning – Concepts related to ARL – ARL Algorithms - Apriori – Eclat – Concepts and Algorithms.

PRESCRIBED BOOKS:

1. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.

REFERENCE BOOKS:

1. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014.
2. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
3. Sebastian Raschka, Vahid Mirjalili, “Python Machine Learning and deep learning”, 2nd edition, kindle book, 2018
4. Carol Quadros, “Machine Learning with python, scikit-learn and Tensorflow”, Packet Publishing, 2018
5. Gavin Hackeling, “Machine Learning with scikit-learn”, Packet publishing, O'Reilly, 2018

E-LEARNING RESOURCES:

1. <https://www.kaggle.com/discussions/general/196686>
2. <https://www.tensorflow.org/resources/learn-ml>
3. https://github.com/mdozmorov/MachineLearning_notes
4. <https://developers.google.com/machine-learning/crash-course>
5. <https://www.ibm.com/topics/machine-learning>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
C	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	2	1	1
III	3	2	1
IV	2	1	2
V	2	2	1
TOTAL	12	7	6
SECTION A - 12		SECTION B - 7	SECTION C - 6

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	2	2	3
CO 5	3	2	2	3	3
Ave.	2.8	2.6	2.6	2.6	3

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To implement different machine learning algorithm techniques	PSO1, PSO2, PSO3 PSO4, PSO5	K1, K2, K3
CO2	To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models	PSO1, PSO2, PSO3 PSO4, PSO5	K2, K3, K4, K5
CO3	To build machine learning algorithms, prepare data, and use different techniques	PSO1, PSO2, PSO3 PSO4, PSO5	K3, K4, K5, K6
CO4	To apply appropriate data sets to the Machine Learning algorithms.	PSO1, PSO2, PSO3 PSO4, PSO5	K4, K5, K6
CO5	To identify and apply Machine Learning algorithms to solve real world problems	PSO1, PSO2, PSO3 PSO4, PSO5	K2, K3, K4, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARTIFICIAL INTELLIGENCE	BATCH: 2025 -2028
PART: III	COURSE COMPONENT: CORE - XVI
COURSE NAME: PRACTICAL - VII: MACHINE LEARNING	COURSE CODE:
SEMESTER: VI	MARKS:100
CREDITS: 4	TOTAL HOURS:90
PRACTICAL	

COURSE OBJECTIVE:

This course to understand the mathematical and statistical perspectives of machine learning algorithms through python programming.

COURSE OUTCOMES:

1. To design and evaluate the unsupervised models through python in built functions
2. To evaluate the machine learning model algorithms by python programming
3. To design and apply various reinforcement algorithms to solve real time complex problems
4. To develop the code for the recommender system using Natural Language processing
5. To understand the basic concepts of deep neural network models and design the same.

LAB EXERCISES:

1. Write a program to implement the Simple and Multiple Linear Regression
2. Write a program to implement the Polynomial Regression
3. Write a program to implement the Bagging Technique
4. Write a program to implement the Adaboost Methods
5. Write a program to implement Logistic Regression algorithm
6. Write a program to demonstrate the workflow of Decision Tree Classification
7. Write a program to implement the Random Forest Classification 8.
8. Write a program to implement the SVM Classification
9. Write a program to perform the K Means Clustering
10. Write a program to perform the Density based Clustering
11. Write a program to implement the Apriori algorithm for market basket analysis
12. Write a program to compare the Supervised Machine Learning algorithms

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	2	2	3
CO 5	3	2	2	3	3
Ave.	2.8	2.6	2.6	2.6	3

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To design and evaluate the unsupervised models through python in built functions	PSO1, PSO2, PSO3 PSO4, PSO5	K1, K2, K3
CO2	To evaluate the machine learning model algorithms by python programming	PSO1, PSO2, PSO3 PSO4, PSO5	K2, K3, K4, K5
CO3	To design and apply various reinforcement algorithms to solve real time complex problems	PSO1, PSO2, PSO3 PSO4, PSO5	K3, K4, K5, K6
CO4	To develop the code for the recommender system using Natural Language processing	PSO1, PSO2, PSO3 PSO4, PSO5	K4, K5, K6
CO5	To understand the basic concepts of deep neural network models and design the same	PSO1, PSO2, PSO3 PSO4, PSO5	K2, K3, K4, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARITIFICIAL INTELLIGENCE	BATCH: 2025 -2028
PART: III	COURSE COMPONENT: CORE – XVII
COURSE NAME: MINI PROJECT	COURSE CODE:
SEMESTER: VI	MARKS:100
CREDITS: 3	TOTAL HOURS:60
PRACTICAL	

Students should develop a software application in small scale, based on the concepts they have learnt in the previous five semesters the programme. It may be based on Database concepts, Object Oriented Programming concepts, Web development, Data Science, Machine Learning, Internet of Things and Big Data etc. Students can take individual or group project.

COURSE OBJECTIVE:

To demonstrate the ability to analyze requirements, identify challenges, and devise effective solutions to solve real world problems.

COURSE OUTCOMES:

1. Gain hands-on experience with programming languages, development tools, and technologies relevant to the project.
2. Utilize computer science principles and methodologies learned in coursework to solve real world problems.
3. Work as team to manage project tasks, share responsibilities, and assimilate components developed by team members.
4. Integrate different technologies and platforms as needed to achieve project goals.
5. Perform effective testing and debugging to ensure the functionality and reliability of the software.

GUIDELINES:

- A student is expected to complete planning, analysing, designing and implementing the project in 3 months timeframe.
- Each individual students' contribution is mandatory for internal assessment and to appear for the final viva.

EVALUATION:

Internal assessment will be based on initial project proposal, two reviews and a comprehensive final report of the project. External assessment will be based on the presentation of the project work and Viva Voce.

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	2	2	3
CO 5	3	2	2	3	3
Ave.	2.8	2.6	2.6	2.6	3

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARITIFICAL INTELLIGENCE	BATCH: 2025 -2028
PART: III	COURSE COMPONENT: ELECTIVE-III
COURSE NAME: INFORMATION SECURITY	COURSE CODE:
SEMESTER: VI	MARKS:100
CREDITS: 5	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To learn fundamentals of cryptography, network security threats, security services, authentication, firewalls; intrusion detection techniques and countermeasures.

COURSE OUTCOMES:

1. To understand and explain the risks faced by computer systems and networks
2. To identify and analyses security problems in computer systems and networks
3. To explain how standard security mechanisms work
4. To develop security mechanisms to protect computer systems and networks
5. To use cryptography algorithms and protocols to achieve computer security

UNIT I

(18 HOURS)

Introduction to Information Security: Attacks, Vulnerability, Security Goals, Security Services and mechanisms

UNIT II

(18 HOURS)

Conventional Cryptographic Techniques: Conventional substitution and transposition ciphers, One-time Pad, Block cipher and Stream Cipher, Steganography.

UNIT III

(18 HOURS)

Symmetric and Asymmetric Cryptographic Techniques: DES, AES, RSA algorithms
Authentication and Digital Signatures: Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos.

UNIT IV

(18 HOURS)

Program Security: Non malicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels

UNIT V

(18 HOURS)

Security in Networks: Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP, S/MIME.

PRESCRIBED BOOKS:

1. Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education.

REFERENCE BOOKS:

1. Cryptography And Network Security Principles and Practice, Fourth or Fifth Edition, William Stallings, Pearson
2. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall.
3. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall.

E-LEARNING RESOURCES:

1. <https://www.cisa.gov/resources-tools/resources/free-cybersecurity-services-and-tools>
2. <https://guides.library.cmu.edu/c.php?g=572612&p=3948772>
3. <https://vigitrust.com/cybersecurity-awareness-resources/>
4. <https://www.getcybersafe.gc.ca/en/resources>
5. <https://www.cyberdegrees.org/resources/the-big-list/>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
C	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	2	1	1
III	3	2	1
IV	2	1	2
V	2	2	1
TOTAL	12	7	6
SECTION A - 12		SECTION B - 7	SECTION C – 6

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	2	2	3
CO 5	3	2	2	3	3
Ave.	2.8	2.6	2.6	2.6	3

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To understand and explain the risks faced by computer systems and networks	PSO1, PSO2, PSO3 PSO4, PSO5	K1, K2, K3
CO2	To identify and analyses security problems in computer systems and networks	PSO1, PSO2, PSO3 PSO4, PSO5	K2, K3, K4, K5
CO3	To explain how standard security mechanisms work	PSO1, PSO2, PSO3 PSO4, PSO5	K3, K4, K5, K6
CO4	To develop security mechanisms to protect computer systems and networks	PSO1, PSO2, PSO3 PSO4, PSO5	K4, K5, K6
CO5	To use cryptography algorithms and protocols to achieve computer security	PSO1, PSO2, PSO3 PSO4, PSO5	K2, K3, K4, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARITIFICIAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: ELECTIVE – III
COURSE NAME: ROBOTICS AND ITS APPLICATIONS	COURSE CODE:
SEMESTER: VI	MARKS:100
CREDITS: 5	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To make the students familiar with the various drive systems of robots, sensors and their applications in robots

COURSE OUTCOMES:

1. To introduce the parts of robots, basic working concepts and types of robots
2. To describe the different physical forms of robot architectures
3. To model simple manipulator and mobile robots mathematically
4. To describe a kinematic robot system
5. To analyze manipulation and navigation problems using knowledge of coordinate frames

UNIT I (18 HOURS)

Introduction: Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.

UNIT II (18 HOURS)

Actuators and sensors: Types of actuators, stepper-DC-servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers-strain gauge-based force torque sensor-proximity and distance measuring sensors

Kinematics of robots: Representation of joints and frames, frames transformation, homogeneous matrix, D-H matrix, Forward and inverse kinematics: two link planar (RR) and spherical robot (RRP). Mobile robot Kinematics: Differential wheel mobile robot.

UNIT III (18 HOURS)

Localization: Self-localizations and mapping - Challenges in localizations - IR based localizations - vision-based localizations - Ultrasonic based localizations - GPS localization systems.

UNIT IV

(18 HOURS)

Path Planning: Introduction, path planning-overview-road map path planning-cell decomposition path planning potential field path planning-obstacle avoidance-case studies Vision system: Robotic vision systems-image representation-object recognition-and categorization-depth measurement- image data compression-visual inspection-software considerations

UNIT V

(18 HOURS)

Application: Ariel robots-collision avoidance robots for agriculture-mining exploration-underwater-civilian- and military applications-nuclear applications-space applications-Industrial robots-artificial intelligence in robots-application of robots in material handling-continuous arc welding-spot welding-spray painting-assembly operation-cleaning

PRESCRIBED BOOKS:

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

REFERENCE BOOKS:

1. Industrial robotic technology-programming and application by M.P. Groover et.al, McGraw Hill 2008
2. Robotics technology and flexible automation by S.R. Deb, THH-2009

E-LEARNING RESOURCES:

1. <https://www.intel.com/content/www/us/en/robotics/types-and-applications.html>
2. <https://www.motoman.com/en-us/applications>
3. <https://www.hp.com/us-en/shop/tech-takes/everyday-robotics>
4. <https://www.slideshare.net/slideshow/robotics-30421670/30421670>
5. <https://ifr.org/>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
C	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	2	1	1
III	3	2	1
IV	2	1	2
V	2	2	1
TOTAL	12	7	6
SECTION A - 12		SECTION B - 7	SECTION C – 6

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	2	2	3
CO 5	3	2	2	3	3
Ave.	2.8	2.6	2.6	2.6	3

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To introduce the parts of robots, basic working concepts and types of robots	PSO1, PSO2, PSO3 PSO4, PSO5	K1, K2, K3
CO2	To describe the different physical forms of robot architectures	PSO1, PSO2, PSO3 PSO4, PSO5	K2, K3, K4, K5
CO3	To model simple manipulator and mobile robots mathematically	PSO1, PSO2, PSO3 PSO4, PSO5	K3, K4, K5, K6
CO4	To describe a kinematic robot system	PSO1, PSO2, PSO3 PSO4, PSO5	K4, K5, K6
CO5	To analyze manipulation and navigation problems using knowledge of coordinate frames	PSO1, PSO2, PSO3 PSO4, PSO5	K2, K3, K4, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: B.Sc., COMPUTE SCIENCE WITH ARITIFICAL INTELLIGENCE	BATCH: 2025 - 2028
PART: III	COURSE COMPONENT: ELECTIVE-III
COURSE NAME: ARTIFICIAL NEURAL NETWORKS	COURSE CODE:
SEMESTER: VI	MARKS:100
CREDITS: 5	TOTAL HOURS:90
THEORY	

COURSE OBJECTIVE:

To understand the biological neural network, model equivalent neuron models, architecture and learning algorithms

COURSE OUTCOMES:

1. To explore the Neuro dynamic models for various problems.
2. To understand the similarity of biological networks and Neural networks
3. To perform the training of neural networks using various learning rules
4. To understand the concepts of forward and backward propagations
5. To understand and construct the Hopfield models

UNIT I

(18 HOURS)

Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process.

UNIT II

(18 HOURS)

Single Layer Perceptron's: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment

Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection.

UNIT III

(18 HOURS)

Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning.

UNIT IV

(18 HOURS)

Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification

UNIT V

(18 HOURS)

Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm Hopfield Models – Hopfield Models, restricted boltzman machine

PRESCRIBED BOOKS:

1. Neural Networks a Comprehensive Foundations, Simon S Haykin, PHI Ed.,
2. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

REFERENCE BOOKS:

1. Neural Networks in Computer Inteligance, Li Min Fu TMH 2003
2. Neural Networks -James A Freeman David M S Kapura Pearson Ed., 2004.
3. Artificial Neural Networks – B. Vegnanarayana Prentice Hall of India P Ltd 2005

E-LEARNING RESOURCES:

1. <https://www.geeksforgeeks.org/artificial-neural-networks-and-its-applications/>
2. <https://www.ibm.com/topics/neural-networks>
3. <https://developer.nvidia.com/discover/artificial-neural-network>
4. <https://www.simplilearn.com/tutorials/deep-learning-tutorial/neural-network>
5. <https://www.arm.com/glossary/artificial-neural-network>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
B	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
C	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
TOTAL MARKS				100

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	2	1	1
III	3	2	1
IV	2	1	2
V	2	2	1
TOTAL	12	7	6
SECTION A - 12		SECTION B - 7	SECTION C – 6

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	2	2	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	3	3	3
CO 4	3	3	2	2	3
CO 5	3	2	2	3	3
Ave.	2.8	2.6	2.6	2.6	3

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	To explore the Neuro dynamic models for various problems.	PSO1, PSO2, PSO3 PSO4, PSO5	K1, K2, K3
CO2	To understand the similarity of biological networks and Neural networks	PSO1, PSO2, PSO3 PSO4, PSO5	K2, K3, K4, K5
CO3	To perform the training of neural networks using various learning rules	PSO1, PSO2, PSO3 PSO4, PSO5	K3, K4, K5, K6
CO4	To understand the concepts of forward and backward propagations	PSO1, PSO2, PSO3 PSO4, PSO5	K4, K5, K6
CO5	To understand and construct the Hopfield models	PSO1, PSO2, PSO3 PSO4, PSO5	K2, K3, K4, K6

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

UG - SOFT SKILLS

SOFT SKILLS: COMMON TO ALL	BATCH: 2025 - 2028
PART: IV	COURSE COMPONENT: SOFT SKILL-I
COURSE NAME: COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT SKILLS	COURSE CODE:
SEMESTER: I	MARKS:100
CREDITS: 2	TOTAL HOURS: 30
THEORY	

COURSE OBJECTIVE:

To build communication skills for personal and professional development.

COURSE OUTCOMES:

1. Students will demonstrate the ability to actively listen to others, understand diverse perspectives, and paraphrase key points accurately, enhancing their comprehension skills in various personal and professional contexts.
2. Students will be able to articulate thoughts, ideas, and information clearly and concisely, using appropriate language and structure to convey messages effectively in both written and verbal communication
3. Students will develop confidence in expressing opinions, asserting boundaries, and advocating for themselves and others, leading to enhanced self-assurance and effectiveness in interpersonal and group communication.
4. Students will learn to adapt their communication style and approach based on the audience, context, and purpose of communication, fostering flexibility and versatility in interacting with diverse individuals and groups.
5. Students will acquire techniques for resolving conflicts, managing disagreements, and negotiating mutually beneficial outcomes through effective communication strategies, promoting constructive problem-solving and collaboration in personal and professional settings.

UNIT I Types of Communication

(6 Hours)

Verbal Communication - Nonverbal Communication - Visual Communication - Written Communication - Interpersonal Communication - Group Communication - Mass Communication - Digital Communication- Barriers – Language- Cultural- Psychological- Semantic- Technological Barriers

UNIT II Etiquette & Ethical Practices in Communication

(6 Hours)

Active Listening - Respectful Language - Clarity and Conciseness – Truthfulness-Professionalism-Tone -Timeliness - Constructive Feedback - Confidentiality - Cultural Sensitivity - - Emotional Intelligence- Social Intelligence- Social Etiquettes-Accountability

UNIT III Self Actualization

(6 Hours)

SWOC Analysis- Self Regulation-Self Evaluation, Self-Monitoring, Self- Criticism, Self- Motivation, Self-awareness and Reflection:

UNIT IV III Leadership and Teamwork**(6 Hours)**

Leadership Skills: Leadership styles- Goal-setting and decision-making- Motivation and influence- Team Dynamics: Team building activities- Conflict resolution- Collaborative problem-solving

UNIT V Stress and Time Management**(6 Hours)**

Definition of Stress, Types of Stress, Symptoms of Stress, Stress coping ability, Stress Inoculation Training, Time Management and Work-Life Balance: Self-discipline Goal-setting

RECOMMENDED TEXTBOOKS

1. Goleman, Daniel (2006) *Emotional Intelligence*, Bantam Books
2. Linden, Wolfgang (2004) *Stress Management- From Basic Science to Better Practice*- University of British Columbia, Vancouver, Canada.
3. Hasson, Gill (2012) *Brilliant Communication Skills*. Great Britain: Pearson Education.
4. Monippally, Matthukutty, M. *Business Communication Strategies*. New Delhi: Tata McGraw-Hill Publishing Company Ltd., 2001.
5. Raman, Meenakshi & Sangeetha Sharma (2011) *Communication Skills*, Oxford University Press.

REFERENCE BOOKS

1. N.Krishnaswamy *Current English for College* (1st Edition) - Trinity Press
2. Wood, Julia T (2015) *Interpersonal Communication: Everyday Encounters* 8th Edition, Cengage Learning.

E-LEARNING RESOURCES

1. <http://www.albion.com/netiquette/corerules.html>
2. <http://www.englishdaily626.com/c-errors.php>
3. <https://www.helpguide.org/articles/relationships-communication/nonverbal-communication.htm>
4. <https://www.communicationtheory.org/verbal-vs-non-verbal-communication-with-examples/>
5. <https://letstalkscience.ca/educational-resources/backgrounders/digital-citizenship-ethics>
6. <https://www.switchboard.app/learn/article/teamwork-leadership-skills>

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

Section	Question Component	Numbers	Marks	Total
A	Answer any 5 out of 7 questions (answer in 50 words)	1-7	2	10
B	Answer any 4 out of 6 questions (answer in 300 words)	8-13	5	20
C	Answer any two(Internal (Choice)	14-15	10	20
	Internal & Viva Voce		50	50

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	----
II	2	1	1
III	1	1	1
IV	1	1	1
V	1	1	1
TOTAL	7		
SECTION A – 7		SECTION B – 6	SECTION C - 4

SOFT SKILLS: COMMON TO ALL	BATCH: 2025 - 2028
PART: IV	COURSE COMPONENT: SOFT SKILL-II
COURSE NAME: INTERVIEW SKILLS AND RESUME WRITING	COURSE CODE:
SEMESTER: II	MARKS:100
CREDITS: 2	TOTAL HOURS: 30
THEORY	

COURSE OBJECTIVE:

To equip the students to acquire the relevant skills for better employability.

COURSE OUTCOMES:

1. Students will gain an overall understanding of the concept, the purpose, and the objectives of an interview
2. Students will become aware of the various types of interviews and the nuances of each one of them
3. Students will understand and equip themselves with the techniques and strategies required to ace an interview
4. Students will be able to draft a biodata /CV/Resume in the proper format
5. Students will embark on acquiring the relevant skills and will learn to leverage them effectively for better employability

UNIT I Introduction to Interview Skills

(6 HOURS)

Definition- meaning- concept of interview –Purpose- Objectives of interview-Characteristic features of job interviews

UNIT II Types of Interview

(6 HOURS)

Traditional one on one job interview- Panel interview- Behavioral interview-Group interview- Phone Interview- Preliminary Interview-Patterned Interview Depth Interview, Stress Interview, Exit Interview- Interview through tele and video conferencing

UNIT III Interviews: Techniques and Strategies

(6 HOURS)

Preparing for the Interview Process- Before the interview-During the interview-After the interview -Tips to ace an interview -Commonly asked questions in interview -Do's and Don'ts of interview - Reasons for rejections

UNIT IV Preparing Biodata/CV/Resume

(6 HOURS)

Essential characteristics of a job Application-Difference between Biodata- CV-Resume-covering letter-Tips to draft an application

UNIT V Leveraging Employability Skills

(6 HOURS)

Personality Development-Organizational skills-Time Management–Stress Management-Effective Communication Skills -Reasoning Ability-Verbal Ability- Group Discussion-Technical skills - Presentation skills

RECOMMENDED TEXTBOOKS

1. Monipally, Matthukutty M. (2017) *Business Communication: From Principles to Practice*
2. Peter, Francis. (2012) *Soft Skills and Professional Communication*. New Delhi: Tata McGraw Hill.

REFERENCE BOOKS

1. Higgins, Jessica JD (2018) 10 Skills for Effective Business Communication: Practical Strategies from the World's Greatest Leaders
2. Nicholas, Sonji (2023) *Interviewing: Preparation, Types, Techniques, and Questions*, Pressbooks
3. Storey, James (2016) *The Art of The Interview: The Perfect Answers to Every Interview Question*

E-LEARNING RESOURCES

1. <https://careermobilityoffice.cs.ny.gov/cmo/documents/Resume%20&%20Interviewing%20Handout.pdf>
2. <https://edu.gcglobal.org/en/interviewingskills/interview-etiquette/1/>
3. <https://findjobhub.com/en/types-of-interviews>
4. <https://egyankosh.ac.in/bitstream/123456789/23411/1/Unit-2.pdf>
5. https://bharatskills.gov.in/pdf/E_Books/CTS/ES/English/ES_Part_1_62%20hour_English.pdf
6. https://bharatskills.gov.in/pdf/E_Books/CTS/ES/English/ES_Part2_58hour_English.pdf

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

Section	Question Component	Numbers	Marks	Total
A	Answer any 5 out of 7 questions (answer in 50 words)	1-7	2	10
B	Answer any 4 out of 6 questions (answer in 300 words)	8-13	5	20
C	Answer any two (Internal Choice)	14-15	10	20
	Internal & Viva Voce		50	50

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	----
II	2	1	1
III	1	1	1
IV	1	1	1
V	1	1	1
TOTAL			
SECTION A – 7		SECTION B – 6	SECTION C - 4

PROGRAMME: COMMON TO ALL IT STUDENTS, B.Com., ISM, B.Com., CA	BATCH: 2025-2028
PART: IV	COURSE COMPONENT: SOFT SKILL III
COURSE NAME: ADOBE UX FOUNDATION	COURSE CODE:
SEMESTER: III	MARKS:100
CREDITS: 2	TOTAL HOURS: 30
PRACTICAL	

(Common to B.Sc., CS, BCA, B.Sc., IT, B.Sc., DA, B.Com. ISM, B.Com., CA)

COURSE OBJECTIVE:

Adobe UX Foundation involves outlining the key skills and knowledge that participants should acquire by the end of the course.

COURSE OUTCOMES:

1. Define and explain the core concepts and principles of user experience.
2. Understand the key features and functionalities of Adobe XD for designing and prototyping.
3. Apply user-centered design principles to create interfaces that prioritize user needs and preferences.
4. Implement interactive and dynamic prototypes to simulate user interactions.
5. Explore collaboration tools within Adobe XD to work efficiently in a team environment.

UNIT I

(6 HOURS)

Introduction to User Experience Design: Define User Experience - User Experience Process – Seven Components of user Experience (UX) – Definition of a Good User Experience Design-Usability Heuristics-Examples of Good User Experience Design – Practical Activity.

UNIT II

(6 HOURS)

User Experience Research: What is User Experience Research – Designing Adobe XD :User Research & Testing – What is Competitor User Experience Research – User Experience Personas & User Profiles – Other types of User Experience Research – Qualitative and Quantitative User Experience Research – Running Interviews and Observations for User Experience –Understanding User – Practical Activity

UNIT III

(6 HOURS)

Visual Design: Definition- Introduction to Atomic Design – Elements of any Visual design:Color & Shape – Imagery – Typography - Buttons – Composition of Visual Design Elements: structure & Grid – Hierarchy of Content – States.

UNIT IV

(6 HOURS)

User Experience Design Strategy: An Introductory guide to information architecture – Techniques & Best practice for developing an information architecture: Software Process – Examples of Information Architecture – Sitemap – Sitemap for website – Examples – Navigation & Hierarchy : Taxonomy & metadata – Examples- Practical Activity

UNIT V

(6 HOURS)

Mock up: Different types of Design Mock –Ups – User Persona, Scenarios & stories – Design Ideation & Sketching – Storyboarding User Experiences – Design Wireframes –Design prototyping & types of prototypes – Practical Activity.

PRESCRIBED BOOKS:

1. The Design of Everyday Things by Don Norman, The revised and expanded edition, 2013.
2. Lean UX: Designing Great Products with Agile Teams by Jeff Gothelf and Josh Seiden, 2013.

REFERENCE BOOKS:

1. Don't Make Me Think by Steve Krug, 3rd edition, 2014
2. The Elements of User Experience by Jesse James Garrett, 2nd edition, 2010
3. Information Architecture: For the Web and Beyond" by Louis Rosenfeld, Peter Morville, and Jorge Arango, 4th edition, 2015.
4. Sketching User Experiences: Getting the Design Right and the Right Design" by Bill Buxton, 1st edition, 2007.
5. About Face: The Essentials of Interaction Design" by Alan Cooper, Robert Reimann, and David Cronin, 4th edition, 2015.

E-LEARNING RESOURCES:

1. <https://learn.futureskillsprime.in/journey/adobe-ux-foundation-learning-journey-this-free-of-cost>.
2. <https://userresearch.google.com/>
3. <https://www.interaction-design.org/literature/topics/visual-design>
4. <https://www.nngroup.com/articles/ux-strategy/>
5. <https://www.mockupworld.co/>

PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	2	3	2
CO 2	3	3	2	2	2
CO 3	2	3	3	2	3
CO 4	3	2	2	3	2
CO 5	2	2	2	2	2

PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Define and explain the core concepts and principles of user experience.	PSO1,PSO2,PSO3, PSO4,PSO5	K1
CO2	Illustrate the key features and functionalities of Adobe XD for designing and prototyping.	PSO1,PSO2,PSO3, PSO4,PSO5	K2
CO3	Apply user-centered design principles to create interfaces that prioritize user needs and preferences.	PSO1,PSO2,PSO3, PSO4,PSO5	K3
CO4	Implement interactive and dynamic prototypes to simulate user interactions.	PSO1,PSO2,PSO3, PSO4,PSO5	K4
CO5	Explore collaboration tools within Adobe XD to work efficiently in a team environment.	PSO1,PSO2,PSO3, PSO4,PSO5	K5

K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create

PROGRAMME: ALL UG	BATCH: 2025 - 2028
PART: IV	COURSE COMPONENT: SOFT SKILL - IV
COURSE NAME: FOUNDATIONS OF QUANTITATIVE APTITUDE	COURSE CODE:
SEMESTER: IV	MARKS:100
CREDITS: 2	TOTAL HOURS: 30
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

Develop learners' problem-solving skills and critical thinking abilities in the context of recruitment aptitude tests.

COURSE OUTCOME:

1. The learner will be able to recognize, describe and represent patterns and relationships, as well as to solve problems using algebraic language and skills.
2. To learn about factors and multiples that numbers have in common with each other.
3. The student will analyse monthly profit and loss statements for a school store and calculate profit margin percentages.
4. Students learn what different types of interest are, where it occurs in real life and understand the concept of simple and compound interests.
5. The learner will draw, interpret and compare pie charts, bar charts and frequency diagrams.

UNIT I: Number system and Number series

(6 HOURS)

Numbers: Numbers and their classification, test for divisibility of numbers, General properties of divisibility, division and remainder, remainder rules.

Number Series: Number series, three steps to solve a problem on series, two-line number series, sum rules on natural numbers.

UNIT II: HCF and LCM of Numbers

(6 HOURS)

Factors, Multiples, Principal of Prime factorization, Highest Common Factor (HCF) and Least Common Multiple (LCM), Product of two numbers, Difference between HCF and LCM.

UNIT III: Percentage, Profit and Loss

(6 HOURS)

Percentage: Introduction, fraction to rate percent, rate percent to fraction, rate percent of a number, express a given quantity as a percentage of another given quantity, convert a percentage into decimals and convert a decimal into percentage.

Profit and Loss: Gain/Loss and % gain and % loss, relation among Cost price, Sale price, Gain/Loss and % gain and % loss.

UNIT IV: Simple Interest and Compound Interest

(6 HOURS)

Simple Interest: Definition, effect of change of P , R and T on Simple Interest, amount.

Compound Interest: Introduction, conversion period, basic formula, to find the Principal/Rate/Time, Difference between Simple Interest and Compound Interest.

UNIT V: Data interpretation

(6 HOURS)

Tabulation, Bar Graphs, Pie Charts, Line Graphs, average.

PRESCRIBED BOOK:

1. Quantitative Aptitude by R.S. Agarwal

REFERENCE BOOKS:

1. Quantitative Aptitude by Abhijit Guha, Fourth Edition.
2. Quantitative Aptitude by Ramandeep Singh.

E - LEARNING RESOURCES:

1. <https://byjus.com/maths/numeralsystem/#:~:text=crore%20is%207.International%20Numeral%20System,8%20%E2%80%93%20Ones>
2. <https://byjus.com/maths/hcf-and-lcm/>
3. <https://byjus.com/maths/profit-loss-percentage/>
4. <https://www.vedantu.com/jee-main/maths-difference-between-simple-interest-and-compound-interest>
5. <https://sites.utexas.edu/sos/guided/descriptive/descriptivec/frequency/>

GUIDELINES TO THE QUESTION PAPER SETTERS**QUESTION PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Multiple Choice Questions: Answer 20 out of 20 questions (each question carries one mark)	1 – 20	20	20
B	Answer any 5 out of 7 questions (each question carries 6 marks)	21 – 27	6	30
TOTAL MARKS				50

BREAK UP OF QUESTIONS FOR PROBLEMS

UNITS	SECTION A	SECTION B
I	4	1
II	4	1
III	4	1
IV	4	1
V	4	1
Any Unit	-	2
TOTAL	20	7

PROGRAMME: COMMON TO ALL	BATCH: 2025-2028
PART: IV	COURSE COMPONENT: SELF STUDY
COURSE NAME: INDIAN HERITAGE AND KNOWLEDGE SYSTEM	COURSE CODE:
SEMESTER: III	MARKS:100
CREDITS: 2	TOTAL HOURS: SELF-STUDY
QUESTION PATTERN: MCQ	
THEORY	

Course Objectives:

Delving into Indian Heritage, this course focuses on South Indian cultures and ancient knowledge like Yoga, Ayurveda, and Siddha, shaping the Nation's identity.

Course Outcomes:

1. To develop a comprehensive understanding among students of Indian heritage, its richness and diversity, and its role in shaping the nation's cultural identity.
2. Students will gain an enhanced insight into the artistic, architectural, and literary achievements of South India and other regions, fostering a sense of pride in Indian cultural heritage.
3. To enhance students' cultural literacy by gaining insights into traditional practices preserved through folklore across India.
4. To acquire knowledge among students of ancient Indian sciences for holistic well-being, promoting physical, mental, and spiritual health.
5. Students will develop a deeper understanding of the interconnectedness of spiritual, medicinal, and artistic dimensions within Indian Heritage systems.

UNIT I: Introduction to Indian Heritage

- **Concept of Heritage:** Definition, the importance of studying heritage, and its diverse forms.
- **Cultural Landscape of India:** Overview of major cultural zones in India, with a focus on South India.

Key Concepts: Cultural heritage, diversity, tangible heritage (e.g., monuments), intangible heritage (e.g., traditions, practices).

UNIT II: Cultural Tapestry of South India

- **Literature:** The classical Tamil literature of Sangam poetry, the epic Kannada works like the "Kuvempu Ramayana," the Telugu compositions of Annamacharya, and the poetic Malayalam works of Kerala's rich literary tradition.
- **Painting:** The intricate gold leaf work of Tanjore painting, the intricate patterns of Mysore painting, hand-painting or block-printing of Kalamkari.
- **Theatre:** The ancient art form of Koothu and the elaborate dance-dramas of Bhagavata Mela in Tamil Nadu, and the colourful folk theatre of Yakshagana in Karnataka.
- **UNESCO Indian Heritage Sites:** Great Living Chola Temples artistry, Hampi-Virupaksha Temple and the Vijaya Vittala Temple, Mahabalipuram- a treasure trove of Pallava art, Mysore Palace-Indo-Saracenic architecture, Periyar National Park- Western Ghats, Kanchipuram-City of Thousand Temples

UNIT III: Tamil Nadu Folklores

- **Origins and Significance:** Historical background of Tamil Nadu folklore and its cultural significance.
 - **Folk Dances:** Exploration of traditional Tamil folk dances like Karakattam, Kolattam, and Kummi.
 - **Folk Music:** Overview of folk music traditions in Tamil Nadu, including Parai Attam and Villu Paatu.
 - **Rituals and Festivals:** Understanding the role of folklore in Tamil Nadu's rituals and festivals- Pongal and Jallikattu.
- Key Concepts:** Karakattam, Kolattam, Parai Attam, Villu Paatu, Tamil folk tales, cultural rituals.

UNIT IV: Unveiling the Knowledge Systems

- **Cultural Landscape of India:** Overview of major cultural zones in India, with a focus on South India.
 - **Yoga:** Exploring the various aspects of Yoga - its philosophy, Eight Limbs, practices (e.g., Asanas, Pranayama), and benefits for physical and mental well-being.
 - **Ayurveda:** Understanding the core principles of Ayurveda - its focus on holistic health, diagnosis, and treatment methods.
- Key Concepts:** Yoga philosophy, Asanas, Pranayama, Tridosha theory (Ayurveda), Doshas (Vata, Pitta, Kapha), Panchakarma, herbal medicine, Ayurvedic lifestyle.

UNIT V: Siddha Tradition and Other Knowledge Systems

- **Siddha Tradition:** Origins, philosophy, medicinal practices, and spiritual aspects.
 - **Other Important Knowledge Systems:** Jyotish Shastra (Indian astrology), Natya Shastra (Treatise on performing arts).
- Key Concepts:** Siddha literature, alchemy, and spirituality in Siddha tradition. Pancha Boothas (Siddha), herbal remedies, Planetary influences, elements of classical Indian dance and music, and aesthetics in Natya Shastra.

QUESTION PAPER PATTERN: MCQ

PROGRAMME: COMMON TO ALL	BATCH: 2025-2028
PART: IV	COURSE COMPONENT: SELF STUDY
COURSE NAME: CONTEMPORARY WORLD AND SUSTAINABLE DEVELOPMENT	COURSE CODE:
SEMESTER: III	MARKS:100
CREDITS: 2	TOTAL HOURS: SELF-STUDY
QUESTION PATTERN: MCQ	
THEORY	

Course Objectives:

Delving into global dynamics, this course highlights Asia and India's pivotal role in achieving global sustainability objectives.

Course Outcomes:

1. Students will gain a comprehensive understanding of the key actors, institutions, and dynamics shaping the contemporary world order.
2. Students will acquire the ability to analyze the political, economic, and security challenges within major Asian regions, fostering informed perspectives on these critical issues.
3. Through the study of recent wars, students will develop critical thinking skills to assess the root causes, human costs, and potential solutions to contemporary conflicts.
4. Students will gain a deeper understanding of the principles and challenges of sustainable development, empowering them to advocate for responsible solutions at local, national, and international levels.
5. Students will be equipped to critically evaluate India's contributions to the SDGs, particularly through specific programs implemented in Tamil Nadu, and assess their effectiveness in achieving sustainable development goals.

UNIT I: Global Governance and Institutions

- **State & Non-State Actors:** Definition, types (nation-states, failed states), functions.
Key Actors: International states, Intergovernmental organizations (IGOs), nongovernmental organizations (NGOs), multinational corporations (MNCs).
- **United Nations (UN):** Structure, key organs (General Assembly, Security Council), functions, WB, & others.
Key Concepts: United Nations General Assembly, United Nations Security Council.
- **Regional Organizations:** European Union (EU), African Union (AU), North Atlantic Treaty Organization (NATO)
Key Concepts: European Union Commission, African Union Commission, North Atlantic Treaty Organization.
- **International Law and Treaties:** Significance, role in addressing global challenges.
Key Concepts: International Court of Justice, International Criminal Court, Geneva Conventions.

UNIT II: Contemporary Asia

Major Geographical Regions

- **Middle East:** Characterized by rich oil reserves, Complex political dynamics, and ongoing conflicts.
Key countries: Iran, Iraq, Israel, Saudi Arabia, Syria, Turkey

- **Southeast Asia:** Rapid economic growth, Challenges- maritime security and environmental degradation.

Key countries: Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam

- **Far East:** Major economic powerhouses and Potential flashpoints.
Key countries: China, Japan, North Korea, South Korea
- **Rise of China:** Political-South China Sea, Territorial disputes and Competition for Resources. Economic- China's Belt and Road Initiative (BRI)
- **Major Economic Centers:** **Singapore-** Global financial hub, **Hong Kong-** Special Administrative Region of China, **United Arab Emirates (UAE)-** Diversified economy driven by oil and gas, tourism, and trade.

Regional Organizations:

- Association of Southeast Asian Nations (ASEAN)
- South Asian Association for Regional Cooperation (SAARC)
- Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)
- Asia-Pacific Economic Cooperation (APEC)
- Shanghai Cooperation Organization (SCO)

UNIT III: Recent Wars of the World

- **Syrian Civil War (2011-present):** Bashar al-Assad regime, Syrian opposition groups, ISIS.
Key Concepts: Origins of the conflict, humanitarian crisis, foreign intervention, refugee crisis.
- **Yemeni Civil War (2015-present):** Houthi rebels, Yemeni government, Saudi-led coalition.
Key Concepts: Proxy war dynamics, humanitarian crisis, role of Iran and Saudi Arabia, UN peace efforts.
- **Ukraine Conflict (2014-present):** Ukrainian government, Russian-backed separatists, Russia.
Key Concepts: Annexation of Crimea, Donbas region conflict, Minsk agreements, NATO-Russia tensions.
- **Ethiopia Civil War (2020-present):** Ethiopian government, Tigray People's Liberation Front (TPLF), Eritrean forces.
Key Concepts: Tigray conflict, humanitarian crisis, regional implications, efforts for ceasefire and peace talks.
- **Nagorno-Karabakh War (2020):** Armenia, Azerbaijan, Russia.
Key Concepts: Conflict over Nagorno-Karabakh region, ceasefire agreement, role of Turkey, peace negotiations.
- **Myanmar Civil War (2021-present):** Myanmar military (Tatmadaw), ethnic armed groups, and Civilian resistance.
Key Concepts: Coup aftermath, Rohingya crisis, ethnic conflicts, ASEAN mediation efforts.

UNIT IV: Sustainable Development Goals

- **Definition of Sustainable Development:** Balancing economic, social, and environmental needs.
Key Concepts: United Nations Development Programme (UNDP), World Wildlife Fund (WWF), Sustainable Development Solutions Network (SDSN).
- **UN Sustainable Development Goals (SDGs):** Overview, targets.
Key Concepts: United Nations, national governments, NGOs, private sector.
- **Challenges and Opportunities:** Achieving sustainability, global cooperation.
Key Concepts: United Nations, national governments, civil society organizations, multinational corporations.

UNIT V: India's Role in Achieving Sustainable Development Goals (SDGs) with Tamil Nadu Initiatives

Addressing Basic Needs:

- **Goal 1: No Poverty**
 - National Rural Employment Guarantee Act (NREGA)
 - Kalaigiar Kanchi Thalaiyalar Scheme

- Ungal Thozhil Udhayanam (UTOY)
- **Goal 2: Zero Hunger**
 - National Food Security Act (NFSA)
 - Nutritious Noon Meal Programme
 - Annadhanam Scheme
 - Amma Unavagam
- **Goal 3: Good Health and Well-being**
 - National Health Mission (NHM)
 - Health Insurance of Tamil Nadu
 - Chief Minister's Comprehensive Health Insurance Scheme
 - Maruthuva Mitri
 - Amma Mini Clinics

Ensuring Essential Services:

- **Goal 4: Quality Education**
 - Sarva Shiksha Abhiyan (SSA)
 - Rashtriya Madhyamik Shiksha Abhiyan (RMSA)
 - Namakkal District Library Scheme
 - Pudhumai Penn Scheme under Higher Education Assurance Scheme (HEAS)
 - Free Coaching for Competitive Exams
- **Goal 6: Clean Water and Sanitation**
 - Swachh Bharat Mission (Clean India Mission)
 - National Rural Drinking Water Programme (NRDWP)
 - Jal Jeevan Mission Tamil Nadu
 - Namakku Naatheey Scheme
 - Kudimaramathu Scheme
- **Goal 7: Affordable and Clean Energy**
 - National Solar Mission
 - Tamil Nadu Solar Energy Policy
 - Green House Scheme

Building Sustainable Communities:

- **Goal 11: Sustainable Cities and Communities**
 - Smart Cities Mission
 - Atal Mission for Rejuvenation and Urban Transformation (AMRUT)
 - Adi Dravidar Housing Scheme
- **Goal 13: Climate Action**
 - National Action Plan on Climate Change (NAPCC)
 - International Solar Alliance
 - Tamil Nadu Wind Energy Policy 2019
- **Goal 17: Partnerships for the Goals**
 - Development Assistance Programmes (DAPs)
 - International Development Cooperation (IDC)
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QUESTION PAPER PATTERN: MCQ