P.R. GOVT. COLLEGE (A)

KAKINADA

Affiliated to Adikavi Nannaya University

Rajamahendravaram

DEPARTMENT OFCOMPUTER SCIENCE

Artificial Intelligence

(Single Major)

BOARD OF STUDIES

2025-2026

BOS COMPOSITION

PROCEEDINGS OF THE PRINCIPAL (FAC), P.R. GOVERNMENT COLLEGE (A), KAKINADA

Present: Dr. Kandula Anjaneyulu, M.A, Ph.D.

R.C.No.2/A.C/BOS - Members Nomination/2025-26 **Dated: 31.07.2025**

SUB: P.R. Government College (A), Kakinada - UG Board of Studies (BOS) - Nomination of Members - Orders issued.

REF: Proc.RC.No.1/A.C/BOS/2025-26 dated: 31 July 2025 of the Principal, Pithapur Rajah's Government College (A) Kakinada.

ORDER:

The Principal, P.R. Government College(A), Kakinada is pleased to constitute UG Boards of Studies in **B.Sc. Artificial Intelligence** for framing the syllabi in respective Subjects for all semesters duly following the norms of the UGC Autonomous guidelines.

S. No	Name of the Person	Designation
1	Sri. R V Satyanarayana	Chairman & Lecturer Incharge, Department of Computer Science
2	Smt. N. Naga Subrahmanyeswari, Lecturer in Computer Science, ASD College for Women (A), Kakinada	University Nominee
3	Sri. G B V Padmanadh, GDC, Mummidivaram	Subject Expert-1, Lecturer in Computer Science
4	Dr. K Srinivas, Professor & HoD, Dept. of CSE, Bonam Venkata Chalamayya Institute of Technology and Science (A), Batlapalem.	Subject Expert-2, Lecturer in Computer Science and Engineering
5	Sri P.Swamy Vandanam, Managing Director, BDPS Computers, Kakinada	Representative from Industry
6	Sri. A Anantha Teja	Member
7	Ms. Peruri Susmitha	Member
8	Sri. Chinta Moses Raju	Member
9	Mrs. Marre Varalakshmi	Member
10	MS. Jonnada Lakshmi Gayatri	Member
11	Sri. Aditya Sai Ganesh Pappu	Member
13	Sri Sakala Apparao, Consultant, Cap Gemini	Student Alumni Member
14	K Helasya Subhadra III B.Sc. (AI)	Student Member
15	V Durga Prasad, II B.Sc. (AI)	Student Member

The above members are requested to attend the BoS meeting on 07-08-2025 FN and share their valuable reviews, and suggestions on the following functionaries.

- Prepare syllabi for the subject keeping in view the objectives of the college and interest of the stake holders for consideration and approval of the IQAC and Academic Council.
- Suggested methodologies for innovative teaching and evaluation techniques.
- Suggest the panel of Names to the academic council for appointment of Examiners.
- Coordinate research, teaching, extension and other activities in the Department.

PRINCIPAL 5/8/25

Dr.Kandula Anjaneyulu
M.A., UGC-NET, JRF, Ph.D.
P. R. Government College (A), Kakinada
PRINCIPAL (FAC)
P.R.GOVERNMENT COLLEGE (A)
KAKINADA - 533 001

Vision and Mission of the college

Vision:

To provide the right academic environment paving way for intellectual excellence, humane feelings and social commitment. The college believes in providing quality education for the socially disadvantaged, economically weaker sections of the society and thereby help them move up the ladder of success and social order.

Mission:

- To impart holistic education with special emphasis on character, culture, updated knowledge and skill-oriented learning.
- To make the students enjoy the fruits of globalization without prejudice to their local and cultural environment.
- To impart necessary life skills so as to make them face any challenge in the bigger world – Social, ethical, psychological or professional.

P. R. Government College (Autonomous), Kakinada

Department of Computer Science

Board of Studies – 2025-26 (Artificial Intelligence Program)

The **Board of Studies meeting** for the **Artificial Intelligence** Program was held in the Department of **Computer Science** on 07 August 2025 (Forenoon) to deliberate on the following agenda items.

AGENDA

1. **Implementation of Pedagogical Practices** – Framing course objectives and outcomes, preparing syllabus blueprints, model question papers, and adopting innovative teaching–learning methodologies (ICT tools, project-based learning, blended learning, etc.) for effective delivery of curriculum in the **Artificial Intelligence Program**.
2. **Departmental Academic Activities (2025–26)** – Planning of seminars, workshops, conferences, training programs, faculty development programs (FDPs), and student development initiatives.
3. **Curriculum Revision and Updation** – Review and necessary modifications of the existing syllabi in Artificial Intelligence.
4. **Adoption of APSCHE Model Curriculum** – Implementation of APSCHE-prescribed curriculum for I Year students with effect from the academic year 2025–26.
5. **Assessment and Evaluation Methods** – Approval of the following pattern:
    - Internal Assessment: **50% weightage** for I, II, and III Year students.
    - End Semester Examinations: **50 Marks** for I, II, and III Year students.
    - Continuous Internal Evaluation (CIE):
        - Project Work – 10 Marks
        - Assignments – 5 Marks
        - Seminar/Presentation – 5 Marks
        - Viva on Theory – 3 Marks
        - Clean & Green Activities and Attendance – 2 Marks
6. **Conduct of Practical Examinations** – Guidelines for laboratory-based evaluations.
7. **Panel of Examiners / Paper Setters / Subject Experts** – Preparation and approval of panel for examinations and related Board of Studies deliberations.
8. **Research and Extension Activities** – Encouraging student research projects, industry collaborations, internships, and community outreach initiatives.

9. **Skill Development and Employability Enhancement** – Introduction of certificate or value-added courses in emerging domains.
10. **Feedback and Quality Assurance** – Mechanism for structured feedback collection from stakeholders (students, alumni, industry experts, and faculty) and its incorporation into curriculum and teaching practices for continuous improvement.
11. **Any Other Matter with the Permission of the Chair.**

RESOLUTIONS

1. Implementation of Pedagogical Practices

- It was resolved to adopt **Outcome-Based Education (OBE)** framework for all AI courses.
- Faculty members shall prepare **syllabus blueprint and model question paper** for each course.
- Innovative teaching methods such as **ICT-enabled learning, project-based learning, and blended learning** will be integrated into regular teaching practices.

2. Departmental Academic Activities (2025–26)

- The BoS resolved to organize:
    - One student workshops.
    - One **National Seminar** on any subfields of Artificial Intelligence
    - Student Development Programs (coding challenges, and internships in AI-related fields).

3. Curriculum Revision and Updation

- It was resolved to **update the AI curriculum** by including courses in **Generative AI, Explainable AI, and Edge AI**.

4. Adoption of APSCHE Model Curriculum

- It was resolved to implement the **APSCHE-prescribed model curriculum** for I Year AI students (2025–26 batch).

5. Assessment and Evaluation Methods

- The following assessment scheme was approved:
    - **Internal Assessment:** 50% weightage (I, II, and III Year students).
    - **End Semester Examination:** 50 Marks (I, II, and III Year students).
    - **Continuous Internal Evaluation (CIE):**
        - Project Work – 10 Marks
        - Assignments – 5 Marks
        - Seminar/Presentation – 5 Marks
        - Viva on Theory – 3 Marks
        - Clean & Green Activities and Attendance – 2 Marks

6. **Conduct of Practical Examinations**
    - Even semester practical examinations shall be conducted with **external examiners** drawn from reputed colleges.
7. **Panel of Examiners / Paper Setters / Subject Experts**
    - The BoS approved the proposed panel of **external examiners, question paper setters, and subject experts**.
8. **Research and Extension Activities**
    - It was resolved to encourage **student research projects** guided by faculty.
    - Collaborations with **industries, research labs, and government agencies** will be promoted.
9. **Skill Development and Employability Enhancement**
    - The BoS approved the introduction of **certificate and value-added courses** in:
        - AI in Cloud Platforms (AWS/GCP)
        - User Interface Design (Web Technologies)
    - Industry partnerships shall be explored for delivery of these courses.
10. **Feedback and Quality Assurance**
    - A **structured feedback mechanism** will be implemented to collect inputs from students, alumni, industry experts, and faculty.
    - The BoS resolved that feedback shall be analyzed every semester and necessary corrective actions will be taken to improve curriculum and teaching.

P. R. Government College (Autonomous), Kakinada
Department of Computer Science
Board of Studies – 2025-26 (Artificial Intelligence Program)
Members Present

The Board of Studies meeting for the Artificial Intelligence program under the Department of Computer Science was held on **07-08-2025 (Forenoon)** at **Computer Science Lab – I**. The meeting was conducted under the chairmanship of **Mr. R. V. Satyanarayana**, Lecturer In-Charge, Department of Computer Science. The following members were present and approved the resolutions discussed during the meeting.

S. No	Name of the Person	Designation	Signature
1	Sri. R V Satyanarayana	Chairman & Lecturer Incharge, Department of Computer Science	
2	Smt. N. Naga Subrahmanyeswari, Lecturer in Computer Science, ASD College for Women (A), Kakinada	University Nominee	
3	Sri. G B V Padmanadh, GDC, Mummidivaram	Subject Expert-1, Lecturer in Computer Science	
4	Dr. K Srinivas, Professor & HoD, Dept. of CSE, BVCITS(A), Batlapalem.	Subject Expert-2, Lecturer in Computer Science and Engineering	
5	Sri P.Swamy Vandanam, Managing Director, BDPS Computers, Kakinada	Representative from Industry	
6	Sri. A Anantha Teja	Member	
7	Ms. Peruri Susmitha	Member	
8	Sri. Chinta Moses Raju	Member	
9	Mrs. Marre Varalakshmi	Member	
10	MS. Jonnada Lakshmi Gayatri	Member	
11	Sri. Aditya Sai Ganesh Pappu	Member	
13	Sri Sakala Apparao, Consultant, Cap Gemini	Student Alumni Member	-
14	K Helasya Subhadra III B.Sc. (AI)	Student Member	
15	V Durga Prasad, II B.Sc. (AI)	Student Member	

PANEL OF NAMES FOR APPOINTMENT OF EXAMINERS/PAPERSETTERS

2025-26

S.NO	NAME OF THE LECTURER	NAME OF THE COLLEGE
1	Dr. N Sridhar	GDC Tuni
2	Smt. Naga Subramanyeswari	ASD Women's College ,Kakinada
3	Sri. D.Suneel	G.D.C.(A), Rajamahendravaram
4	Sri RASMI RANJAN KHANSAMA	GDC TUNI
5	Dr. Ch. V. M. Hari	Dr VS Krishna G.D.C.(A), Visakhapatnnam
6	Sri. D. V. Raghava Swamy	Dr VS Krishna G.D.C.(A), Visakhapatnnam
7	Sri. BODALA RAVI	GDC Tuni
8	Sri. R Ashok Kumar	SCIM Govt. College, Tanuku
9	Sri. SSVAS Samba Murthy	GDC, Paderu
10	Dr. Jahnavi	VS Krishna College, VIsakhapatnam
11	Sri. E Jyothi Kiranmai	SCIM Govt. College, Tanuku
12	Sri. D Vijay Kumar	SCIM Govt. College, Tanuku
13	Smt. U Sandhya Rani	GDC(A), Rajahmundry
14	Sri H Devaraj	GDC(A), Rajahmundry
15	Sri P Narasinga Rao	GDC(A), Rajahmundry
16	Sri D Seeta Ramudu	GDC(A), Rajahmundry

PITHAPUR RAJAH'S GOVT DEGREE COLLEGE (AUTONOMOUS) ::KAKINADA

DEPARTMENT OF COMPUTERSCIENCE

UNDER CBCS PATTERN

Courses for the Academic Year 2025-26

COURSE STRUCTURE OF B.Sc. (ARTIFICIAL INTELLIGENCE)

S.No	Semester	Course Code	Title of the Course(Paper)	Max Marks (SEE)	Marks inCIA	Hrs/Week			
						L	T	P	C
1	SEM - I	Major-1	Computer Fundamentals and Office Automation	50	50	3	-	-	3
2			Computer Fundamentals and Office Automation Lab	50	-	-	-	2	1
3		Major-2	Mathematical Foundation For AI	50		4	-	-	4
4	SEM - II	Major-3	Python Programming And Data Structures	50	50	3	-	-	3
5			Python Programming And Data Structures Lab	50	-	-	-	2	1
6		Major-4	Artificial & Computational Intelligence	50	50	3	-	-	3
7			Artificial & Computational Intelligence Lab	50	--	-	-	2	1
3	Summer		Community service Project	100	-	-	-	-	4
4	SEM-III	Major-5	Document Oriented Database	50	50	3	-	-	3
5			Document Oriented Database Lab	50	-	-	-	2	1
6		Major-6	Operating Systems	50	50	3	--	-	3
7			Operating Systems Lab	50	-	--	--	2	1
8		Major-7	Data Structures using C	50	50	3	--	-	3
9			Data Structures using C Lab	50	--	--	--	2	1
10		Major-8	Inferential Statistics	50	50	3	--	--	3
11			Statistical Data Analysis Using SPSS - II Lab	50	--	--	--	2	1
12	SEM-IV	Major-9	Data Warehousing and Data Mining	50	50	3	--	-	3
13			Data Warehousing and Data Mining Lab	50	-	-	-	2	1
14		Major-10	Machine Learning using Python	50	50	3	-	-	3
15			Machine Learning using Python Lab	50	--	--	--	2	1
16		Major-11	Introduction to AI	50	50	3	-	-	3
17			Introduction to AI Lab	50	-	-	-	2	1
18	INTERNSHIP			100	-	-	-	-	4
19			Introduction to Predictive Analytics using Python	50	50	3	-	-	3

20	SEM-V	Major-12	Introduction to Predictive Analytics using Python Lab	50	-	-	-	2	1
21		Major-13	Algorithms for Intelligent Systems	50	50	3	-	-	3
22			Algorithms for Intelligent Systems Lab	50	-	-	-	2	1
23		Major-14	Natural Language Processing	50	50	3	-	-	3
24			Natural Language Processing Lab	50	-	-	-	2	1
25		Major-15	Software Project Management	50	50	3	-	-	3
26			Software Project Management Lab	50	-	-	-	2	1
	SEM-VI	APPRENTICESHIP		200	-	-	-	-	12

L=Lecture,T=Tutorial,P=Practical,C=Credits

PITHAPUR RAJAH'S GOVT DEGREE COLLEGE (AUTONOMOUS)::KAKINADA

DEPARTMENT OF COMPUTERSCIENCE

UNDER CBCS PATTERN

Courses for the Academic Year 2025-26

Course Structure of B.Sc. (Computer Science Minor)

S.No	Semester	Course Code	Titleofthe Course(Paper)	Max Marks (SEE)	Marks inCIA	Hrs/Week			
						L	T	P	C
1	SEM-II	Minor - 1	Problem Solving using C	50	50	3	--	-	3
			Problem Solving using C Lab	50	--	-	-	2	1
2	SEM-III	Minor - 2	Object Oriented Programming using Java	50	50	3	--	-	3
			Object Oriented Programming using Java Lab	50	--	-	-	2	1
3	SEM-IV	Minor - 3	Database Management System	50	50	3	--	-	3
			Database Management System Lab	50	--	-	-	2	1
4		Minor - 4	Object Oriented Software Engineering	50	50	3	-	-	3
			Object Oriented Software Engineering Lab	50	--	--	--	2	1
5	SEM-V	Minor - 5	Web Applications Development using PHP & MYSQL	50	50	3	-	-	3
			Web Applications Development using PHP & MYSQL Lab	50	--	-	-	2	1
6		Minor - 6	Internet of Things	50	50	3	-	-	3
			Internet of Things Lab	50	--	-	-	2	1

L=Lecture,T=Tutorial,P=Practical,C=Credits

PITHAPUR RAJAH'S GOVT DEGREE COLLEGE (AUTONOMOUS)::KAKINADA

DEPARTMENT OF COMPUTERSCIENCE

Marks Distribution for the I Year, II Year & III year

Internal: 50 marks External: 50 marks

S.No.	Activities	Marks Allotted
1	Two Internal Mid Term Exams (Avg of two).. for 25marks	25 Marks
2	Project(10M), Viva voce(3M), Assignments(5M), seminars(5M),clean & green and attendance-(2M)	25 Marks
		Total - 50 Marks

B.Sc. (Hons.)Artificial Intelligence

Program Specific Outcomes (PSOs)

After completion of the program, the student is able to

PSO1: AI Problem Solving Proficiency: Demonstrate proficiency in analyzing intricate problems, identifying AI-based solutions, and developing algorithms using machine learning and AI techniques.

PSO2: Advanced AI Modeling and Implementation: Excel in designing AI models, implementing machine learning algorithms, and deploying AI solutions for real-world applications.

PSO3: Expertise in Natural Language Processing and Computer Vision: Apply their expertise in natural language processing and computer vision to analyze text and images, and innovate AI-driven solutions in these specialized domains.

PSO4: Ethical AI and Human-AI Interaction: Critically evaluate AI systems for ethical implications, ensuring responsible development, and collaborate in designing AI systems that seamlessly interact with humans.

B.Sc (Honours) with Single Major

Semester	Major* (4 Cr)			Minor (4 Cr)			AECC (3 Cr)			Multi Disny' (2 Cr)			Skill Enhancement Courses (2Cr)			OOTC			Env. Edn (2 Cr)			Total		
	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr
Sem 1	2*	10	8				2	8	6	1	2	2	2	4	4							7	24	20
Sem 2	2	6+4	8	1	3+2	4	2	8	6				2	4	4							7	27	22
Community Service Project of 180 hours with 4 Credits. Student is eligible for Exit Option-1 with the award of Certificate in respective discipline																								
Sem 3	4	12+8	16	1	3+2	4				1	2	2	1	2	2							7	29	24
Sem 4	3	9+6	12	2	6+4	8				1	2	2	1	2	2							7	29	24
Short-Term Internship/Apprenticeship/OJT of 180 hours with 4 Credits. Student is eligible for Exit Option-2 with the award of Diploma in respective major with minor																								
Sem 5	4	12+8	16	2	6+4	8													1	2	2	7	32	26
Sem 6	**Semester Internship/Apprenticeship/OJT with 12 Credits. Student is eligible for Exit Option-3 with the award of Degree in respetive major**																							
																			IKS#					
Sem 7	3	9+6	12										2*	6+4	8	1	2	2	1	2	0	6	29	22
Sem 8	3	9+6	12										2*	6+4	8	1	2	2	1	2	0	6	29	22
	21		84	6		24	4		12	3	6	6	10	32	28	2	4	4	2	4	0	47		**160**
20 Additional Credits for 10 month mandatory Internship/OJT/Apprenticeship																								

C Courses **H** Hours **Cr** Credits **OOTC** Open Online Transdisciplinary

IKS# Indian Knowledge Systems - Audit Course

SEMESTER-I

	Pithapur Rajah's Government College(A)::Kakinada **Department of Computer Science**	**Program:** I B.Sc. (AI)
Major-1	**Course Name:** Computer Fundamentals and Office Automation	**Semester:** I
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

- Understand the evolution of computer systems, various number systems, and the fundamental components of a computer.
- Explain the functional organization of computers, types of computer systems, and networking fundamentals including topologies and Internet basics.
- Gain proficiency in using word processing and presentation tools for creating professional documents and visual presentations.
- Develop skills in using spreadsheet software for performing calculations, data manipulation, and visualization.
- Apply advanced data analysis and visualization techniques using spreadsheets for effective decision-making and reporting.

Course Outcomes:

- Identify and convert between different number systems and describe the evolution and generations of computers.
- Illustrate the block diagram and explain the working of computer components, input/output devices, and memory hierarchy.
- Create and format professional documents and presentations using MS Word/Google Docs and PowerPoint/Google Slides.
- Perform data entry, use formulas and functions, generate charts, and apply conditional formatting in spreadsheets for analysis.
- Utilize advanced spreadsheet features such as Pivot Tables, Data Validation, and Dashboards for comprehensive data visualization and decision support.

UNIT-I

Number Systems: Binary, Decimal, Octal, Hexadecimal; conversions between number systems.

Evolution of Computers: History from early mechanical devices to modern-day systems. Block Diagram of a Computer: Components like Input Unit, Output Unit, Memory, CPU (ALU + CU).

Generations of Computers: First to Fifth Generation – technologies, characteristics, examples.

UNIT-II

Basic organization and N/W fundamentals:

Computer Organization: Functional components – Input/ Output devices, Storage types, Memory hierarchy. Types of Computers: Micro, Mini, Mainframe, and Supercomputers.

Networking Fundamentals: Definition, need for networks, types (LAN, WAN, MAN), topology (Star, Ring, Bus). **Internet Basics:** IP Address, Domain Name, Web Browser, Email, WWW.

UNIT-III

Word Processing and presentations:

Word Processing Basics: Using MS Word/Google Docs – formatting, styles, tables, mail merge.

Presentation Tools: Using PowerPoint/Google Slides – slide design, animations, transitions.

Applications: Creating resumes, reports, brochures, and presentations. Keyboard Shortcuts.

UNIT-IV

Spreadsheet Basics:

Spreadsheet Concepts: Understanding rows, columns, cells in tools like MS Excel/Google Sheets, cell referencing. **Functions and Formulae:** SUM, AVERAGE, IF, COUNT.

Charts and Graphs: Creating visual representations

Data Handling: Sorting, filtering, conditional formatting.

Text Functions: LEFT, RIGHT, MID, LEN, TRIM, CONCAT, TEXTJOIN

Advanced Functions: Logical: IF, AND, OR, IFERROR, Lookup: VLOOKUP, HLOOKUP, XLOOKUP, INDEX, MATCH

UNIT-V

Data Analysis and Visualization:

Conditional Formatting: Custom rules, Color scales, Icon sets, Data bars

Data Analysis Tools: Pivot Tables and Pivot Charts, Data Validation (Drop-downs, Input Messages, Error Alerts), What-If Analysis: Goal Seek, Scenario Manager, Data Tables

Charts and Dashboards: Creating Interactive Dashboards, Using slicers with Pivot Tables, Combo Charts and Sparklines. **Productivity Tips:** Using Named Ranges, Freeze Panes, Split View

Text Book(s)

- Fundamentals of Computers, Reema Thareja, Oxford University Press, Second Edition
- Fundamentals of Computers, V. Rajaraman – PHI Learning
- Introduction to Computers by Peter Norton – McGraw Hill
- Microsoft Office 365 In Practice by Randy Nordell – McGraw Hill Education

Reference Books:

- Excel 2021 Bible by Michael Alexander, Richard Kusleika – Wiley
- Networking All-in-One For Dummies by Doug Lowe – Wiley
- Microsoft Official Docs and Training: https://learn.microsoft.com
- Google Workspace Learning Center: https://support.google.com/a/users

	Pithapur Rajah's Government College(A)::Kakinada **Department of Computer Science**	**Program:** I B.Sc. (AI) **Semester:** I
Major-1	Course Name: Computer Fundamentals And Office Automation	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	1	2	20
II	2	1	25
III	1	1	15
IV	1	2	20
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13 Questions to Answer: 3 (Essay) + 4 (Short) = 7
Total Marks before Choice: 95
Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajah's Government College(A)::Kakinada **Department of Computer Science**	**Program:** I B.Sc. (AI) **Semester:** I
Major-1	**Course Name:** Computer Fundamentals and Office Automation	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
TIME: 2 Hrs		**Max. Marks**: 50

SECTION-I

Answer any THREE questions (Must attempt at least one from each Part). Each question carries 10 Marks. **3X10=30M**

PART-A

1. Explain different number systems and their conversions with examples.
2. Explain the functional components of a computer and memory hierarchy.
3. Explain the features and uses of MS Word/Google Docs in word processing.

PART-B

4. Describe different types of computer networks and their topologies.
5. Explain spreadsheet basics, cell referencing, and commonly used functions in MS Excel/Google Sheets.
6. Explain conditional formatting and its types like color scales, icon sets, and data bars.

SECTION-II

Answer any FOUR questions. Each question carries 5 Marks. **5X4=20M**

7. Draw and explain the block diagram of a computer system.
8. Write short notes on early mechanical computing devices.
9. Write short notes on types of computers.
10. Write short notes on mail merge and table creation in MS Word.
11. Write short notes on text functions like LEFT, RIGHT, MID, LEN, and CONCAT
12. Explain sorting, filtering, and conditional formatting in spreadsheets.
13. Write short notes on creating interactive dashboards and using slicers.

	Pithapur Rajah's Government College (A): Kakinada **Department of Computer Science**	**Program:** I B.Sc. (AI) **Semester:** I
Major-1	**Course Name:** Computer Fundamentals and Office Automation Lab	
	Hours Allocated: 2hrs/week	Credits: 1

List of Experiments

1. Demonstration of Assembling and Dissembling of Computer Systems.
2. Identify and prepare notes on the type of Network topology of your institution.
3. Prepare your resume in Word.
4. Using Word, write a letter to your higher official seeking 10-days leave.
5. Prepare a presentation that contains text, audio and video.
6. Using a spreadsheet, prepare your class Time Table.
7. Using a Spreadsheet, calculate the Gross and Net salary of employees (Min 5) considering all the allowances.
8. Generate the class-wise and subject-wise results for a class of 20 students. Also generate the highest and lowest marks in each subject.
9. Using IF, AND, OR, and IFERROR to Automate Grade Evaluation.
    a. Create a table of student scores in different subjects.
    b. Use IF to assign grades (A/B/C/Fail).
    c. Use IFERROR to handle missing scores or invalid data.
10. Employee Database Search Using VLOOKUP, HLOOKUP, XLOOKUP, INDEX, and MATCH
    a. Create a database of employees (Name, ID, Department, Salary).
    b. Implement VLOOKUP to search by employee ID.
    c. Use HLOOKUP to extract department heads by role.
    d. Apply XLOOKUP for more flexible searches.
    e. Use INDEX + MATCH as an alternative to VLOOKUP.
11. Sales Report Analysis Using Pivot Tables and Charts
    a. Use a dataset of product sales (Product, Region, Date, Quantity, Revenue).
    b. Create Pivot Tables to summarize data by region/product.
    c. Insert Pivot Charts for visual analysis (e.g., bar, line).
    d. Add slicers to make the dashboard interactive.
12. Designing a Data Entry Form with Drop-downs and Input Rules
    a. Create a student registration form.

b. Add drop-down lists for course selection using Data Validation.
c. Add input messages to guide users.
d. Add error alerts for wrong entries.

13. Monthly Budget Planning using Goal Seek and Scenario Manager
    a. Create a simple personal budget (income, expenses, savings).
    b. Use Goal Seek to determine income needed to save a desired amount.
    c. Use Scenario Manager to compare different budgeting scenarios (best/ worst/ realistic case).
    d. Create a one-variable Data Table to analyze how different expenses affect savings.
14. Dashboard Creation Using Combo Charts, Sparklines & Slicers
    a. Use existing sales or attendance data.
    b. Insert combo charts (e.g., column + line).
    c. Add sparklines to show trends.
    d. Use slicers with Pivot Tables to control dashboard elements.
    e. Finalize and format for interactivity.

	Pithapur Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** I B.Sc. (AI) **Semester:** I
MAJOR 2	Course Name: Mathematical Foundation For Ai	
	Hours Allocated: 4hrs/week	Credits: 4

Course Objectives:

1. To develop a strong foundation in linear algebra, set theory, and functions essential for Artificial Intelligence.
2. To understand and solve systems of linear equations using matrix methods.
3. To gain knowledge of eigenvalues, eigenvectors, and matrix diagonalization techniques.
4. To learn fundamental concepts of probability and statistics for effective data analysis.
5. To explore various types of functions and their applications relevant to AI problem-solving and optimization.

Course Outcomes:

1. Solve complex linear algebra problems including computation of matrix properties and operations.
2. Apply set theory and compute eigenvalues/eigenvectors for mathematical and AI-based problems.
3. Understand differentiation rules and solve problems involving constrained optimization.
4. Calculate probabilities in different real-life situations and analyze discrete random variables.
5. Analyze data using statistical measures (mean, median, variance, correlation, etc.) and interpret visual data representations.

Unit I:

Basic Linear Algebra and Systems of Linear Equations

Vectors and matrices: basics and operations (addition, multiplication, transpose, inverse)

Elementary row operations: row swapping, scalar multiplication, row addition Row Echelon Form (REF), Reduced Row Echelon Form (RREF), Rank of matrix

System of linear equations: coefficient and augmented matrix representation

Types of solutions: unique, infinite, no solution Gaussian elimination method using REF and back substitution

Unit II:

Set Theory and Eigen Concepts

Sets, subsets, set operations (union, intersection, difference, complement), Venn diagrams, Cartesian products

Relations and functions: definitions and properties, linear transformations, Eigenvalues, eigenvectors, characteristic polynomial, Diagonalization of matrices and symmetric matrices

Unit III: Functions and their Properties

Definition, types of functions (polynomial, rational, exponential, logarithmic), Domain, range, and inverses of functions, Composition of functions, Continuity and basic limits, Graphical representation of functions, Maxima & Minima of functions.

Unit IV:

Vector Differentiation:

Vector differentiation –ordinary – derivatives of vectors – Differentiability – Gradient – Divergence - Curl operators - Directional derivatives of functions

Unit V:

Fundamentals of Probability & Basic Statistics

Probability: Concept of Uncertainty, Axioms and rules of probability, Conditional probability and independence, Law of total probability and Bayes‘ theorem

Measures of central tendency: Mean, Median, Mode

Measures of dispersion: range, interquartile range, variance, standard deviation

Introduction to correlation and covariance

Data representation: histograms, bar charts, scatter plots

Textbooks and References

1. Mathematics for Machine Learning, M. P. Deisenroth, A. A. Faisal, C. S. Ong, Cambridge University Press, 2020.
2. Introductory Linear Algebra, Howard Anton, Wiley.
3. Probability and Statistics for Engineers and Scientists, Ronald E. Walpole, Wiley.
4. Discrete Mathematics and its Applications, Kenneth H. Rosen, McGraw Hill.
5. online Resources: Khan Academy, MIT Open course Ware (Linear Algebra, Probability, Statistics, Functions).

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** I B.Sc. (AI) **Semester:** I
MAJOR 2	Course Name: MATHEMATICAL FOUNDATION FOR AI	
	Hours Allocated: 4hrs/week	Credits: 4

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	1	2	20
II	1	1	15
III	1	1	15
IV	1	1	15
V	2	2	30

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** I B.Sc. (AI) **Semester :** I
MAJOR 2	Course Name: MATHEMATICAL FOUNDATION FOR AI	
	Hours Allocated: 4hrs/week	Credits: 4
MODEL PAPER		
Time: 2hrs		Maxmarks:50M

Section -I

Answer any three of the following questions. Must attempt at least one question from each part. Each question carries 10 Marks 3 X 10 = 30M

Part – A

1. Explain different types of matrices and their operations with example.
2. Describe the Laws of set operations with suitable Venn diagrams.
3. Explain the concepts of probability, conditional probability, and independence with examples.

Part - B

4. Discuss the continuity and Limits of function.
5. Explain vector differentiation and derivatives of vector functions.
6. Describe Bayes' Theorem and its applications.

Section II

Answer any four of the following questions. Each question carries 5 marks. 4 X 5 = 20M

1. Write the steps to perform elementary row operations.
2. What is difference between REF and RREF?
3. Define union and intersection of sets.
4. What is logarithmic function?
5. Define Gradient?
6. Write the formula for Mean, Median, and mode.
7. Define Variance and Standard devation.

	Pithapur Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** I B.Sc. **Semester:** I
LSC-1	**Course Name**: AI Fundamentals	
	Hours Allocated: 4hrs/week	Credits: 3

Course Objectives:

- Understand the fundamental concepts, history, and subfields of Artificial Intelligence and its real-world applications.
- Explore the various domains where AI is applied such as healthcare, finance, agriculture, and education.
- Analyze ethical considerations, bias, fairness, transparency, and accountability in AI systems.
- Familiarize with generative AI tools, prompt engineering concepts, and their importance in human–AI interaction.
- Apply prompt engineering techniques in different areas such as education, business, and creative content generation using AI tools.

Course Outcomes (Learning Outcomes):

- Explain the fundamentals, history, and various subfields of Artificial Intelligence.
- Identify and describe major real-world applications of AI across multiple industries.
- Evaluate ethical, fair, and transparent AI practices ensuring accountability and security in AI systems.
- Demonstrate an understanding of generative AI tools and prompt engineering concepts in AI/ML applications.
- Implement prompt engineering strategies for solving real-world problems in education, business, and creative industries.

Unit I. AI and its Subfields

Introduction to Artificial Intelligence, History, Definition, Artificial General Intelligence, Industry Applications of AI, Challenges in AI.

Knowledge Engineering, Machine Learning, Computer Vision, Natural Language Processing, Robotics.

Unit 2. Applications of AI

Healthcare, Finance, Retail, Agriculture, Education, Transportation.

Unit 3. Bias and Fairness in AI Systems

Ethics in AI, Bias and Fairness in AI Systems, Transparency in AI Systems, Accountability, Security, Privacy, Inclusivity, Sustainability, Robustness, Reliability.

Unit 4. AI in Research, Generative AI and prompt engineering

AI in Experimentation and Multi-disciplinary research, Generative AI introduction, ChatGPT, Hugging Face, Gemini and other tools basics, Perplexity, Prompt engineering Definition and its importance, Role of Prompt Engineering in AI/ML Interaction, Emerging trends and Future Directions in AI.

Unit 5. Applications of Prompt engineering

Applications of Prompt Engineering: Education, Business & Commerce, Content Creation: AI for Creative Writing, AI for creative design, writing AI scripts for video, generating slides and slidesGPT usage, Designing thumbnails and channel branding with AI

TEXT BOOKS:

1. AI for Everyone: A Beginner's Handbook for Artificial Intelligence (AI) by Saptarsi Goswami, Amit Kumar Das , Amlan Chakrabarti
2. Prompt Engineering for Beginners: by Kapila Arora, Geetu Garg, Gaurav Arora.

REFERENCE BOOKS:

1. Let‘s Learn Artificial Intelligence: Base Module, Niti Ayog, Atal Innovation Mission.
2. Prompt Engineering for Generative AI: Future-proof inputs for Reliable AI-outputs by James Phoenix & Mike Taylor.
3. Generative AI Tutorial:https://www.w3schools.com/gen_ai/
4. Generative AI 360°: Practical Guide to ChatGPT, Midjourney & AI Tools to Boost Productivity & Creativity , For Professionals, Marketers & Entrepreneurs by Hitesh Motwani , ZebraLearn, 2025.
5. Generative AI: Prompt Engineering Basics:
6. Learn Generative AI Prompt Engineering for everyone. https://www.coursera.org/learn/generative-ai-prompt-engineering-for everyone?action=enroll
7. Free Artificial Intelligence (AI) Tutorial - Hands-On Prompt Engineering for AI Beginners & Business User | Udemy, https://www.udemy.com/course/prompt-engineering-for-ai-beginners-business-users

	Pithapur Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** I B.Sc. **Semester:** I
LSC-1	**Course Name**: AI Fundamentals	
	Hours Allocated: 4hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	1	2	20
II	1	1	15
III	1	1	15
IV	2	1	25
V	1	2	20

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** I B.Sc. **Semester:** I
LSC-1	**Course Name:** AI Fundamentals	
	Hours Allocated: 4hrs/week	Credits: 4
Model Paper		
Time: 2Hrs		Max. Marks:50M

SECTION-I

Answer any THREE questions (Must attempt at least one from each Part). Each question carries 10 Marks.

PART-A

1. Describe the challenges faced in Artificial Intelligence and its major industry applications.
2. Describe the role of AI in education and transportation with suitable examples.
3. Discuss transparency, accountability, and privacy issues in Artificial Intelligence.

PART-B

4. Define Prompt Engineering and explain its importance in AI–ML interaction.
5. Discuss Generative AI and describe the features of tools like ChatGPT, Hugging Face, Gemini, and Perplexity.
6. Explain the applications of Prompt Engineering in education and business sectors.

SECTION-II

Answer any FOUR questions. Each question carries 5 Marks.

7. What is Artificial General Intelligence (AGI)?
8. Write any two applications of AI in real-world industries.
9. Write a short note on AI in education.
10. What is meant by bias in AI systems?
11. Write a short note on Prompt Engineering.
12. What is the use of Prompt Engineering in education?
13. How is AI used for creative writing?

	Pithapur Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** I B.Sc. **Semester:** I
LSC-1	**Course Name**: AI Fundamentals-Practice Session	
	Hours Allocated: 2hrs/week	Credits:

Lab List

1. Create a mind map of AI subfields: NLP, CV, ML, Robotics, Knowledge Engineering using Canva/Napkin AI/ Similar Open AI tool
2. Text Analysis with Open-Source NLP Tools: **Tool:** Voyant Tools (text analysis web app)
   - Input sample texts (e.g., news articles, speeches).
   - Explore word frequency, keywords, sentiment.
   - Understand how NLP extracts meaning from text.
3. Train a basic image classifier using webcam images. Observe how the model "learns." Using Google Teachable Machine
   - Train two image categories (e.g., ―Smiling‖ vs. ―Not Smiling‖) using their own webcam images.
   - Observe how the model learns to classify.
   - Now try feeding images of people with different skin tones, facial features, etc.
   - Observe misclassifications or differences in confidence.
4. Simulate an AI chatbot helping a farmer or a student. You may use any GenAI tool of your choice. You may use the prompt below and also try your own.

Prompt:

"Act as an agriculture assistant. A farmer wants to know the best crop based on soil and season. Ask questions and suggest crops."

5. Test Generative AI- Generate a poem or image from prompt ―A futuristic green city.‖ using ChatGPT, Hugging Face (e.g., image or text generation)
6. Observe how generative AI models may show biased results when prompted with neutral profession descriptions. (Bing Image Creator / DALL·E on ChatGPT/ChatGPT). Generate images using the following neutral prompts:
   - ―A doctor treating a patient‖
   - ―A teacher in a classroom‖
   - ―A CEO giving a speech‖
   - ―A software engineer working from home‖

   Observe and discuss:
   - What gender/race/age are most commonly shown?

- Are the results stereotypical or diverse?

7. Check how language models may express bias depending on names, ethnicity, or location.

Use ChatGPT or Gemini

Prompts:

Prompt A:

—A person named Raj is applying for a bank loan. Will he be approved?‖

Prompt B:

—A person named John is applying for a bank loan. Will he be approved?‖

Change names, genders, and nationalities.

Observe the following and report your findings:

- Are the responses different?
- Is one version more positive or negative?
- Does the model express bias or hesitate?
- Should AI make such predictions?
- How do developers prevent this?

8. Exploring Text Generation and Summarization with Google AI Studio

Generate Creative Content

—Write a short story (150 words) about a robot who wants to become a chef.‖

- Submit and read the AI-generated story.
- Discuss how detailed and creative the output is.

Summarize a Paragraph

Prompt:

Summarize the following paragraph in 3 sentences:

—Artificial Intelligence is a branch of computer science that aims to create intelligent machines that can mimic human thinking. It includes various subfields like machine learning, natural language processing, and robotics. AI is widely used in industries such as healthcare, finance, and transportation to improve efficiency and decision-making.‖

- Submit and review the summary.
- Evaluate how well AI extracts key points.

Refine Your Prompt

Try changing the summary prompt to:

—Summarize the paragraph above in simple language for 10-year-olds.‖

- Compare this output to the previous one.
- Note how prompt wording changes results.

9. AI for Creative Writing

Prompt:

—Write a short motivational story for 10-year-old students in under 150 words.‖

10. Generate **Slides:** Tool: SlidesGPT/Other Free AI tool

    Prompt:

    —Create a 5-slide presentation on _AI in Smart Farming‘.‖

11. YouTube Thumbnails / Branding: Tool: Canva + Magic Media AI

    Design a thumbnail using Canva‘s AI tools with a prompt like:

    —Design a YouTube thumbnail for a video titled _Top 5 AI Tools for Students‘.‖

SEMESTER-II

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** I B.Sc. (Artificial Intelligence) **Semester :** II
Course 3	Course Name: Python Programming And Data Structures	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives

1. To introduce the fundamentals of Python programming, including environment setup, syntax, and core concepts.
2. To develop problem-solving skills using control flow, functions, and modules.
3. To provide knowledge of Python data structures, file handling, and exception handling for effective programming.
4. To impart object-oriented programming concepts and GUI development skills for building applications.

Course Outcomes (COs)

After successful completion of the course, students will be able to:

1. Explain the basic features, syntax, data types, and operators of Python programming.
2. Apply control flow constructs, functions, and modules to develop structured Python programs.
3. Demonstrate the use of sequences, sets, and dictionaries for effective data handling and manipulation.
4. Implement file handling techniques and apply exception handling mechanisms for robust applications.
5. Develop object-oriented and GUI-based applications using Python.

Unit 1: Basics of Python Programming

Introduction to Python, Features of Python, Programming Modes - Interactive Mode & Script Mode, Identifiers, Naming Conventions, Keywords (Reserved Words), Built-in Data Types, Literals - Integer, Float, Complex, Boolean, String, Variables, Operators, Expressions, Assignment Statements, Input/ Output Statements, Python Syntax (Lines, Comments, Indentation), Operators & Operands, Classification of Operators - Arithmetic Operators, Relational Operators, Logical Operators, Bitwise Operators, Assignment, Augmented Assignment, Identity Operators, Expressions & Precedence Rules

Unit 2: Control Flow, Functions & Modules

Control Flow - if Statement, if-else, if-elif-else. Iterative Statements – while, for, Nested Loops, Loop Control Statements – break, continue, pass, else with loops

Functions: Need for Functions, Defining & Invoking User-defined Functions, Return Statement, Function Input/ Output Cases, Scope of Variables - Local, Global, Nested Functions, Function Arguments - Required, Positional, Default, Variable-length, main() Function, Documentation Strings, Recursive Functions, Anonymous Functions (Lambda), Library Functions

Modules - Import, from..import, Creating & Using Modules, Namespaces

Unit 3: Core Data Types and Python Collections

Strings: Representation, Indexing, Slicing, Immutability, Operators, Methods, Formatting **Lists**: Creation, Indexing, Slicing, Mutability, Common Methods, List Comprehension **Tuples**: Immutability, Operations, Tuple Assignment

Sets and Frozensets: Methods, Mathematical Operations, Comprehension

Dictionaries: Key-Value Structure, Methods, Traversal, Nested Dictionaries

Unit 4: File Handling, Exception Management & Object-Oriented Programming

File Handling: Types, Opening, Reading, Writing, Closing, CSV Files, OS/ Pathlib Error Types, Exception Handling: try-except, raise, User-defined Exceptions, Assertions **OOP Concepts:** Classes, Objects, Attributes, Methods, Constructor and Destructors **Encapsulation**: Private and Public Members

Inheritance: Single, Multilevel, Multiple, Method Overriding

Unit 5: Abstract Data Structures and GUI Programming

Abstract Data Structures (ADTs): Concepts and Importance. **Linked Lists:** Definition, Types- Singly, Doubly, Circular; Node Structure, Insertion, Deletion, Traversal (Single Linked list implementation only). **Stacks:** LIFO Principle, Implementation using List, Applications. **Queues:** FIFO Principle, Implementation using List, Priority Queues

GUI Programming with Tkinter: Widgets (Label, Button, Entry, Menu, Listbox, Canvas etc.), Event Handling, Building Simple GUI Apps.

Textbooks:

1. Python Programming-An Object Oriented approach, Anita Goel, Universities Press
2. Python Programming using Problem Solving Approach Reema Thareja Oxford University Press 2020
3. Exploring Python, Budd T A, McGraw-Hill Education, 1st Edition, 2011.

Reference Book:

1. Python: The Complete Reference, Martin C. Brown, Mc Graw-Hill, 2018
2. Fundamentals of Python, Kenneth A. Lambert. (2019), First Programs,2nd Edition, CENGAGE Publication.

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** I B.Sc. (Artificial Intelligence) **Semester :** II
Course 3	Course Name: Python Programming And Data Structures	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Short Answer Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	2	1	25
II	1	2	20
III	1	2	20
IV	1	1	15
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** I B.Sc. (Artificial Intelligence) **Semester :** II
Course 3	**Course Name:** Python Programming And Data Structures	
	Model Paper	
	Time: 2hrs	Max. Marks: 50

SECTION-I

Answer any THREE questions (Must attempt at least one from each Part). Each question carries 10 Marks.

PART-A

1. Explain the important features of Python and discuss why Python is considered a powerful and easy-to-learn programming language.
2. Describe Python‘s built-in data types with examples.
3. Explain the different types of loop/ iterative control flow statements in Python.

PART-B

4. Discuss various Python collections — List, Tuple, Set, and Dictionary — highlighting their characteristics, operations, and applications.
5. Explain file handling in Python. Write a Python program to open a text file, read its contents, and display the number of lines, words, and characters.
6. Explain the concept of Stack in Python. Discuss its implementation using list with examples.

SECTION-II

Answer any FOUR questions. Each question carries 5 Marks.

7. What are identifiers and keywords in Python? State the naming conventions with examples.
8. Write a Python function to find the factorial of a number using recursion.
9. Differentiate between local and global variables with examples.
10. Explain string slicing in Python and demonstrate any three string methods with examples.
11. What is a tuple? Explain tuple operations and the concept of immutability with an example.
12. Explain exception handling using try, except, and finally blocks with an example.
13. What is event handling in Tkinter? Write a simple GUI program that displays a message when a button is clicked.

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** I B.Sc. (Artificial Intelligence) **Semester :** II
Course 3	**Course Name:** Python Programming And Data Structures	
	Hours Allocated: 2hrs/week	Credits: 1

1. Basic Python Programs:
    a. Write a program to display basic details (name, roll number, department) using print() and demonstrate different literal types (int, float, string, boolean, complex).
    b. Write a program to perform arithmetic, relational, logical, bitwise, and assignment operations on given inputs.
2. Control Flow Practice
    c. Write a program to find the largest of three numbers using if-elif-else.
    d. Write a program to check whether a number is prime or not using loops.
    e. Write a program to illustrate the use of loop control statements (break, continue, pass).
3. Functions and Recursion
    f. Write a program to define a function to calculate factorial of a number (using recursion).
    g. Write a program to demonstrate different types of function arguments (default, positional, keyword, variable-length).
4. Write a program to illustrate string slicing, concatenation, repetition, and built-in methods.
5. Write a program to create a list of numbers, perform insertion, deletion, searching, sorting, and list comprehension.
6. Write a program to demonstrate tuple packing, unpacking, and immutability.
7. Write a program to implement set operations (union, intersection, difference, subset, superset).
8. Write a program to create a dictionary of student roll numbers and marks, and perform add, update, delete, and traversal operations.
9. Write a program to read and display count of vowels, consonants, digits, and spaces of a text file.
10. Write a program to copy the contents of one file into another file.
11. Write a program to read and process student marks from a CSV file (calculate average, highest, lowest).

12. Write a program to demonstrate exception handling using try-except-finally.
13. Write a program to create a class Student with attributes and methods to display details.
14. Write a program to demonstrate single and multilevel inheritance.
15. Implement stack (LIFO) and queue (FIFO) using lists.
16. Implement singly linked lists: node creation, insertion, deletion, traversal.
17. Write a Tkinter program with Label, Entry, and Button widgets to take user input and display it.
18. Write a Tkinter program to create a simple calculator application

	Pithapur Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** I B.Sc. (AI) **Semester:** II
Course 4	Course Name: **ARTIFICIAL & COMPUTATIONAL INTELLIGENCE**	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objective:

By the end of the course, the student will be able to:

1. Understand the fundamental concepts, history, and scope of Artificial Intelligence and its real-world applications.
2. Analyze the working of intelligent agents and apply the PEAS framework to model AI-based systems.
3. Explore and implement different search strategies for solving AI problems efficiently.
4. Comprehend the structure, functionality, and applications of expert systems in decision-making processes.
5. Gain insights into machine learning paradigms, computational intelligence techniques, and ethical implications in AI development.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Define and explain key concepts of Artificial Intelligence, including agents, environments, and problem-solving approaches.
2. Design PEAS representations and categorize intelligent agents based on their functions and architectures.
3. Apply uninformed and informed search algorithms to solve various AI-based problems.
4. Develop simple expert system models and differentiate them from intelligent agent systems.
5. Demonstrate an understanding of machine learning techniques and evaluate ethical, transparent, and responsible AI practices.

Unit 1: Introduction to Artificial Intelligence and PEAS Framework

Introduction to AI: Definition, history, applications, and scope

The PEAS framework: Performance Measure, Environment, Actuators, Sensors, Examples of PEAS in real-world AI systems

Intelligent agents: Intelligent agents and their environments, **Types of intelligent agents**: Simple reflex, model-based, goal-based, utility-based, Agent architectures and rationality.

Unit 2: Expert Systems

Definition and components of Expert Systems (Knowledge Base, Inference Engine, User Interface), Rule-based systems and knowledge representation, Examples of expert systems: medical diagnosis, decision support, Limitations and comparison with AI agents, Role and significance of expert systems in AI evolution

Unit 3: Search Strategies in AI

Problem-solving as search: problem formulation, states, actions, goal test, Traveller‘s problem

Uninformed (Blind) Search: Breadth-first search, Depth-first search, Uniform-cost search

Informed (Heuristic) Search: Greedy best-first search, A* algorithm, Applications of search in AI problems

Unit 4: Introduction to Machine Learning

What is machine learning, definitions, Types of learning: Supervised, Unsupervised, Reinforcement learning (basic ideas), classification, Regression, clustering and Association, Basic learning algorithms overview and applications

Unit 5: Computational Intelligence and Ethics in AI

Overview of computational intelligence (Basics of fuzzy logic, neural networks), Role of computational intelligence in AI, Ethics and societal challenges in AI, Responsible AI, fairness, transparency, and safety concerns.

Recommended Textbooks and References

- Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 4th Edition
- Elaine Rich, Kevin Knight, Artificial Intelligence, 3rd Edition
- Michael Negnevitsky, Artificial Intelligence: A Guide to Intelligent Systems
- Ivan Bratko, Prolog Programming for Artificial Intelligence, 4th Edition
- Online resources: AI course materials from Coursera, NPTEL, GeeksforGeeks AI tutorials.

	Pithapur Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** I B.Sc. (AI) **Semester:** II
Course 4	Course Name: **ARTIFICIAL & COMPUTATIONAL INTELLIGENCE**	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Short Answer Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
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III	1	2	20
IV	1	1	15
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13 Questions to

Answer: 3 (Essay) + 4 (Short) = 7 Total Marks before

Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** I B.Sc. (AI) **Semester:** II
Course 4	Course Name: **ARTIFICIAL & COMPUTATIONAL INTELLIGENCE**	
	Hours Allocated: 3hrs/week	Credits: 3

Section -I

Answer any three of the following questions. Must attempt at least one question from each part. Each question carries 10 Marks **3 X 10 = 30M**

Part – A

1. What is the PEAS framework? Explain each part with simple examples.
2. What is an Expert System? Explain its main components with examples.
3. What are informed search techniques? Explain A* algorithm with examples.

Part - B

4. Describe the different types of uninformed search strategies like BFS, DFS, and Uniform-cost search.
5. What is Machine Learning? Explain its types with simple examples.
6. Discuss the role of computational intelligence in Artificial Intelligence applications.

Section-II

Answer any four of the following questions. Each question carries 5 marks. 4 X 5 = 20M

7. What is the main goal of Artificial Intelligence
8. What is the difference between a simple reflex agent and a goal-based agent?
9. Give two examples of Expert Systems used in real life.
10. What is the main difference between informed and uninformed search strategies?
11. What is the difference between supervised and unsupervised learning?
12. What do you mean by responsible AI?
13. Mention any two ethical concerns related to AI systems.

	Pithapur Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** I B.Sc. (AI) **Semester:** II
Course 4	Course Name: **Artificial & Computational Intelligence**	
	Hours Allocated: 1hr/week	Credits: 1

LAB PROGRAMS LIST

1. Introduction to Prolog Environment and Syntax

- Setting up Prolog, understanding facts, rules, and queries.

2. Defining Simple Facts and Queries

- Write and test simple facts like family relationships, likes/dislikes.

3. Creating Rules in Prolog

- Define logical rules with conditions and test queries.

4. List Handling in Prolog

- Write programs to manipulate lists (head, tail, concatenation).

5. Recursion in Prolog

- Implement recursive relations such as factorial and Fibonacci.

6. Search and Backtracking

- Demonstrate Prolog‘s backtracking with sample queries and control cuts.

7. Family Relationship Programs

- Model family trees and query relationships like siblings, ancestors.

8. Solve the Eight Queens Problem

- Classic AI problem solved using backtracking.

9. Implement Simple Arithmetic Operations

- Addition, subtraction, multiplication using Prolog predicates.

10. Monkey and Banana Problem

- Logic problem modeling and solution.

11. Basic Expert System Prototype

- Write rules for a simple medical diagnosis or recommendation system.

12. Implement Search Algorithms (Conceptual)

- Demonstrate basic search algorithms like best-first search using Prolog rules.

	Pithapur Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** I BSc(AI/IOT/DS) **Semester:** II
LSC2	**Applications Of Artificial Intelligence**	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives

- Provide a foundation in the AI ecosystem, including hardware, cloud, and edge platforms relevant to Computer science.
- Familiarize students with different types of datasets and public repositories used in AI research.
- Develop skills in building AI data pipelines through collection, annotation, cleaning, and preprocessing.
- Expose students to no-code AI platforms, vibe coding, and workflow automation tools for rapid AI application development.
- Introduce applications of AI in networking, cybersecurity, and digital forensics, highlighting both opportunities and challenges.

Course Outcomes

On successful completion of this course, students will be able to:

- Explain the role of AI hardware, edge devices, and cloud platforms in enabling applications in Computer Science.
- Differentiate data types and utilize public datasets relevant to AI.
- Design and implement a conceptual AI data pipeline for solving problems.
- Apply no-code/low-code AI platforms, vibe coding tools, and workflow automation for simple AI-powered applications.
- Evaluate the role of AI in networking, cybersecurity, and digital forensics, and discuss its challenges and future scope.

Unit 1

Infrastructure and Platforms for Building Applications using AI

Hardware used in building AI applications: Processors - CPU, GPU, TPU, NPU, Memory - RAM, VRAM, Storage - HDD, SSD

Platforms for building applications using AI: Online platforms (Example - Google AutoML, H2O.ai, Teachable Machine or similar platforms - for practice only); Desktop (No-code/Low-code) platforms (Orange Data Mining, KNIME, Weka, RapidMiner or similar tools - for practice only).

Edge AI: Concept; Applications in daily life in devices like Refrigerators, Led Bulbs, Surveillance Cameras, Micro Ovens, Smart Cars/Scooters; Edge AI in smart Appliances

Unit 2

Foundations of Data - Types, Ethics and Utility in Building Applications using AI Importance of data in building AI applications: Data as the fuel for AI, Role of big data in training AI models.

Conceptual Foundations of Data: Data vs. Information vs. Knowledge.

Structure of Data: Structured, Semi-Structured, and Unstructured Data.

Modalities of Data: Text, Image, Audio, Video, Tabular, Time-Series, and Spatial Data.

Formats of Data: Text Formats (CSV, JSON, XML), Image Formats (JPEG, GIF, PNG), Audio/Video (MP3, WAV, MP4, AVI).

Data Repositories: Definition of public Datasets; Definition of private Datasets; Importance of Public Datasets, Popular Public Dataset Repositories (Example - Kaggle, Hugging Face Datasets, UCI Machine Learning Repository, Google Dataset Search or similar ones - for demonstration only), Dataset licensing and usage rights.

Ethics, Privacy in Data Usage: Privacy concerns related to data usage; Regulations governing data usage - GDPR, HIPAA (Overview), Ethical use of data, Responsible AI data practices.

Unit - 3

The AI Data Pipeline: From Collection to Model Readiness

The AI Data Pipeline: Stages and Components: Key Stages (Data Collection, Annotation, Preprocessing, Splitting, Feeding into AI Models

Core Components: Ingestion, Storage, Processing, Validation, Delivery

Data Collection Methods for AI: Manual Input (Surveys, forms, human-curated entries), Sensors & IoT Devices (Real-time data from physical environments), System Logs & Transactions, Web Scraping (Automated extraction from websites), APIs (Structured data access from external platforms)

Data Annotation and Labelling: Definition & Importance; Annotation Methods: Manual Annotation, Automated Annotation; Types of Annotation: Classification, Bounding Boxes, Segmentation, Transcription, Named Entity Recognition (NER)

Data Cleaning and Preprocessing: Importance of data cleaning; Understanding ―Dirty‖ Data: Missing Values, Duplicates, Incorrect Formats, Outliers, Noise; Steps in Data Cleaning: Identify Issues, Handle Errors (Imputation, Removal), Validate Cleaned Data

Data Splitting: Splitting data into training set and test set.

Data Transformation Techniques: Normalization, Transformation, Feature Engineering (Conceptual)

Unit 4

AI-Powered No-Code Development: Vibe Coding and Workflow Automation

Vibe Coding: Concept & Workflow: What is Vibe Coding and how it works; Comparison: Vibe Coding vs. traditional programming; Tools Overview: Google AI Studio, Firebase Studio, Replit, Cursor, Windsurf (for demonstration and practice only); Tool Selection: Choosing the right platform for your needs; Benefits & Challenges: Advantages and limitations of Vibe Coding; Paradigm Shift: From code-centric to prompt-driven development; Prompt Crafting: Structure and examples of effective app prompts.

Workflow Automation using AI: Fundamentals: What is workflow automation and its relevance in the AI era; Real-world Applications: Auto-email responses, Feedback summarization, Social media alerts & analytics; Toolset Overview: Zapier, Power Automate, n8n, Lindy and other similar tools (for demonstration and practice only); Choosing the Right Tool: Features, use cases, and integration potential.

Unit-5

AI in Networks, Cybersecurity, and Forensics

AI in Networking: Need of AI in Network Management, How AI works in Traffic Prediction & Intrusion Detection, Uses of AI in Optimization, Fault Management, and Routing

AI in Cyber Security: Need of AI in Cyber Security, How AI works in Cyber Security, Uses of AI in Cyber Security, Challenges and Considerations of AI in Cyber Security

AI in Digital Forensics: How AI enhance digital forensic investigations, Role of AI in cyber-forensic evidence acquisition and analysis, Overcoming challenges and limitations of AI in forensics, The future outlook for AI-powered forensic tools

	Pithapur Rajah's Government College(A)::Kakinada Department of Computer Science	Program: IBSc(AI/IOT/DS) Semester: II
LSC2	APPLICATIONS OF ARTIFICIAL INTELLIGENCE	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	2	1	25
II	1	2	20
III	1	2	20
IV	1	1	15
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13 Questions to Answer:3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** I BSc(AI/IOT/DS) **Semester:** II
LSC2	**APPLICATIONS OF ARTIFICIAL INTELLIGENCE LAB**	
	Hours Allocated: 2hrs/week	Credits: 1

Suggested Lab Practicals (No Coding)

Lab 1 - Exploring Public Datasets (Orange Data Mining)

- Visit a public repository (Kaggle, UCI, data.gov.in)
- Download a dataset (e.g., rainfall data, literacy rates, or traffic accident statistics)
- Procedure:
    1. Open Orange → Add *File* widget → Load a CSV (e.g., Titanic dataset).
    2. Connect to *Data Table* → View rows/columns.
    3. Connect to *Data Info* → Check attributes, data types.
    4. View in *Data Table* and *Distributions* widget.
- **Observation**: Note numeric, categorical, missing values.
- **Outcome:** Students understand structured data format in CSV.

Lab 2 – Exploring Cybersecurity Datasets (Orange Data Mining)

- Dataset: Kaggle Cybersecurity dataset. https://www.kaggle.com/datasets/teamincribo/cyber-security-attacks?select=cybersecurity_attacks.csv
- Procedure:
    1. Load dataset into Orange (File widget).
    2. View using **Data Table** and **Distributions** widgets.
    3. Identify numerical (packet size, duration) and categorical (protocol type, attack type) attributes.
- **Observation:** Note features that indicate ―attack‖ vs. ―normal traffic.‖
- **Outcome:** Students understand the type of features used in intrusion detection.

Lab 3 - Understanding Dataset Metadata and Formats

- Take two datasets in different formats (CSV, JSON)
- View metadata (description, features, size, license)
- Compare domain-specific datasets (e.g., medical vs. finance)

Lab 4 - Data Annotation Exercise

- Use **MakeSense.ai** or **VGG Image Annotator (VIA)**
- Annotate 10 sample images (traffic signs, fruits, or medical scans)
- Export annotations in XML or YOLO format
- Discuss annotation errors and challenges

Lab 5 - Data Cleaning and Visualization (Orange Data Mining)

- **Aim**: To clean dirty data and visualize categorical and numeric attributes.
- Procedure:
    1. Load dataset.
    2. Connect *File → Edit Domain* (to change types) and *Impute* (to fill missing values).
    3. Compare cleaned vs. original in *Data Table.*
    4. *Distributions* widget.
    5. Check various features distribution.

  (Optional: Create simple bar charts/line charts to visualize trends using Google Looker Studio)
- **Observation**: Missing values filled with mean/median., Graphical representation of data.
- **Outcome:** Learn importance of data cleaning., Students learn importance of visualization in preprocessing.

Lab 6: Train/Test Split in Orange

- **Aim**: To split dataset for AI training/testing.
- Procedure:
    1. Load Titanic dataset.
    2. Connect *File → Data Sampler* (70% train, 30% test).
    3. Connect outputs to *Data Table* widgets to view.
- **Observation**: Students see two different subsets.
- **Outcome:** Concept of model validation using split data.

Lab 7 – Writing a Detailed Prompt for a Simple Game App (Generative AI)

- **Objective**: Understand prompt engineering by designing a game idea.
- Activity:
    1. Open ChatGPT (or Gemini, Copilot).

2. Write a detailed prompt like *"Create a simple text-based treasure hunt game with levels, scoring, and random challenges."*
3. Ask the AI to refine game rules, scoring, and characters.
4. Document how prompt detail changes the AI's response.

- **Outcome**: Students learn how detailed prompts shape AI outputs.

Lab 8 – Create a Portfolio Website using Vibe Coding Tool

- **Objective**: Learn how AI-assisted coding tools can automatically generate websites from simple instructions.
- Activity:
    1. Open **Vibe Coding Tool** (Windsurf/Cursor/Firebase Studio/Any other vibe coding tool).
    2. Give a natural language instruction:
       "Create a personal portfolio website for a Computer Science student. It should have sections: About Me, Education, Skills, Projects, and Contact."
    3. Experiment with different prompts to change **layout, theme, or color scheme** (e.g., *"Make it a modern dark theme with blue highlights."*).
    4. Preview the generated site and customize content.
- **Outcome**: Students experience how **AI converts prompts into functional websites** with minimal coding effort.

Lab 9 – Develop an Interactive Education Quiz App using Vibe Coding Tool

- **Objective**: Understand AI's role in creating **educational applications**.
- Activity:
    1. Open **Vibe Coding Tool**.
    2. Give prompt:
       "Build an interactive quiz app for students with multiple-choice questions on AI basics. Include features: Start Quiz, Show Score, Retry."
    3. Refine the app by asking AI to:
        - Add **timer** for each question.
        - Show **correct/incorrect answers** instantly.
        - Add a **Leaderboard** page.
    4. Test the app by playing the quiz.
- **Outcome**: Students see how **AI-generated apps** can support **e-learning and assessments**.

Lab 10-Automating Feedback Summarization using n8n and AI

Objective: Automatically summarize student feedback responses using AI and email the summary to the teacher.

Steps:

1. **Trigger Node:** Google Sheets (watch new row for feedback).
2. **AI Node:** Send text to OpenAI/Gemini API for summarization.
   (Get a free API from **OpenRouter (https://openrouter.ai/)** → Gives free trial credits + access to multiple models.)
3. **Action Node:** Gmail → email summarized feedback to teacher.
4. **Test:** Enter sample feedback in Google Sheet → receive AI summary via email.
5. **Discussion:** How AI reduced manual effort in reading every response.

Outcome: Students see how automation + AI can transform data into insights instantly.

Lab 11 – Using AI Functions in Google Sheets

Objective: Enable students to experience Google Sheets' built-in AI-powered features like summarizing, categorizing, sentiment analysis, and text generation through simple prompts within the spreadsheet environment.

Tools & Setup

Enable Google Sheets with Workspace Labs
https://workspace.google.com/labs-sign-up/u/1/

Follow the References and experiment with summarizing, categorizing, sentiment analysis, and text generation using =AI() function
https://support.google.com/docs/answer/15820999?visit_id=638919819014625788- 1742465261&p=ai-function&rd=1 https://support.google.com/docs/answer/13447609?hl=en&sjid=9077695331310534831-NC
https://support.google.com/docs/answer/13635180?hl=en&ref_topic=13450085&sjid=9077695331310534831-NC

Outcome: Students will experience various AI functions within a spreadsheet-text generation, summarization, categorization, sentiment analysis.

Lab 12- Deep Fake Image Detection Objective

Enable students to critically assess image authenticity using multiple free AI tools, understanding the strengths and limitations of each.

Tools:

Deepfake-O-Meter: https://zinc.cse.buffalo.edu/ubmdfl/deep-o-meter/landing_page

Decopy AI Image Detector: https://decopy.ai/ai-image-detector/

Procedure

1. **Collect Images**
    - 2 real images (e.g., faces from Unsplash or personal photos)
    - 2 AI-generated or manipulated images (e.g., from Midjourney, DALL·E, or Google AI studio)
2. Run through DeepFake-o-Meter
    - Visit the platform and upload an image.
    - Note the output: what algorithms flag or overall score for authenticity.
3. Use Decopy AI Image Detector
    - Upload the same images.
    - Check results indicating whether the image appears AI-generated.

Observation: How AI tools help in Digital Forensics.

Note: The Tools suggested above are tentative. Teacher/Student is free to choose any other similar tool to execute the said lab experiments.

Books/References

1. **Data Science for Beginners**, Andrew Park
   (Introductory concepts of data types, collection, cleaning, and visualization without coding)
2. **AI Basics for Non-Programmers**, Tom Taulli
   (Clear explanations of AI data lifecycle and real-world use cases)
3. **Data Preparation for Machine Learning**, Jason Brownlee
   (Conceptual understanding of dataset quality, preprocessing, and pipelines)
4. **Hands-On Data Science for Non-Programmers**, David Meerman Scott
   (Spreadsheet-based data exploration and visualization)
5. You Look Like a Thing and I Love You – Janelle Shane
6. Vibe coding: https://cloud.google.com/discover/what-is-vibe-coding
   https://www.ibm.com/think/topics/vibe-coding
   https://firebase.google.com/docs/studio/prompting
7. Workflow Automation: https://www.ibm.com/think/topics/workflow-automation
   https://www.ibm.com/think/topics/ai-workflow
   https://n8n.io/
8. AI in Cyber Security: https://www.geeksforgeeks.org/ethical-hacking/ai-in-cybersecurity/
9. AI in Networks:
   https://www.cisco.com/site/us/en/learn/topics/artificial-intelligence/what-is-ai-in- networking.html
10. AI in Digital Forensics:
    https://www.eccouncil.org/cybersecurity-exchange/cyber-talks/ai-and-ml-in-digital- forensics-the-future-of-forensic-investigations/

	Pithapur Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** I BSc(AI/IOT/DS) **Semester:** II
LSC2	**APPLICATIONS OF ARTIFICIAL INTELLIGENCE**	
	MODEL QUESTION PAPER	
Time: 2Hrs		Max. Marks: 50M

SECTION-1

Answer any three of the following questions. Must attempt at least one question from each part. Each question carries 10 Marks. 3X10=30M

PART-A

1. Explain the different types of processors (CPU, GPU, TPU, NPU) used in AI applications and discuss how each contributes to AI performance.
2. What is Edge AI? Describe its architecture and explain how it enables real-time intelligence in smart devices.
3. Explain the importance of data as the ―fuel for AI.‖ How does big data contribute to the effectiveness of AI systems?

PART-B

4. Explain the key stages and components of an AI Data Pipeline.
5. Explain the concept of **Vibe Coding**. How is it different from traditional programming?
6. Explain how AI enhances cybersecurity through intrusion detection and threat prediction.

SECTION-II

Answer any four of the following questions. Each question carries 5 marks. 4 X 5 = 20M

7. Define NPU and state its importance in AI hardware acceleration.
8. Differentiate between Data, Information, and Knowledge
9. List various modalities of data used in AI applications.
10. Explain the key stages and components of an AI Data Pipeline.
11. Define ―Data Ingestion‖ and its role in the data pipeline.
12. Explain prompt-driven development?
13. Write the Uses of AI in network management.

	Pithapur Rajah's Government College(A) Kakinada Department of Computer Science	**Program:** I B.Sc. (BOT/ZOO/BIO/MICRO) **Semester:** II
LSC-2	**Course Name**: Applications of Artificial Intelligence	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

- To understand the hardware infrastructure and software platforms required for building and deploying AI applications.
- To explore various data types, structures, and ethical considerations involved in collecting and using data for AI applications.
- To study the stages of the AI data pipeline, including data collection, annotation, preprocessing, and transformation.
- To examine the role of AI in biological sciences such as botany, zoology, and environmental science.
- To analyze the applications of AI in biotechnology and biochemistry, including genome sequencing, protein modeling, and drug discovery.

Course Outcomes (Learning Outcomes):

- Identify and describe the essential hardware and software platforms used in AI-based application development.
- Classify and evaluate various types and formats of data and apply ethical and responsible data usage practices.
- Design and implement a basic AI data pipeline from data collection to preprocessing and model readiness.
- Apply AI techniques to solve real-world problems in biological and environmental sciences.
- Demonstrate understanding of how AI contributes to advancements in biotechnology and bio-chemistry, including genomics and drug discovery.

Unit 1

Infrastructure and Platforms for Building Applications using AI

Hardware used in building AI applications: Processors - CPU, GPU, TPU, NPU, Memory RAM, VRAM, Storage - HDD, SSD

Platforms for building applications using AI: Online platforms (Example - Google AutoML, H2O.ai, Teachable Machine or similar platforms - for practice only); Desktop (No-code/Low code) platforms (Orange Data Mining, KNIME, Weka, RapidMiner or similar tools - for practice only).

Edge AI: Concept; Applications in daily life in devices like Refrigerators, Led Bulbs, Surveillance Cameras, Micro Ovens, Smart Cars/Scooters; Edge AI in smart Appliances

Unit 2

Foundations of Data - Types, Ethics and Utility in Building Applications using AI

Importance of data in building AI applications: Data as the fuel for AI, Role of big data in training AI models.

Conceptual Foundations of Data: Data vs. Information vs. Knowledge.

Structure of Data: Structured, Semi-Structured, and Unstructured Data.

Modalities of Data: Text, Image, Audio, Video, Tabular, Time-Series, and Spatial Data.

Formats of Data: Text Formats (CSV, JSON, XML), Image Formats (JPEG, GIF, PNG), Audio/Video (MP3, WAV, MP4, AVI).

Data Repositories: Definition of public Datasets; Definition of private Datasets; Importance of Public Datasets, Popular Public Dataset Repositories (Example - Kaggle, Hugging Face Datasets, UCI Machine Learning Repository, Google Dataset Search or similar ones - for demonstration only), Dataset licensing and usage rights.

Ethics, Privacy in Data Usage: Privacy concerns related to data usage; Regulations governing data usage - GDPR, HIPAA (Overview), Ethical use of data, Responsible AI data practices.

Unit 3

The AI Data Pipeline: From Collection to Model Readiness

The AI Data Pipeline: Stages and Components: Key Stages (Data Collection, Annotation, Preprocessing, Splitting, Feeding into AI Models

Core Components: Ingestion, Storage, Processing, Validation, Delivery

Data Collection Methods for AI: Manual Input (Surveys, forms, human-curated entries), Sensors & IoT Devices (Real-time data from physical environments), System Logs & Transactions, Web Scraping (Automated extraction from websites), APIs (Structured data access from external platforms)

Data Annotation and Labelling: Definition & Importance; Annotation Methods: Manual Annotation, Automated Annotation; Types of Annotation: Classification, Bounding Boxes, Segmentation, Transcription, Named Entity Recognition (NER).

Data Cleaning and Preprocessing: Importance of data cleaning; Understanding ―Dirty‖ Data: Missing Values, Duplicates, Incorrect Formats, Outliers, Noise; Steps in Data Cleaning: Identify Issues, Handle Errors (Imputation, Removal), Validate Cleaned Data.

Data Splitting: Splitting data into training set and test set.

Data Transformation Techniques: Normalization, Transformation, Feature Engineering

(Conceptual)

Unit 4

AI in Biological Sciences

AI in Botany & Agriculture: Plant disease detection via image recognition; Crop yield forecasting using climate and soil analytics; Precision agriculture: smart irrigation and fertilizer planning.

AI in Zoology, Ecology & Environmental Sciences: Wildlife monitoring: species ID from camera trap data; Aquatic systems: fish recognition and water quality modeling; Livestock health and disease prediction; Environmental tracking: forest cover and pollution analysis

Unit 5

AI in BioTechnology and Bio-Chemistry

Application of AI in Genome sequencing & gene function prediction; Using AI in Protein structure modeling (e.g., AlphaFold); AI for Drug discovery: virtual compound screening; Application of AI in Microbial classification & metagenomic profiling; Chemical reaction and material property prediction

	Pithapur Rajah's Government College(A) Kakinada Department of Computer Science	**Program:** I B.Sc. (BOT/ZOO/BIO/MICRO) **Semester:** II
LSC-2	**Course Name**: Applications of Artificial Intelligence	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	1	2	20
II	1	2	15
III	2	1	15
IV	1	1	25
V	1	1	20

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** I B.Sc. (BOT/ZOO/BIO/MICRO) **Semester:** II
LSC-2	**Course Name:** Applications of Artificial Intelligence	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
Time: 2Hrs		Max. Marks:50M

SECTION-I

Answer any THREE questions (Must attempt at least one from each Part). Each question carries 10 Marks.

PART-A

14. Explain the role of hardware components like CPU, GPU, TPU, and NPU in building AI applications.

15. Explain the importance of data in AI and describe the role of big data in training AI models.

16. What is data cleaning? Explain its importance and the steps involved in cleaning data.

PART-B

17. Explain the stages and core components of the AI data pipeline

18. Describe the role of AI in zoology and ecology for wildlife monitoring and species identification.

19. Describe the use of AI in microbial classification and material property prediction.

SECTION-II

Answer any FOUR questions. Each question carries 5 Marks.

20. Differentiate between GPU and TPU in AI hardware.

21. Define Edge AI and mention two examples of its use in daily life.

22. What is dataset licensing and why is it important?

23. Differentiate between Data, Information, and Knowledge.

24. Define manual annotation and automated annotation.

25. What is precision agriculture?

26. What is AlphaFold and why is it important?

	Pithapur Rajah's Government College(A) Kakinada Department of Computer Science	**Program:** I B.Sc. (BOT/ZOO/BIO/MICRO) **Semester:** II
LSC-2	**Course Name**: Applications of Artificial Intelligence Lab	
	Hours Allocated: 2hrs/week	Credits: 1

Lab List

Suggested Lab Practicals (No Coding)

Lab 1 - Exploring Public Datasets (Orange Data Mining)

- Visit a public repository (Kaggle, UCI, data.gov.in)
- Download a dataset (e.g., rainfall data, literacy rates, or traffic accident statistics)
- Procedure:
    1. Open Orange → Add File widget → Load a CSV (e.g., Titanic dataset).
    2. Connect to Data Table → View rows/columns.
    3. Connect to Data Info → Check attributes, data types.
    4. View in Data Table and Distributions widget.
- Observation: Note numeric, categorical, missing values.
- Outcome: Students understand structured data format in CSV.

Lab 2 - Understanding Dataset Metadata and Formats

- Take two datasets in different formats (CSV, JSON)
- View metadata (description, features, size, license)
- Compare domain-specific datasets (e.g., medical vs. finance)

Lab 3 - Data Annotation Exercise

- Use MakeSense.ai or VGG Image Annotator (VIA)
- Annotate 10 sample images (traffic signs, fruits, or medical scans)
- Export annotations in XML or YOLO format
- Discuss annotation errors and challenges

Lab 4 - Data Cleaning and Visualization (Orange Data Mining)

- Aim: To clean dirty data and visualize categorical and numeric attributes.
- **Procedure:**
    1. Load dataset.
    2. Connect File → Edit Domain (to change types) and Impute (to fill missing values).
    3. Compare cleaned vs. original in Data Table
    4. Distributions widget.
    5. Check various features distribution.

    (Optional: Create simple bar charts/line charts to visualize trends using Google Looker Studio)
- **Observation:** Missing values filled with mean/median., Graphical representation of data.
- **Outcome:** Learn importance of data cleaning., Students learn importance of visualization in preprocessing.

Lab 5: Train/Test Split in Orange

- **Aim:** To split a dataset for AI training/testing.
- **Procedure:**
    1. Load Titanic dataset.
    2. Connect File → Data Sampler (70% train, 30% test).
    3. Connect outputs to Data Table widgets to view.
- **Observation:** Students see two different subsets.
- **Outcome:** Concept of model validation using split data.

Lab 6: Plant Leaf Disease Detection

- Dataset: Plant leaf disease datasets (PlantVillage, Kaggle).
- Tool: Google Teachable Machine / Plantix app.
- Activity: Upload leaf images to classify healthy vs diseased leaves.

Lab 7: Crop Yield Prediction

- Dataset: FAO crop yield datasets.
- Tool: Orange Data Mining (drag-and-drop AI workflows).
- Activity: Predict yield for different crops based on soil & climate features.

Lab 8: Species Recognization

- Dataset: Camera trap image datasets (Snapshot Serengeti, LILA BC).
- Tool: iNaturalist / Wildbook AI platform.
- Activity: Upload wildlife images for species recognition & conservation mapping.

Lab 9: Predict and visualize 3D protein structures:

- Dataset: Genomic & protein sequence databases (NCBI, UniProt, AlphaFold DB).
- Tool: AlphaFold Protein Structure Viewer (online).
- Activity: Predict and visualize 3D protein structures.

Lab 10: Analyze chemical similarity and predict drug-likeness.

- Dataset: Drug compound datasets (ChEMBL).
- Tool: ChemMine Tools (web-based).
- Activity: Analyze chemical similarity and predict drug-likeness.

Lab 11: Identify microbial species from sequencing datasets.

- Dataset: Metagenomics datasets (MG-RAST).
- Tool: MG-RAST online platform.
- Activity: Identify microbial species from sequencing datasets.

Note: The Tools suggested above are tentative. Teacher/Student is free to choose any other similar tool to execute the said lab experiments.

Books/References

1. **Data Science for Beginners,** Andrew Park
   (Introductory concepts of data types, collection, cleaning, and visualization without coding)
2. **AI Basics for Non-Programmers,** Tom Taulli
   (Clear explanations of AI data lifecycle and real-world use cases)
3. **Data Preparation for Machine Learning,** Jason Brownlee
   (Conceptual understanding of dataset quality, preprocessing, and pipelines)
4. **Hands-On Data Science for Non-Programmers,** David Meerman Scott
   (Spreadsheet-based data exploration and visualization)
5. You Look Like a Thing and I Love You – Janelle Shane
6. **Artificial Intelligence in Life Sciences** – Elsevier.
7. **Artificial Intelligence in Agriculture** – CRC Press (B. Prasad).

8. **AI for Ecology and Conservation** – Springer.
9. **Bioinformatics and Drug Discovery using AI** – Academic Press.
10. Databases & Platforms: FAO, GBIF, PlantVillage, ChEMBL, UniProt, AlphaFold DB

Online Resources

- Kaggle Dataset Search, https://www.kaggle.com/datasets
- Google Dataset Search, https://datasetsearch.research.google.com
- UCI Machine Learning Repository, https://archive.ics.uci.edu
- Hugging Face Datasets, https://huggingface.co/datasets
- Open Government Data (India), https://data.gov.in

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** I B.Sc. (Maths, Physics, Chemistry) **Semester:** II
LSC2	Course Name: **APPLICATIONS OF ARTIFICIAL INTELLIGENCE**	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objective:

By the end of the course, the student will be able to:

6. Introduce the fundamental hardware and software infrastructure used in building AI applications, including modern processors and platforms.
7. Familiarize students with various data types, structures, and repositories essential for AI model development.
8. Explain the stages of the AI data pipeline — from data collection to preprocessing and model readiness.
9. Illustrate the applications of AI in Physical Sciences such as Physics and Chemistry for scientific research and discovery.
10. Explore the applications of AI in Mathematics and Earth Sciences for solving analytical, predictive, and environmental problems.

Course Outcomes:

After successful completion of the course, students will be able to:

6. Identify and describe key hardware components (CPU, GPU, TPU, NPU) and software platforms used for AI application development.
7. Classify and differentiate types, modalities, and formats of data used in AI applications.
8. Demonstrate understanding of dataset repositories, licensing, and ethical considerations in AI data usage.
9. Explain the stages of an AI data pipeline, including data collection, annotation, preprocessing, and transformation.
10. Apply AI techniques to analyze and interpret data in Physics and Chemistry contexts such as material science, drug discovery, and energy systems.

Unit 1. Infrastructure and Platforms for Building Applications using AI

Hardware used in building AI applications: Processors - CPU, GPU, TPU, NPU, Memory - RAM, VRAM, Storage - HDD, SSD Platforms for building applications using AI: Online platforms (Example - Google AutoML, H2O.ai, Teachable Machine or similar platforms - for practice only); Desktop (No-code/Low-code) platforms (Orange Data Mining, KNIME, Weka, RapidMiner or similar tools - for practice only). Edge AI: Concept; Applications in daily life in devices like Refrigerators, Led Bulbs, Surveillance Cameras, Micro Ovens, Smart Cars/Scooters; Edge AI in smart Appliances.

Unit 2: Foundations of Data - Types, Ethics and Utility in Building Applications using AI

Importance of data in building AI applications: Data as the fuel for AI, Role of big data in training AI models.

Conceptual Foundations of Data: Data vs. Information vs. Knowledge.

Structure of Data: Structured, Semi-Structured, and Unstructured Data.

Modalities of Data: Text, Image, Audio, Video, Tabular, Time-Series, and Spatial Data.

Formats of Data: Text Formats (CSV, JSON, XML), Image Formats (JPEG, GIF, PNG),Audio/Video (MP3, WAV, MP4, AVI).

Data Repositories: Definition of public Datasets; Definition of private Datasets; Importance of Public Datasets, Popular Public Dataset Repositories (Example - Kaggle, Hugging Face Datasets, UCI Machine Learning Repository, Google Dataset Search or similar ones - for demonstration only), Dataset licensing and usage rights.

Ethics, Privacy in Data Usage: Privacy concerns related to data usage; Regulations governing data usage - GDPR, HIPAA (Overview), Ethical use of data, Responsible AI data practices.

Unit 3. The AI Data Pipeline: From Collection to Model Readiness

The AI Data Pipeline: Stages and Components: Key Stages (Data Collection, Annotation, Preprocessing, Splitting, Feeding into AI Models

Core Components: Ingestion, Storage, Processing, Validation, Delivery

Data Collection Methods for AI: Manual Input (Surveys, forms, human-curated entries), Sensors & IoT Devices (Real-time data from physical environments), System Logs & Transactions, Web Scraping (Automated extraction from websites), APIs (Structured data access from external platforms)

Data Annotation and Labelling: Definition & Importance; Annotation Methods: Manual Annotation, Automated Annotation; Types of Annotation: Classification, Bounding Boxes, Segmentation, Transcription, Named Entity Recognition (NER)

Data Cleaning and Preprocessing: Importance of data cleaning; Understanding ―Dirty‖ Data: Missing Values, Duplicates, Incorrect Formats, Outliers, Noise; Steps in Data Cleaning: Identify Issues, Handle Errors

(Imputation, Removal), Validate Cleaned Data

Data Splitting: Splitting data into training set and test set.

Data Transformation Techniques: Normalization, Transformation, Feature Engineering (Conceptual)

Unit 4: AI in Physical Sciences (Physics & Chemistry Applications)

AI in Physics: AI for analyzing astronomical images (identifying galaxies, stars, exoplanets), CERN Datasets for Particle Physics.

AI in material science: discovering new superconductors and quantum materials

AI in energy: predicting power grid loads, optimizing solar and wind energy systems

AI in Chemistry:

Protein structure prediction (AlphaFold).

AI in drug discovery - virtual screening of compounds.

AI in chemistry - reaction outcome & material property prediction.

Unit 5: AI in Mathematics and Earth Sciences

AI in Mathematics:

Pattern recognition in large datasets (fractals, chaos systems, number theory)

Automated theorem proving and symbolic mathematics

AI in optimization problems (transport, logistics, resource allocation)

(Explore the Wolfram Alpha Tool: https://www.wolframalpha.com/examples/mathematics)

AI in Earth Sciences

Climate modeling: AI predicting weather patterns, cyclones, and long-term climate change

Remote sensing: AI analyzing satellite images for deforestation, urbanization, and natural resource mapping, Earthquake and natural disaster prediction using sensor networks.

AI in geology: identifying mineral deposits, oil, and groundwater reserves.

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** I B.Sc. (Maths, Physics, Chemistry) **Semester:** II
LSC2	Course Name: **Applications Of Artificial Intelligence**	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	1	2	20
II	1	1	15
III	2	2	30
IV	1	1	15
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** I B.Sc. (Maths, Physics, Chemistry) **Semester:** II
LSC2	Course Name: **APPLICATIONS OF ARTIFICIAL INTELLIGENCE**	
	Hours Allocated: 3hrs/week	Credits: 3
Max. Time: 2 Hrs		Max. Marks: 50

Section -I

Answer any three of the following questions. Must attempt at least one question from each part. Each question carries 10 Marks **3 X 10 = 30M**

Part – A

14. Explain the roles of CPU, GPU, TPU, NPU, RAM, VRAM, HDD, and SSD in building AI applications.

15. Explain the importance of data in building AI applications and the role of big data in training AI models.

16. Explain the key stages and core components of the AI data pipeline.

Part - B

17. Describe various data collection methods used in AI applications with examples.

18. Explain the applications of AI in Physics, including astronomy and particle physics.

19. Discuss the role of AI in climate modeling, weather prediction, and natural disaster forecasting.

Section-II

Answer any four of the following questions. Each question carries 5 marks. 4 X 5 = 20M

20. Differentiate between GPU and TPU in AI hardware.

21. Define Edge AI and mention two examples of its use in daily life.

22. Differentiate between data, information, and knowledge.

23. Define data annotation and list two common annotation methods.

24. What is data normalization, and why is it important in AI preprocessing?

25. How is AI used in analyzing astronomical images?

26. What are two uses of AI in geology?

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** I B.Sc. (Maths, Physics, Chemistry) **Semester:** II
LSC2	Course Name: **APPLICATIONS OF ARTIFICIAL INTELLIGENCE**	
	Hours Allocated: 2hrs/week	Credits: 1

LAB PROGRAMS LIST

Suggested Lab Practicals (No Coding)

Lab 1 - Exploring Public Datasets (Orange Data Mining)

- Visit a public repository (Kaggle, UCI, data.gov.in)
- Download a dataset (e.g., rainfall data, literacy rates, or traffic accident statistics)
- Procedure:
    1. Open Orange → Add *File* widget → Load a CSV (e.g., Titanic dataset).
    2. Connect to *Data Table* → View rows/columns.
    3. Connect to *Data Info* → Check attributes, data types.
    4. View in *Data Table* and *Distributions* widget.
- **Observation**: Note numeric, categorical, missing values.
- **Outcome:** Students understand structured data format in CSV.

Lab 2 - Exploring Scientific Datasets

Dataset: Earth datasets, Physics Particle Dataset

Tool: Orange Data Mining.

Activity:

- Load a CSV (e.g., earthquake dataset:

  https://www.kaggle.com/datasets/warcoder/earthquake-dataset

  Physics particle dataset:

  https://www.kaggle.com/datasets/dsfelix/physics-particles)
- Use **Data Table + Distributions** to view features.
- Compare categorical vs numerical attributes.

Outcome: Students understand how scientific datasets

Lab 3 - Understanding Dataset Metadata and Formats

- Take two datasets in different formats (CSV, JSON)
- View metadata (description, features, size, license)

- Compare domain-specific datasets (e.g., medical vs. finance)

Lab 4 - Data Annotation Exercise

- Use **MakeSense.ai** or **VGG Image Annotator (VIA)**
- Annotate 10 sample images (traffic signs, fruits, or medical scans)
- Export annotations in XML or YOLO format
- Discuss annotation errors and challenges

Lab 5 - Data Cleaning and Visualization (Orange Data Mining)

- **Aim**: To clean dirty data and visualize categorical and numeric attributes.
- Procedure:
    1. Load dataset.
    2. Connect *File → Edit Domain* (to change types) and *Impute* (to fill missing values).
    3. Compare cleaned vs. original in *Data Table.*
    4. *Distributions* widget.
    5. Check various features distribution.

    (Optional: Create simple bar charts/line charts to visualize trends using Google Looker Studio)
- **Observation**: Missing values filled with mean/median., Graphical representation of data.
- **Outcome:** Learn importance of data cleaning., Students learn importance of visualization in preprocessing.

Lab 6: Train/Test Split in Orange

- **Aim**: To split dataset for AI training/testing.
- Procedure:
    1. Load Titanic dataset.
    2. Connect *File → Data Sampler* (70% train, 30% test).
    3. Connect outputs to *Data Table* widgets to view.
- **Observation**: Students see two different subsets.
- **Outcome:** Concept of model validation using split data.

Lab 7 – Material Science Data Exploration (Chemistry + Physics)

Dataset: Materials Project Database (https://next-gen.materialsproject.org/) OR Kaggle chemistry datasets (https://www.kaggle.com/competitions?tagIds=7402-Chemistry).

Tool: Orange Data Mining.

Activity: Load material/compound dataset (e.g., band gap, conductivity).

Visualize trends (scatter plots, bar charts).

Identify correlations between features.

Outcome: Students see how AI identifies new material properties.

Lab 8 – Earthquake Prediction Data Analysis (Earth Sciences)

Dataset: USGS Earthquake Dataset (public): https://www.kaggle.com/datasets/rupindersinghrana/usgs-earthquakes-2024

Tool: Orange Data Mining

Activity:

- Load earthquake data (time, magnitude, depth).
- Plot frequency over time & regions.
- Perform simple clustering (e.g., k-means in Orange).

Outcome: Understand how AI detects seismic patterns.

Lab 9– Climate Data Visualization (Earth Sciences)

Dataset: NASA GISS climate dataset (https://data.giss.nasa.gov/gistemp/) / FAO rainfall data (https://www.fao.org/aquastat/en/geospatial-information/climate-information).

Tool: Google Looker Studio (free dashboard tool).

Activity:

- Import CSV of temperature/rainfall data.
- Build trend graphs and heat maps.

Outcome: Learn visualization of climate patterns & anomalies.

Lab 10 – Chemical Compound Classification (Chemistry)

Prerequisite: Discuss conceptually about Clustering

Dataset: PubChem / ChEMBL chemical datasets. (https://pubchem.ncbi.nlm.nih.gov/source/ChEMBL) **Tool:** ChemMine Tools (free web-based). (https://chemminetools.ucr.edu/)

Activity:

- Input chemical structures or SMILES notations.
- Predict chemical similarity clusters.
- Analyze ―drug-likeness‖ properties.

Outcome: Understanding AI in drug discovery & reaction prediction.

Lab 11 – Symbolic Mathematics Solver (Mathematics)

Dataset: Wolfram Alpha examples / OpenMath datasets. **Tool:** MathPix (OCR) + Symbolab / WolframAlpha (free tier)- https://www.wolframalpha.com/

Activity:

- Input handwritten/scanned math problems using MathPix.
- Use Wolfram Alpha to see symbolic solving.
- Compare AI vs manual solution steps.

Outcome: Understand automated theorem proving and symbolic AI.

Lab 11 – Explore the Mathematical AI tool

Tool: WolframAlpha (free tier)- https://www.wolframalpha.com/

Activity:

- Solve specific math problems or find information on Mathematical subjects and topics.

Outcome: Understand deep computational power of AI tools in solving Math Problems.

Lab 12 – Explore various Remote Sensing Datasets

Tool: https://developers.google.com/earth-engine/datasets/

Activity:

- Explore any Three Satellite Sensor Datasets
- Identify the Significance and the Period of Availability
- Study various bands available in the data

Outcome: Understand various Remote Sensing Datasets.

Note: The Tools suggested above are tentative. Teacher/Student is free to choose any other similar tool to execute the said lab experiments.

Books/References

1. **Data Science for Beginners**, Andrew Park

(Introductory concepts of data types, collection, cleaning, and visualization without coding)

2. **AI Basics for Non-Programmers**, Tom Taulli

(Clear explanations of AI data lifecycle and real-world use cases)

3. **Data Preparation for Machine Learning**, Jason Brownlee

(Conceptual understanding of dataset quality, preprocessing, and pipelines)

4. **Hands-On Data Science for Non-Programmers**, David Meerman Scott *(Spreadsheet-based data exploration and visualization)*

5. You Look Like a Thing and I Love You – Janelle Shane

6. AI in Astronomy:

https://www.borntoengineer.com/how-is-artificial-intelligence-is-helping-us-learn-about-the-universe

https://primo.ai/index.php/Astronomy

7. CERN datasets for Particle Physics: https://opendata.cern.ch/

8. AI in Material Science:
https://deepmind.google/discover/blog/millions-of-new-materials-discovered-with-deep-learning/
https://www.temasek.com.sg/content/dam/temasek-corporate/news-and-views/resources/reports/ai-meets-materials.pdf
9. AI in Energy: https://www.xenonstack.com/blog/ai-renewable-energy-production
https://www.sandtech.com/insight/how-ai-is-transforming-the-future-in-energy-management/
10. AI in Chemistry:
https://chemintelligence.com/ai-for-chemistry
https://deepmind.google/science/alphafold/
https://aimagazine.com/articles/alphafold-2-the-ai-system-that-won-google-a-nobel-prize
https://blog.google/technology/ai/google-deepmind-isomorphic-alphafold-3-ai-model/#life-molecules
11. AI in Drug Discovery:
https://www.ddw-online.com/the-promise-of-ai-advancing-drug-discovery-with-ultra-large-library-processing-29063-202403/
https://www.medchemexpress.com/ai-driven-drug-screening.html?srsltid=AfmBOoqhDeVNqW9S5vn1m4FZargNAKEFdOKaPvwsnOIzenQEEJoWkz8J
12. AI in Optimization Problems:
https://throughput.world/blog/ai-in-transportation-and-logistics/
https://codewave.com/insights/ai-transforming-transportation-logistics/
13. AI in Remote Sensing:
https://www.satimagingcorp.com/applications/artificial-intelligence-ai/

SEMESTER-III

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** II B.Sc. (AI) **Semester:** III
MAJOR 5	Course Name: **DOCUMENT ORIENTED DATABASE**	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

By the end of this course, students will be able to:

- Understand the fundamental concepts of database systems and the roles of various users in a database environment.
- Learn the architecture, components, and functions of a Database Management System (DBMS).
- Understand the need for NoSQL databases and explore the key concepts and types, with a focus on MongoDB.
- Perform CRUD operations and manage collections in MongoDB effectively.
- Model data using both embedded and normalized approaches in MongoDB.

Course Outcomes:

Students after successful completion of the course will be able to:

- To educate student regarding databases and how to manage databases.
- To handle the large amount of data handling demands of business
- To implement a data store that provides high performance, high availability, and automatic scaling
- To Process an immense diversity of data that needs to be stored and processed.
- To make use of features and functionalities to work on NO SQL Data Base Mongo DB

UNIT-I

Overview of Database Management Systems:

Introduction, Data and Information, Characteristics of the Database Approach - Self- Describing Nature of the a Database System, Insulation between Programs and Data, Data Abstraction, Support of Multiple Views of the data, Sharing of Data and multiuser Transaction Processing, Actors on the Scene - Database Administrators, Database Designers, End Users, Sophisticated Users, Temporary Users, Specialized users, System Analysts and Application Programmers , Advantages of using a DBMS - Controlling Redundancy ,Restricting unauthorized Access , Permitting Inferencing and Actions Using Rules ,Providing Multiple User Interfaces , Representing Complex Relationships

Among data , Enforcing Integrity Constraints , Providing Backup and Recovery, Database System Concepts and Architecture, DBMS Architecture and Data Independence - The Three-Schema Architecture, Database Languages and Interfaces.

UNIT – II

Mongo DB Features and Installation, The Need for No SQL Databases, What Are No SQL Databases? CAP Theorem, BASE Approach, Types of NoSQL Databases, Document Database, MongoDB Is Schemeless MongoDB Uses BSON, Rich Query Language, Terms Used in MongoDB, Data Types in MongoDB, Working with Database Commands, Create Database, Drop Database.

UNIT- III

MongoDB CRUD Operations, Collections, Create a Collection, Create Capped Collections, Create Operations, Insert Documents, Read Operations, Query Documents, Update Operations, Update Documents, Delete Operations, Delete Documents, Working with Arrays.

UNIT- IV

Data Modeling and Aggregation, Data Models, Embedded Data Models, Normalized Data Models Data Model Relationship Between Documents, Data Model Using an Embedded Document, Data Model Using Document References.

UNIT - V

Indexes and Working with Indexes, Index Types, Index Properties, Indexing Strategies.

Text Book:

1. ―Fundamentals of Database Systems‖ by R. Elmasri and S. Navathe
2. ―Database System Concepts‖ by Abraham Silberschatz, Henry Korth, and S. Sudarshan, Mc Grawhill, 2010.
3. MongoDB Recipes: With Data Modeling and Query Building Strategies By Subhashini Chellappan, Dharanitharan Ganesan, Publisher: Apress

Reference Book:

1. ―Database Management Systems‖ by Raghu Ramakrishnan, NcGrawhill,2002
2. ―Prinicples of Database Systems‖ by J.D.Ullman
3. MongoDB Basics 1st ed. Edition, by Peter Membrey (Author) Publisher : Apress WebResources

Web Links:

1. https://docs.mongodb.com/manual/tutorial/getting-started
2. https://www.tutorialspoint.com/mongodb/index.htm

Recommended Co – Curricular Activities:

A. Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

B. General

1. Group Discussion
2. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

1. Programming exercises,
2. Practical assignments and laboratory reports,
3. Observation of practical skills,
4. Individual and group project reports.
5. Efficient delivery using seminar presentations,
6. Viva voce interviews.
7. Computerized adaptive testing, literature surveys and evaluations,
8. Peers and self-assessment, outputs form individual and collaborative work.

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** II B.Sc. (AI) **Semester:** III
MAJOR 5	Course Name: **DOCUMENT ORIENTED DATABASE**	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	2	2	30
II	1	1	15
III	1	2	20
IV	1	1	15
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) =

7 Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** II B.Sc. (Artificial Intelligence) **Semester:** III
Major- 5	Course Name**: DOCUMENT ORIENTED DATABASE**	
	Hours Allocated: 3hrs/week	Credits: 3
MODEL PAPER		
TIME: 2 Hrs		Max. Marks: 50

SECTION – I

Answer any THREE of the following questions. Must attempt at least ONE question from each part. Each question carries 10 Marks. **3 X 10 = 30M**

Part – A

1. Explain the roles and responsibilities of a Database Administrator (DBA).
2. Describe the three-schema architecture in detail, explain each level.
3. Explain Features of MongoDB.

Part – B

4. Explain the CRUD operations in MongoDB with relevant examples.
5. What is Data Model? Compare and contrast embedded data models with normalized data models.
6. Define Index. Describe the different types of indexes used in databases.

Section II

Answer any FOUR of the following questions. Each question carries 5 marks. **4 X 5 = 20**

7. Define redundancy and explain how DBMS controls it.
8. What is the purpose of a Backup and Recovery system in a DBMS?
9. Analyse the CAP theorem
10. Define NoSQL databases and list at least three types.
11. Explain about Create and Read operations in MongoDB?
12. Explain the role of the aggregation framework in MongoDB.
13. Explain various indexing strategies in MongoDB.

	Pithapur Rajahs Government College(A) **Kakinada Department of Computer Science**	**Program:** II B.Sc. (AI) **Semester:** III
MAJOR 5	Course Name: **DOCUMENT ORIENTED DATABASE LAB**	
	Hours Allocated: 3hrs/week	Credits: 1

LAB LIST

1. Installing configuring running of Mongo db
2. Working with data base commands in mongo db
3. Working with crud operations in mongo db
4. Implementing aggregation operations in mongo db
5. Implementing index operations
6. Working with create, alter, drop, rename and Truncate tables using MYSQL
7. Working with insert, update, delete, select statements using MYSQL
8. Write an MYSQL Program to retrieve the data from two tables using joins.
9. Write a MYSQL program to retrieve and display the names of the top5 students with highest marks in a specified course.
10. Write an MYSQL Program to calculate the average marks of all students and display it along with their name.

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	Pithapur Rajahs Government College(A) Kakinada	**Program:** II B.Sc. (Artificial Intelligence) **Semester :** III
MAJOR 6	**Course Name:** Operating System	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

- Understand the fundamental concepts, functions, and structures of operating systems..
- Explore the evolution and various types of operating systems including batch, time-sharing, real- time, distributed, and parallel systems..
- Analyze the concepts of processes, threads, CPU scheduling, and process synchronization mechanisms. To understand the structure and commands in unix
- Learn different memory management techniques such as paging, segmentation, and virtual memory.

Course Outcomes:

- Understand the fundamental concepts, functions, and architecture of operating systems.
- Identify and differentiate between various types of operating systems such as batch, time-sharing, distributed, and real-time systems.
- Explain the concepts of processes, threads, CPU scheduling, and synchronization mechanisms.
- Apply memory management techniques including paging, segmentation, and virtual memory.

UNIT-I

Operating System:

Introduction, Operating Systems Objectives and functions, Computer System Architecture, OS Structure, OS Operations. Evolution of Operating Systems, types of operating system, Simple, Batch, Multi programmed, time shared, Parallel, Distributed Systems, Real-Time Systems, Operating System services.

UNIT-II

Process and CPU Scheduling –

Process concepts The Process, Process State, Process Control Block, Process communication. Threads.

Process Scheduling, Scheduling Queues, Schedulers, Context Switch, Pre-emptive Scheduling, Dispatcher, Scheduling Criteria, Scheduling algorithms, Process Synchronization, The Critical section Problem, Semaphores, Classic Problems of Synchronization.

UNIT-III

Memory Management and Virtual Memory –

Logical & physical Address Space, Swapping, Contiguous Allocation, Paging-Structure of Page Table Segmentation, Segmentation with Paging, Virtual Memory, Demand Paging, Performance of Demanding Paging Page Replacement Page Replacement Algorithms, Allocation of Frames.

UNIT-IV

Introduction to Unix:-

Architecture of Unix, Features of Unix , Unix Commands – PATH, man,echo, printf, script, passwd, uname, who, date, 83ty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip.

UNIT-V

Shell programming:

Ordinary and environment variables. The profile. Read and read only commands. Command line arguments. Exit and exit status of a command. Logical operators for conditional execution. The test command and its shortcut. The if, while, for and case control statements. The set and shift commands and handling positional parameters. The here (<<) document and trap command. Simple shell program examples.

TEXT BOOKS:

―Operating System Concepts‖-Silberschatz, Galvin, Gagne—eight Edition-John Willey & Sons INC 1,2,3 units Sumitabha Das., Unix Concepts and Applications., 4thEdition., Tata McGraw Hill(4,5) units

REFERENCE TEXT BOOKS:

1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition,Wiley Student Edition.

2. Principles of Operating Systems by Naresh Chauhan, OXFORD University Press

Student Activity:

1. Load any new operating system into your computer.
2. Partition the memory in your system
3. Create a semaphore for process synchronization.

Recommended Co – Curricular Activities:

Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

C. General

1. Group Discussion
2. Others

Recommended Continuous Assessment Methods:

1. Programming exercises.
2. Practical assignments and laboratory reports.
3. Observation of practical skills.
4. Individual and group project reports.
5. Efficient delivery using seminar presentations.
6. Viva voce interviews.
7. Computerized adaptive testing, literature surveys and evaluations.
8. Peers and self-assessment, outputs form individual and collaborative work.

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	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** II B.Sc. (Artificial Intelligence) **Semester :** III
MAJOR 6	**Course Name:** Operating System	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

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Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A) Kakinada	**Program:** II B.Sc. (Artificial Intelligence) **Semester :** III
MAJOR 6	**Course Name:** Operating System	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
Time:2 hrs.		Max.marks:50M

SECTION-I

Answer any THREE questions (Must attempt at least one from each Part). 3X10=30M

PART-A

1. What are the different types of OS? Explain
2. Explain process scheduling. Explain various types of process scheduling
3. Demonstrate Page replacement algorithms?

PART-B

4. What is meant by Real-Time operating system? Its functions and types?
5. What is mean by Architecture of Unix and its commands?
6. Demonstrate Environmental variables?

SECTION-II

Answer any FOUR questions. Each question carries. 4X5=20M

7. Define operating systems and its functions?
8. Explain different types of schedulers?
9. Write about semaphores?
10. Explain Segmentation?
11. Demonstrate Page replacement algorithms?
12. Explain features of UNIX?
13. Explain Logical operators in shell programming?

	Pithapur Rajahs Government College(A) Kakinada	**Program:** II B.Sc. (Artificial Intelligence) **Semester:** III
MAJOR 6	**Course Name: Operating System LAB**	
	Hours Allocated: 2 hrs./week	**Credits:** 1

LAB LIST

1. Write the program to implement CPU scheduling algorithm for first come first serve Scheduling.
2. Write a program to implement CPU scheduling algorithm for shortest job first scheduling.
3. Write a 'C' program to perform priority scheduling.
4. Write a program to implement CPU scheduling for Round Robin Scheduling.
5. Execute various file/directory handling commands in UNIX.
6. Write a Simple shell script for basic arithmetic and logical calculations.
7. Write a shell script to display list of users currently logged in.
8. Write a shell script to delete all the temporary files.
9. Write a shell script to search an element from an array using binary searching.
10. Write a shell script to determine whether a given number is a prime number or not.
11. Write a shell script to print the first n Fibonacci numbers.
12. Execute various system administrative commands.

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	Pithapur Rajahs Government College(A)::Kakinada Department of Computer Science	**Program:** II B.Sc. (AI) **Semester :** III
MAJOR 7	Course Name: DATA STRUCTURES USING _C‘	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

- The objective of the course is to Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

Course Outcomes:

- After completing this course a student will be able to : Summarize the properties, interfaces and behaviors of basic abstract data types
- Discuss the computational efficiency of the principal algorithms for sorting & searching Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
- Demonstratedifferent methodsfortraversingtrees

UNIT -I

Data Structures- Definition, Classification of Data Structures, Operations on Data Structures, Abstract Datatype(ADT), and Preliminaries of algorithms. Time and Space complexity. **Searching**- Linear search, Binary search. **Sorting**- Insertion sort, Selection sort, Bubble sort, Quick sort, merging (Merge sort) algorithms.

UNIT-II

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal , Reversing Single Linked list, Applications on Single Linked list –Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list- Insertion, Deletion.

UNIT -III

Queues & Stacks: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues-Circular Queues, Deques, Priority Queues.

Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Infix to Post fix Conversion, Evaluating Post Expressions.

UNIT-IV

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Balanced Binary Trees AVL Trees, Insertion, Deletion and Rotations.

UNIT- V

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

Text Books:

1. DataStructuresUsingC. 2ndEdition. ReemaThareja, Oxford.
2. Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:

1. Fundamentals of Data Structures in C, 2ndEdition, Horowitz, Sahni, Universities Press
2. DataStructures: A Pseudo Code Approach, 2/e, Richard F. Gilberg, Behrouz A. Forouzon, Cengage.
3. Data Structures with C, Seymour Lipschutz TMH

E-Resources:

1. http://algs4.cs.princeton.edu/home/
2. https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf

	Pithapur Rajahs Government College(A)::Kakinada Department of Computer Science	**Program:** II B.Sc. (AI) **Semester :** III
MAJOR 7	Course Name: DATA STRUCTURES USING _C‘	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	2	1	25
II	1	2	20
III	1	2	20
IV	1	1	15
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer:3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** II B.Sc. (AI) **Semester :** III
MAJOR 7	Course Name: DATA STRUCTURES USING _C‘	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
TIME: 2 Hrs		Max. Marks: 50

SECTION-I

Answer any THREE questions (Must attempt at least one from each Part). Each question carries 10 Marks. 3X10=30M

PART-A

1. What is Abstract Data Type (ADT)? How does an Abstract Data Type (ADT) simplify the use of data structures, and why is it important in software development?
2. What is a queue? Describe how a queue can be implemented with an array?
3. Describe Prim's algorithm for finding a Minimum Spanning Tree (MST). Provide a step-by-step example of how it works.

PART-B

4. Define data structure. Explain different types of data structure
5. Describe the process of adding a new node to a single linked list in three different scenarios: at the start, at an arbitrary position, and at the end.
6. Explain the procedure for deleting a node from a binary search tree. Discuss the different cases that need to be handled during deletion.

SECTION-II

Answer any FOUR questions. Each question carries 5 Marks. 4X5=20M

7. Explain the difference between linear and non-linear data structures with examples
8. Describe the traversal operation in a single linked list. Why is it important?
9. List advantages and disadvantages of using a single linked list
10. Define a priority queue and what are its typical applications?
11. Explain the process of pushing and popping elements in a stack implemented with a linked list.
12. What is a binary search tree (BST)? Explain its key properties
13. Explain the following terms

i. Vertex (or node) ii. Edge iii. Degree iv. Path v. Sub graph

	Pithapur Rajahs Government College(A)::Kakinada Department of Computer Science	**Program:** II B.Sc. (AI) **Semester :** III
MAJOR -7	Course Name: DATA STRUCTURES USING _C' LAB	
	Hours Allocated: 2hrs/week	Credits: 1

LAB LIST

1. Write a program to read _n' numbers of elements into an array and insert an element in specified position of that array
2. Write a program to search an item in a given list using the following Searching Algorithms
   a) Linear Search
   b) Binary Search
3. Write Program to implement Single Linked List with insertion, deletion and traversal operations
4. Write Program to implement Circular doubly Linked List with insertion, deletion and traversal operations
5. Write a program for the implementation of Bubble Sort
6. Write a program for the implementation of Insertion Sort
7. Write a program for the implementation of Quick Sort
8. Write a program for implementing of Merge Sort Algorithms
9. Write a program to implement the stack operations using array
10. Write a programs to implement Stack operations using Linked List
11. Write a program to implement the Queue operations using array
12. Write a program to implement the Queue operations using linked list
13. Write a program to convert a given infix expression to postfix expression using stack
14. Write a program for Binary Search Tree operations and its traversal

	Pithapur Rajahs Government College(A) Kakinada **Computer Science**	**Program:** II B.Sc. (Artificial Intelligence) **Semester:** IV
MAJOR-8	Course Name: **INFERENTIAL STATISTICS**	
	Hours Allocated: 3hrs/week	Credits: 3

COURSE OBJECTIVES:

- This course enables students to gain knowledge in sampling, and non parametric methods..
- To learn about the ANOVA one way and Two way
- To familiar with dealing with testing of Hypothesis.

COURSE OUTCOMES:

- learn about basic concepts of Sampling.
- learn about basic concepts of
- learn about various Tests of Hypothesis.
- know about various Non Parametric Tests
- know about Anova one way and two way

UNIT-I

Theory of Estimation: Parameter, Statistic, Standard Error of the statistic, concept of bias and mean square error of an estimate, Criteria of good estimator - unbiasedness, consistency, efficiency, and sufficiency.

Methods of estimation- Maximum Likelihood estimator(MLE) and Method of Moments(MME).Concepts of confidence interval and confidence coefficient, confidence intervals for the parameters of univariate normal.

UNIT-II

Testing of Hypothesis: Statistical hypotheses, critical region, size and power of a test, most powerful test, two types of errors. Neyman Pearson lemma(WITHOUT PROOF) and its applications, uniformly most powerful unbiased test. One and two tailed tests. Procedure for testing of hypothesis, Tests of significance of large samples Single proportion and difference of proportions, single mean and difference of means

UNIT-III

Exact Sampling distributions: Student's t-distribution, Chi-square distribution, Snedecor's Tests of significance for small samples: Student's t-distribution single mean, difference of means and paired t-test. Chi-square distribution- test for goodness of fit and independence of attributes.

UNIT-IV

F- Distribution definitions, properties and applications. F-test or equality of two variance Anova one way and two way.

UNIT-V

Non-parametric methods- definition, advantages and disadvantages. One sample test- Sign test, Run test, Wilcoxon-signed rank test. Two independent sample tests: Median test, Wilcoxon- Mann Whitney U test, Kruskal Wallis test - Simple Problems Note: Without proofs of named theorems and more importance to applications.

TEXT BOOKS:

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand &Sons, NewDelhi.
2. O. P. Gupta: Mathematical Statistics, Kedar nath Ram nath & Co.
3. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd.
4. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons

REFERENCES:

1. S.C. Gupta &V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand& Sons, New Delhi.
2. O. P. Gupta: Mathematical Statistics ,Kedarnath Ramnath &Co.
3. P.N.Arora&S.Arora:QuantitativeAptitudeStatistics–VolII,S.Chand&CompanyLtd

K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley &Sons

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** II B.Sc. (Artificial Intelligence) **Semester:** IV
MAJOR-8	Course Name: INFERENTIAL STATISTICS	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	ToAnswer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	1	1	15
II	2	2	30
III	1	2	20
IV	1	1	15
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer:3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** II B.Sc. (Artificial Intelligence) **Semester:** IV
MAJOR-8	Course Name: INFERENTIAL STATISTICS LAB	
	Hours Allocated: 2hrs/week	Credits: 1

LAB LIST

1. Large sample test for single mean
2. Large sample test for difference of means
3. Large sample test for single proportion
4. Large sample test for difference of proportions
5. Large sample test for difference of standard deviations
6. Large sample test for correlation coefficient
7. Small sample test for single mean
8. Small sample test for difference of means
9. Small sample test for correlation coefficient
10. Pairedt-test (paired samples).
11. Small sample test for single variance(□2test)
12. Small sample test for difference of variances (F test)
13. 2 test for goodness of fit and independence of attributes
14. Non parametric tests for single sample(run test, sign test and Wilcoxon signed rank test)
15. Non parametric tests for related samples(sign test and Wilcoxon signed rank test)
16. Non parametric tests for two independent samples (Median test, Wilcoxon –Mann-Whitney-U test, Wald - Wolfowitz' s runs test)

	Pithapur Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** II B.Sc. (Artificial Intelligence) **Semester: IV**
MAJOR-8	Course Name: INFERENTIAL STATISTICS	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
TIME: 2 Hrs		Max. Marks: 50

SECTION-I

Answer any three of the following questions. Must attempt at least one question from each part. Each question carries 10Marks **3X10=30M**

Part-A

1. Prove that Sample mean square is unbiased estimator of Population variance.
2. Explain about large sample test for single proportion
3. Define (i) Critical Region (ii) one and two tailed test (iii) uniform powerful test (iv) power of a test

.Part-B

4. Illustrate about one way classification of ANOVA
5. Illustrate about chi square distribution and chi-square test for goodness of fit.
6. Distinguish between the parametric tests and non- parametric tests?

SECTION-II

Answer any four of the following questions. Each question carries 5Marks. **4X5=20M**

7. Explain about the consistency and efficiency?
8. Define Null and Alternative hypothesis.
9. Write about two types of errors.
10. Explain about large sample test for Single mean
11. Explain about large sample test for Single Proportion.
12. Describe about paired t-test.
13. Write about Advantages and Disadvantages of Non- parametric tests

SEMESTER-IV

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** II B.Sc. (Artificial Intelligence) **Semester:** IV
MAJOR 9	Course Name: Data Warehouse and Data Mining	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

The course aims to enable students to:

- Understand the fundamental principles, architecture, and components of Data Warehousing and Data Mining.
- Learn data preprocessing techniques to prepare data for mining tasks.
- Apply classification, prediction, and clustering techniques to real-world datasets.
- Explore association rule mining and its applications in knowledge discovery.
- Gain insights into advanced mining techniques for spatial, multimedia, text, and web data.

Course Outcomes:

Upon successful completion of the course, students will be able to:

- Explain the architecture and implementation of Data Warehousing and Data Mining systems.
- Apply data preprocessing methods for cleaning, integration, transformation, and reduction.
- Perform classification and prediction using decision trees, Bayesian models, SVM, and ensemble methods.
- Implement clustering techniques and analyze outliers in high-dimensional datasets.
- Demonstrate the ability to mine spatial, multimedia, text, and web data for practical applications.

UNIT I

Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

UNIT II

Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture Of A Typical Data Mining Systems- Classification Of

Data Mining Systems.

Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

UNIT III

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Backpropagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT IV

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model- Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

UNIT V

Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

Text Book

1. Jiawei Han, Micheline Kamber and Jian Pei ―Data Mining Concepts and Techniques‖, Third Edition, Elsevier, 2011.

Reference Books

1. Alex Berson and Stephen J. Smith ―Data Warehousing, Data Mining & OLAP‖, Tata Mc Graw – Hill Edition, Tenth Reprint 2007.

2. K.P. Soman, Shyam Diwakar and V. Ajay ―Insight into Data mining Theory and Practice‖, Easter Economy Edition, Prentice Hall of India, 2006.

3. G. K. Gupta ―Introduction to Data Mining with Case Studies‖, Easter EconomyEdition, Prentice Hall of India, 2006.

4. Pang-Ning Tan, Michael Steinbach and Vipin Kumar ―Introduction to Data

Mining‖,Pearson Education, 2007.

RECOMMENDED CO-CURRICULAR ACTIVITIES:

(Co-curricular activities shall not promote copying from textbook or from others work and shallencourage self/independent and group learning)

A. Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual andchallenging)
2. Student seminars (on topics of the syllabus and related aspects (individualactivity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups asteams))
4. Study projects (by very small groups of students on selected local real- time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

B. General

1. Group Discussion
2. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted:

1. The oral and written examinations (Scheduled and surprise tests)
2. Closed-book and open-book tests.
3. Programming exercises.
4. Practical assignments and laboratory reports.
5. Observation of practical skills.
6. Individual and group project reports.
7. Efficient delivery using seminar presentations.
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations.
10. Peers and self-assessment, outputs form individual and collaborative work.

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	Pithapur Rajahs Government College(A)::Kakinada	**Program:** II B.Sc. (Artificial Intelligence) **Semester :** IV
MAJOR 9	**Course Name: Data Warehouse and Data Mining**	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	1	2	20
II	2	1	25
III	1	2	20
IV	1	1	15
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A)Kakinada Department of Computer Science	**Program:** II B.Sc. (Artificial Intelligence) **Semester:** IV
MAJOR 9	**Course Name:** Data Warehouse and Data Mining Lab	
	Hours Allocated: 3hrs/week	Credits: 1

LAB LIST

1. List applications for mining
2. File format for data mining
3. Conversion of various data files
4. Training the given dataset for an application
5. Testing the given dataset for an application
6. Generating accurate models
7. Data pre-processing – data filters
8. Feature selection
9. Web mining
10. Text mining
11. Design of fact & dimension tables
12. Generating graphs for star schema

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	Pithapur Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** II B.Sc. (Artificial Intelligence) **Semester: IV**
MAJOR 9	Course Name: Data Warehouse and Data Mining	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
TIME: 2 Hrs		Max. Marks: 50

SECTION -I

Answer any three of the following questions. Must attempt atleast one question from each part. Each question carries 10Marks **3X10=30M**

Part-A

1. What is Data Warehousing? Explain Data Warehousing Architecture?
2. What is olap? Explain its types?
3. Define Classification of Data Mining systems?

Part-B

4. Explain Bayesian classification?
5. Explain any two major Clustering methods?
6. What is multimedia data mining and explain its categories and applications ofdata mining ?

SECTION-II

Answer any four of the following questions. Each question carries 5Marks

4X5=20M

7. Why is meta data is necessary in a data warehouse?
8. What is multidimensional data model?
9. Determine the difference between Data mining and Data Warehouse?
10. What is mean by data preprocessing?
11. Difference between Classifier and Predictor?
12. Define cluster analysis?
13. Determine the process of text mining?

	Pithapur Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** II B.Sc. (Artificial Intelligence) **Semester:** IV
MAJOR 10	Course Name: Machine Learning using Python	
	Hours Allocated: 3hrs/week	Credits: 3

OBJECTIVES:

- To understand the basic concepts of machine learning.
- To understand and build supervised learning models.
- To understand and build unsupervised learning models.
- To evaluate the algorithms based on corresponding metrics identified

COURSE OUTCOMES:

At the end of this course, the students will be able to:

- Explain the basic concepts of machine learning.
- Construct supervised learning models.
- Construct unsupervised learning algorithms.
- Evaluate and compare different models

UNIT -I

INTRODUCTION TO MACHINE LEARNING

Review of Linear Algebra for machine learning; Introduction and motivation for machine learning; Examples of machine learning applications, Vapnik- Chervonenkis (VC) dimension, Probably Approximately Correct (PAC) learning, Hypothesis spaces, Inductive bias, Generalization, Bias variance trade-off.

UNIT -II

SUPERVISED LEARNING

Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Perceptron algorithm, Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random Forests.

UNIT -III

ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING

Combining multiple learners: Model combination schemes, Voting, Ensemble Learning – bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization.

UNIT- IV

NEURAL NETWORKS

Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks – Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.

UNIT- V

DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS

Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, measuring classifier performance, assessing a single classification algorithm and comparing two classification algorithms – t test, McNemar‘s test, K-fold CV paired t test.

TEXT BOOKS:

1. Ethem Alpaydin, ―Introduction to Machine Learning‖, MIT Press, Fourth Edition,2020.
2. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective,―Second Edition‖, CRC Press, 2014.

REFERENCES:

1. Christopher M. Bishop, ―Pattern Recognition and Machine Learning‖, Springer,2006.
2. Tom Mitchell, ―Machine Learning‖, McGraw Hill, 3rd Edition, 1997.
3. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, ―Foundations of Machine Learning‖, Second Edition, MIT Press,2012, 2018.
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, ―Deep Learning‖, MIT Press,2016
5. Sebastain Raschka, Vahid Mirjalili , ―Python Machine Learning‖,Packt publishing 3rd Edition, 2019.

Recommended Co – Curricular Activities:

Measurable

- Assignments (in writing and doing forms on the aspects of syllabus content andoutside the syllabus content. Shall be individual and challenging)
- Student seminars (on topics of the syllabus and related aspects (individual activity))
- Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
- Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation andcontribution of students shall be ensured (team activity))
- General
- Group Discussion
- Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

- Programming exercises,
- Practical assignments and laboratory reports,
- Observation of practical skills,
- Individual and group project reports.
- Efficient delivery using seminar presentations,
- Viva voce interviews.
- Computerized adaptive testing, literature surveys and evaluations,
- Peers and self-assessment, outputs form individual and collaborative work.

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	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** II B.Sc. (AI) **Semester :** IV
Major - 10	Course Name: **Machine Learning using Python**	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
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UNIT-WISE DISTRIBUTION:

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Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** II B.Sc. (Artificial Intelligence) **Semester:** IV
MAJOR 10	Course Name: **Machine Learning using Python Lab**	
	Hours Allocated: 3hrs/week	Credits: 1

LAB LIST

1. Write a python program to import and export data using Pandas library functions.
2. Demonstrate various data pre-processing techniques for a given dataset
3. Implement Dimensionality reduction using Principle Component Analysis (PCA) method.
4. Write a Python program to demonstrate various Data Visualization Techniques.
5. Implement Simple and Multiple Linear Regression Models.
6. Develop Logistic Regression Model for a given dataset.
7. Develop Decision Tree Classification model for a given dataset and use it to classify anew sample.
8. Implement Naïve Bayes Classification in Python.
9. Build KNN Classification model for a given dataset.
10. Build Artificial Neural Network model with back propagation on a given dataset.
    a) Implement Random forest ensemble method on a given dataset.
    b) Implement Boosting ensemble method on a given dataset.
11. Write a python program to implement K-Means clustering Algorithm.

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	Pithapur Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** II B.Sc. (Artificial Intelligence) **Semester: IV**
MAJOR 10	Course Name: Machine Learning using python	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
TIME: 2 Hrs		Max. Marks: 50

SECTION-I

Answer any three of the following questions. Must attempt at least one question from each part. Each question carries 10Marks **3X10=30M**

Part-A

1. Define linear algebra and explain with an example how linear algebra concepts are used in machine learning algorithms?
2. How do different types of inductive bias affect the learning process and the resulting models?
3. What is the naive Bayes classifier and how does it utilize Bayes' theorem for classification?

Part-B

4. What is the K-means clustering algorithm and how does it partition data points into clusters based on similarity?
5. What is regularization and how does it prevent overfitting in neural networks?
6. What methods can be used to compare the performance of two classification algorithms?

SECTION-II

Answer any four of the following questions. Each question carries 5Marks. **4X5=20M**

7. What is generalization in the context of machine learning?
8. What does the concept of PAC learning entail in machine learning?
9. What are the limitations of the perceptron algorithm?
10. Explain the difference between single and multiple variable linear regression?
11. Explain the process of meta-learning in stacking?
12. Explain the normalization process?
13. What is bootstrapping and how does it differ from K-fold cross validation?

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** II B.Sc. (Artificial Intelligence) **Semester:** IV
MAJOR 11	Course Name: **Introduction to AI**	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

- Understand the fundamental concepts and techniques of Artificial Intelligence.
- Identify the problems that can be solved using AI and classify AI problem-solving approaches.
- Analyze various search strategies for problem-solving and game playing.
- Explore knowledge representation schemes and reasoning under uncertainty.
- Learn about different logic systems and their applications in inference and learning.

Course Outcomes:

- Define and explain the basics of Artificial Intelligence, its history, agents, environments, and problem formulation.
- Apply different searching algorithms such as BFS, DFS, A*, and evaluate them for specific AI problems including game playing strategies.
- Demonstrate knowledge representation using predicate logic, semantic networks, and handle uncertainty using probabilistic reasoning.
- Apply logical inference methods such as forward and backward chaining, unification, resolution, and various learning techniques including decision trees and reinforcement learning.
- Explain the structure and functioning of expert systems, their real-world applications, and different approaches for knowledge acquisition and reasoning.

UNIT – I

Introduction to AI: What is AI? AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT-II

Searching: Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A*, AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-

Beta pruning, Evaluation functions.

UNIT-III

Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Baye‘s probabilistic interferences and dempstershafer theory.

UNIT-IV

First order logic: Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

UNIT-V

Expert systems:- Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, expert systems success factors, types of expert systems, knowledge engineering, scope of knowledge, difficulties in knowledge acquisition methods of machine learning, selecting an appropriate knowledge acquisition method, societal impacts reasoning in artificial intelligence, inference with rules, with frames: model based reasoning, case based reasoning, explanation & meta knowledge inference with uncertainty.

TEXT BOOKS

Stuart Russell, Peter Norvig: ―Artificial Intelligence: A Modern Approach‖,2nd Edition,Pearson Education, 2007

REFERENCES

1. Artificial Neural Networks B. Yagna Narayana, PHI
2. Artificial Intelligence, 2nd Edition, E.Rich and K.Knight (TMH).
3. Artificial Intelligence and Expert Systems – Patterson PHI.
4. Expert Systems: Principles and Programming- Fourth Edn, Giarrantana/ Riley, Thomson.
5. PROLOG Programming for Artificial Intelligence. Ivan Bratka- Third Edition – Pearson Education.
6. Neural Networks Simon Haykin PHI

Web Resources:

https://www.javatpoint.com/artificial-intelligence-ai

https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_overview.html

https://www.academia.edu/32098490/Introduction_to_artificial_intelligence

Recommended Co – Curricular Activities:

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

A: Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data [individuals or groups as teams]
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

B: General

1. Group Discussion
2. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports.
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work.

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** II B.Sc. (Artificial Intelligence) **Semester:** IV
MAJOR 11	Course Name: **Introduction to AI**	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	1	2	20
II	2	1	25
III	1	2	20
IV	1	1	15
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A)Kakinada **Department of Computer Science**	**Program:** II B.Sc. (Artificial Intelligence) **Semester:** IV
MAJOR 11	**Course Name: Introduction to AI Lab**	
	Hours Allocated: 3hrs/week	Credits: 1

Lab List

1. A) Basic programs in python.

   B) Programs demonstrating list, Vector, Matrix and Array

2. Solving water – jug problem using Python.
3. Implementing DFS and BFS using Python.
4. Solve 8 – puzzle problem using A* algorithm.
5. Solve 8 – puzzle problem using hill climbing Algorithm.
6. Implement Tic – Tac – Toe game using Python.
7. Develop Python code for mini – max algorithm.
8. Develop Python code for Hangman game.
9. A) Develop Python code for removing punctuation marks from the given string.

   B) Develop Python code for sorting the sentence in alphabetical order.

10. A) Using Pylog programming, display first order logic.

    B) Using Pylog programming, display unification process.

11. A) Find mean and mode for given data set.

    B) Calculate variance and standard deviation for given data set.

12. A) Determining probability of a prime number appearing when a 20 sided die is rolled.

    B) Time series analysis to predict rain fall information base on record.

13. Predict the class of testing sample using Bayes Classification.

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	Pithapur Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** II B.Sc. (Artificial Intelligence) **Semester: IV**
MAJOR 11	Course Name: **Introduction to AI**	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
TIME: 2 Hrs		Max. Marks: 50

SECTION –I

Answer any three of the following questions. Must attempt at least one question from each part. Each question carries 10 Marks. 3 X 10 = 30M

Part-A

1. Define AI? Explain about problems or challenges of AI.
2. Explain types of uninformed search algorithms?
3. Explain knowledge representation in AI?

Part-B

4. Explain types of AI Intelligent Agents?
5. Explain inference in First order logic
6. Explain about Expert System.

SECTION – II

Answer any four of the following questions. Each question carries 5 marks. 4 X 5 = 20M

7. Write the structure of Agents?
8. Explain about history of AI?
9. Write about Hill climbing?
10. Explain Alpha-Beta pruning
11. Explain Baye‘s probabilistic interferences
12. Explain forward chaining, Backward chaining,
13. Explain structure of expert systems

SEMESTER-V

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** III B.Sc. (Artificial Intelligence) **Semester:** V
MAJOR 12	Course Name: Introduction to Predictive Analytics Using Python	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

By the end of this course, students will be able to:

- Enable students to write Python programs for data analysis and predictive tasks.
- Introduce the fundamental phases of the data analytics lifecycle.
- Teach the usage of key Python libraries such as NumPy, Pandas, Matplotlib, Seaborn, and Scikit-learn.
- Develop the ability to preprocess and visualize real-world data.
- Equip students to evaluate, interpret, and improve predictive models.

Course Outcomes (Learning Outcomes):

After completing this course, students will be able to:

- Write and execute Python code for data analysis and modeling.
- Use Python libraries to clean, analyze, and visualize data effectively.
- Build predictive models using regression, classification, and other ML techniques.
- Assess model performance using relevant evaluation metrics.
- Work with real-world datasets to derive actionable insights.

UNIT I

Introduction to Linear Regression: Linear Methods for Regression and Classification: Overview of supervised learning, Linear regression models and least squares, Multiple regression, Multiple outputs, Subset selection, Ridge regression, Lasso regression, Linear Discriminant Analysis, Logistic regression, Perceptron learning algorithm.

UNIT II

Model Assessment and Selection: Model Assessment and Selection: Bias, Variance, and model complexity, Bias-variance trade off, Handling Missing Data and Outliers, Estimate of In-sample prediction error, Feature Engineering and Feature Scaling, Confusion Matrix, Cross- validation, Bootstrap methods, conditional or expected test error.

UNIT III

Additive Models, Trees and Boosting: Generalized additive models, Regression and classification trees, Boosting methods- exponential loss and AdaBoost, Numerical Optimization via gradient boosting, Examples (Spam data, California housing, New Zealand fish, Demographic data).

UNIT IV

Introduction to NN: Neural Networks (NN), Support Vector Machines (SVM), and K-nearest Neighbor: Fitting neural networks, Back propagation, Issues in training NN, SVM for classification, K-Means Clustering Algorithm, SVM for regression, K-nearest – Neighbour classifiers (Image Scene Classification).

UNIT V

Unsupervised Learning and Random forests: Association rules, Cluster analysis, Principal Components, Random forests and analysis**.**

TEXT BOOKS:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning- Data Mining, Inference, and Prediction, Second Edition, Springer Verlag, 2009.

REFERENCE BOOKS:

1. C.M.Bishop –Pattern Recognition and Machine Learning, Springer, 2006.

2. L. Wasserman-All of statistics.

3. Gareth James. Daniela Witten. Trevor Hastie Robert Tibshirani. An Introduction to Statistical Learning with Applications in R.

Co-curricular Activities:

- Mini project using real datasets (e.g., house price prediction, churn analysis)

- Conduct a Hackathon or Data Challenge
- Workshop on deploying ML models using Flask or Streamline
- Poster or PowerPoint presentation on predictive models
- Code review sessions for predictive model projects

Continuous assessment:

Let the students be tested in the following questions from each unit

- Class Tests / Unit Tests (MCQs, short answers, coding questions)
- Lab Assignments using Python (e.g., implement regression, classification models)
- Mini Project Evaluation (problem definition, dataset, implementation, accuracy, report)
- Quiz (on Python syntax, libraries like scikit-learn, pandas, model concepts)
- Viva-Voce (ask students to explain model choice, accuracy, overfitting, etc.)
- Python Code Submissions on GitHub or Google Classroom

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** III B.Sc. (Artificial Intelligence) **Semester:** V
MAJOR 12	Course Name: **Introduction to Predictive Analytics Using Python**	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	2	1	25
II	1	2	20
III	1	2	20
IV	1	1	15
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** III B.Sc. (Artificial Intelligence) **Semester: V**
MAJOR 12	Course Name: Introduction to Predictive Analytics Using Python	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
TIME: 2 Hrs		Max. Marks: 50

SECTION-I

Answer any THREE questions (Must attempt at least one from each Part). Each question carries 10 Marks. **3X10=30M**

PART-A

1. Define Supervised Learning. Explain Linear Regression models and the Least Squares method in detail.
2. Explain the Perceptron Learning Algorithm and discuss how the weight update rule works.
3. Explain Bias, Variance, and Model Complexity. Discuss Bias-Variance Trade-off with example.

PART-B

4. Explain regression and classification trees with real-world examples.
5. Describe K-nearest Neighbor and K-Means Clustering Algorithm with suitable applications.
6. Discuss about random forest and its working mechanism.

SECTION-II

Answer any FOUR questions. Each question carries 5 Marks. **4X5M=20M**

7. Define Multiple Outputs in regression models with example.
8. What is the use of estimating in-sample prediction error?
9. What is the purpose of handling missing data and outliers?
10. What are generalized additive models?
11. Explain about numerical optimization in gradient boosting?
12. What are the major issues in training neural networks?
13. Describe about cluster analysis.

	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** III B.Sc. (Artificial Intelligence) **Semester:** V
MAJOR 12	**Course Name:** Introduction to Predictive Analytics Using Python Lab	
	Hours Allocated: 2hrs/week	Credits: 1

LAB LIST

1. Demonstrating logistic regression.
2. Demonstrating perceptron learning algorithm.
3. Demonstrating Bayesian model.
4. Demonstrating numerical optimization.
5. Demonstrating classification trees.
6. Demonstrating regression analysis.
7. Demonstrating L - nearest neighbour.
8. Demonstrating back propagation.
9. Demonstrating SVM for regression analysis.
10. Demonstrating random forests and analysis

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** III B.Sc. (Artificial Intelligence) **Semester :** V
MAJOR13	Course Name: ALGORITHMS FOR INTELLIGENT SYSTEMS	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objective:

- Enabling students to understand the fundamental concepts and goals of AI.
- Introducing various AI applications in real life and familiarizing students with modern AI tools and techniques.
- Exploring problem-solving approaches and search techniques in AI.
- Understanding how intelligent agents operate in different environments.
- Providing insight into knowledge representation, reasoning, and learning for intelligent systems.
- Developing a strong conceptual foundation for advanced AI topics like heuristics, game playing, and adversarial search.

Course Outcomes:

- Understand the foundations, goals, historical developments, and real-life applications of Artificial Intelligence.
- Represent real-world problems as search problems and apply appropriate problem-solving techniques.
- Apply both uninformed and informed search algorithms to find solutions within practical time constraints.
- Use logical representations and deduction techniques to model and solve AI problems.
- Design and analyze intelligent agents and understand how they interact with various types of environments.

UNIT I

Introduction to Artificial Intelligence: What is Artificial Intelligence?, Definitions and goals of AI**,** Applications of AI in real life**. A Brief History of AI -** Evolution from early symbolic AI to modern deep learning**,** Key milestones and AI winters**. The State of the Art in AI:** Recent advancements (e.g., deep learning, reinforcement learning, generative AI)**,** Modern AI tools and platforms (e.g., OpenAI, TensorFlow, etc.)**,** Ethical issues and societal impacts of AI.

UNIT II

Intelligent Agents: Agents and Environments - What is an agent?**,** Structure of intelligent agents **Rationality:** Rational behavior**,** Bounded rationality, **PEAS Framework:** Performance measure, Environment, Actuators, Sensors**,** Designing task environments.

Environment Types: Fully vs. partially observable, Deterministic vs. stochastic, Episodic vs. sequential, Static vs. dynamic, Discrete vs. continuous

Agent Types: Simple reflex agents, Model-based reflex agents, Goal-based agents, Utility-based agents, Learning agents.

UNIT III

Solving Problems by Searching: Problem-Solving Agents - Goal formulation**,** Problem formulation**. Problem Types -** Single-state, multiple-state, contingency, exploration problems**. Problem Formulation -** Initial state, actions, transition model, goal test, path cost. **Example Problems -**Vacuum world, 8-puzzle, Route finding.

Basic Search Algorithms: Uninformed search strategies **-** Breadth-First Search (BFS)**,** Depth-First Search (DFS)**,** Uniform Cost Search**,** Depth-Limited Search**,** Iterative Deepening Search.

UNIT IV

Informed Search and Heuristics: Informed Search Strategies - Best-First Search**,** A* Search**. Heuristics -** Designing heuristic functions**,** Admissibility and consistency**,** Examples of heuristics in problem-solving**,** Heuristic evaluation for 8-puzzle, path-finding.

UNIT V

Adversarial Search and Game Playing: Games and Adversarial Search - Game vs. search problems, Game trees. **Perfect Play and Minimax Decisions** - Minimax algorithm, Optimal strategies for zero-sum games. **Alpha-Beta Pruning** - Efficiency improvements, Practical implications. **Resource Limits and Approximate Evaluation** - Cut-off tests and evaluation functions. **Games of Chance -** Card games, Dice games, stochastic elements.

Reference Text Book: Title: Artificial Intelligence: A Modern Approach, Author(s): Stuart Russell and Peter Norvig, Edition:3rd Edition, Publisher:Prentice-Hall.

A. Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the

syllabus content. Shall be individual and challenging)

2. Student seminars (on topics of the syllabus and related aspects individual activity))

3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))

4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

B. General

1. Group Discussion

2. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),

2. Closed-book and open-book tests,

3. Programming exercises,

4. Practical assignments and laboratory reports,

5. Observation of practical skills,

6. Individual and group project reports.

7. Efficient delivery using seminar presentations,

8. Viva voce interviews.

9. Computerized adaptive testing, literature surveys and evaluations,

10. Peers and self-assessment, outputs form individual and collaborative work.

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	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** III B.S (Artificial Intelligenc **Semester :** V
MAJOR 13	Course Name: ALGORITHMS FOR INTELLIGENT SYSTEMS	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	1	2	20
II	2	1	25
III	1	2	20
IV	1	1	15
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** III B.Sc. (Artificial Intelligence) **Semester :** V
MAJOR 13	Course Name: ALGORITHMS FOR INTELLIGENT SYSTEMS	
	Hours Allocated: 3hrs/week	Credits: 3
MODEL PAPER		
TIME: 2 Hrs		Max. Marks: 50

SECTION – I

Answer any THREE of the following questions. Must attempt at least ONE question from each part. Each question carries 10 Marks. 3 X 10 = 30M

Part – A

1. Explain the evolution of Artificial Intelligence from early symbolic systems to modern deep learning.
2. Discuss in detail the PEAS framework for designing intelligent agents.
3. Compare and contrast various environment types an AI agent can operate in. Provide appropriate real-world scenarios for each type.?

Part – B

4. Describe the process of solving problems by searching. Explain different types of problems and how they influence problem formulation.?
5. Explain and compare A Search with Best-First Search.* Illustrate with an example how heuristics influence search performance.
6. Explain about Expert System.

SECTION - II

Answer any FOUR of the following questions. Each question carries 5 marks. 4 X 5 = 20M

7. What are the primary goals of Artificial Intelligence?
8. Define an intelligent agent. How is it different from a simple program?
9. What is rational behavior in the context of AI?
10. Write short notes on Uniform Cost Search
11. Define admissibility and consistency in heuristics
12. What are cut-off tests in game playing, and why are they important?
13. List and briefly describe any three modern AI platforms or tools.

	Pithapur Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** III B.Sc. (Artificial Intelligence) **Semester :** V
MAJOR 13	Course Name: ALGORITHMS FOR INTELLIGENT SYSTEMS LAB	
	Hours Allocated: 2hrs/week	Credits: 1

LAB LIST

1. Study of PROLOG Write the following programs using PROLOG:
2. Write a program to solve 8-queens problem.
3. Solve any problem using depth first search
4. Solve any problem using best first search.
5. Solve 8-puzzle problem using best first search
6. Solve Robot (traversal) problem using means End Analysis.
7. Solve the Traveling Salesman problem.

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	Pithapur Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** III B.Sc. (Artificial Intelligence) **Semester:** V
MAJOR 14	Course Name: Natural Language Processing	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

- Understand the basics of language structure and linguistics in NLP.
- Learn core NLP techniques like tokenization, POS tagging, and parsing.
- Apply machine learning methods to language processing tasks.
- Build real-world NLP applications such as chatbots and translators.
- Gain hands-on experience with NLP tools like NLTK, spaCy, and Transformers.
- Discuss ethical and linguistic challenges in NLP systems.

Course Outcomes (Learning Outcomes):

- Understand core linguistic concepts in NLP.
- Apply basic NLP techniques like tokenization and parsing.
- Build machine learning models for text data.
- Develop NLP applications like chatbots and sentiment analyzers.
- Use NLP tools such as NLTK, spaCy, and Transformers.
- Evaluate NLP systems for accuracy and ethical issues.

UNIT I

Origins and challenges of NLP – Language Modelling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT II

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff –

Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing –Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Named Entity Recognition (NER).

UNIT IV

Requirements for representation, Transformer Architecture, Word Embeddings – Syntax- Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT V

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Question Answering (QA) Systems – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

TEXT BOOKS:

1. aniel Jurafsky, James H. Martin―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python¦, First Edition, O_Reilly Media, 2009

REFERENCE BOOKS:

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, ―Natural Language Processing with Java¦, O_Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.

4. Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval¦, Oxford University Press, 2008.

Co-curricular Activities:

Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning) Dice Rolling Simulator

- participating in technical workshops and training programs
- Attending and presenting in seminars and webinars
- Presenting technical papers in conferences and symposiums
- Doing internships and industry-based training
- Being an active member of technical clubs or student chapters like IEEE, CSI, etc.

Continuous assessment:

Let the students be tested in the following questions from each unit

1. Continuous assessment evaluates students regularly through quizzes, assignments, and participation.
2. It encourages consistent learning and tracks progress throughout the course.
3. Provides timely feedback and helps improve performance.
4. Contributes to the final grade along with the end-semester exam.

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** III B.Sc. (Artificial Intelligence) **Semester:** V
MAJOR 14	Course Name: Natural Language Processing	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
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UNIT-WISE DISTRIBUTION:

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	Pithapur Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** III B.Sc. (Artificial Intelligence) **Semester:** V
MAJOR 14	Course Name: Natural Language Processing	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
TIME: 2 Hrs		Max. Marks: 50

SECTION-I

Answer any THREE questions (Must attempt at least one from each Part). Each question carries 10 Marks. 3X10=30M

PART-A

1. Describe the role of Finite-State Automata in Natural Language Processing.
2. Explain N-gram models with smoothing, interpolation, and backoff techniques.
3. Explain Context-Free Grammars (CFGs) and Dependency Grammar. How are they used in syntactic analysis?

PART-B

4. Discuss Probabilistic CFG and Named Entity Recognition (NER).
5. Describe the Transformer Architecture and its impact on semantic analysis.
6. Explain coherence and reference phenomena in discourse analysis.

SECTION-II

Answer any FOUR questions. Each question carries 5 Marks. 4X5=20M

7. Define Regular Expressions with an example.
8. What is Minimum Edit Distance?
9. Define Smoothing in N-gram models.
10. Mention any two issues in PoS tagging.
11. Write the difference between shallow and deep parsing.
12. What are semantic attachments?
13. What is Question Answering (QA) in NLP?

	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** III B.Sc. (Artificial Intelligence) **Semester:** V
MAJOR 14	**Course Name:** Natural Language Processing lab	
	Hours Allocated: 2hrs/week	Credits: 1

LAB LIST

1. Write a program in prolog to implement simple facts and Queries
2. Write a program in prolog to implement simple arithmetic
3. Write a program in prolog to solve Monkey banana problem
4. Write a program in prolog to solve Tower of Hanoi
5. Write a program in prolog to solve 8 Puzzle problems
6. Write a program in prolog to solve 4-Queens problem
7. Write a program in prolog to solve Traveling salesman problem
8. Write a program in prolog for Water jug problem List of Experiments (NLP) 1. Word Analysis 2. Word Generation 3. Morphology 4. N-Grams 5. N-Grams Smoothing

	Pithapur Rajahs Government College(A) Kakinada	**Program:** III B.Sc. (Artificial Intelligence) **Semester :** V
MAJOR 15	**Course Name:** Software Project Management	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

- To understand the fundamental principles of software project management.
- To have a good knowledge of responsibilities of project manager.
- To be familiar with the different methods and techniques used for project management.

Course Outcomes:

- Evaluate and decide the software project management**.**
- Determine and classify the project life cycle and estimate the effort of Agile methods
- Formulate the project activity plan and project risk management.
- Organize and manage the project contracts.
- Establishing the staffing pattern and Document the organizational behavior.

UNIT I

PROJECT EVALUATION AND PROJECT PLANNING

Importance of Software Project Management – Activities Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic Program Management – Stepwise Project Planning.

UNIT II

PROJECT LIFE CYCLE AND EFFORT ESTIMATION:

Software process and Process Models – Choice of Process models – mental delivery – Rapid Application development – Agile methods – Extreme Programming – SCRUM – Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points – COCOMO II A Parametric Productivity Model – Staffing Pattern.

UNIT III

ACTIVITY PLANNING AND RISK MANAGEMENT:

Objectives of Activity planning – Project schedules – Activities – Sequencing and

scheduling Network Planning models – Forward Pass & Backward Pass techniques – Critical path (CRM) method– Risk identification – Assessment – Monitoring – PERT technique – Monte Carlo simulation–Resource Allocation – Creation of critical patterns – Cost schedules.

UNIT IV

PROJECT MANAGEMENT AND CONTROL:

Framework for Management and control – Collection of data Project termination – Visualizing progress – Cost monitoring – Earned Value Analysis- Project tracking – Change control, Software Configuration Management – Managing contracts – Contract Management

UNIT V

STAFFING IN SOFTWARE PROJECTS:

Managing people – Organizational behaviour – Best methods of staff selection – Motivation – The Oldham-Hackman job characteristic model – Ethical and Programmed concerns Working in teams – Decision making – Team structures – Virtual teams – Communications genres – Communication plans.

TEXT BOOKS:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

REFERENCES:

1. Robert K. Wysocki ―Effective Software Project Management‖ – Wiley Publication,2011.
2. Walker Royce: ―Software Project Management‖- Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, ―Managing Global Software Projects‖ – McGraw Hil Education (India), Fourteenth Reprint 2013.

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	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** III B.Sc. (Artificial Intelligence) **Semester :** V
MAJOR 15	**Course Name: Software Project Management**	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	2	2	30
II	1	2	20
III	1	1	15
IV	1	1	15
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A) Kakinada	**Program:** III B.Sc. (Artificial Intelligence) **Semester :** V
MAJOR 15	**Course Name: Software Project Management**	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
TIME: 2 Hrs		Max. Marks: 50

SECTION-I

Answer any THREE questions (Must attempt at least one from each Part). 3X10=30M

PART-A

1. Explain project portfolio management?
2. Explain the different software process models with examples.
3. Write about PERT and Monte Carlo simulation techniques?

PART-B

4. Explain activities and methodologies?
5. Discuss various project tracking techniques?
6. Discuss organizational behavior in project teams?

SECTION-II

Answer any FOUR questions. Each question carries. 4X5=20M

7. What is Risk evaluation?
8. What is step wise project planning?
9. Define SCRUM.
10. What is Rapid application development (RAD).
11. Define Critical path method.
12. Explain visualizing progress?
13. What is Ethical concern in staffing.

	Pithapur Rajahs Government College(A) Kakinada	**Program:** III B.Sc. (Artificial Intelligence) **Semester:** V
MAJOR 15	**Course Name: Software Project Management lab**	
	Hours Allocated: 2 hrs./week	**Credits:** 1

LAB LIST

1. Demonstrate function point analysis.
2. Demonstrate flexi model.
3. Demonstrate SEL model.
4. Demonstrate basic COCOMO.
5. Demonstrate intermediate COCOMO.
6. Demonstrate detailed COCOMO.
7. Demonstrate early design model and calculate effort for development of project

	Pithapur Rajahs Government College(A)::Kakinada Department of Computer Science	**Program:** I B.Sc. (AI) **Semester :** II
Minor Course -1	Course Name: **Problem Solving Using C**	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives

- To explore basic knowledge on computers
- Learn how to solve common types of computing problems.
- Learn to map problems to programming features of C.
- Learn to write good portable C programs.

Course Outcomes

Upon successful completion of the course, a student will be able to:

- Understand the working of a digital computer and Fundamental constructs of Programming
- Analyze and develop a solution to a given problem with suitable control structures
- Apply the derived data types in program solutions
- Use the „C" language constructs in the right way
- Apply the Dynamic Memory Management for effective memory utilization

UNIT-I

Introduction to computer and programming: Introduction, Basic block diagram and functions of various components of computer, Concepts of Hardware and software, Types of software, Compiler and interpreter, Concepts of Machine level, Assembly level and high- level programming, Flowcharts and Algorithms

Fundamentals of C: History of C, Features of C, C Tokens-variables and keywords and identifiers, constants and Data types, Rules for constructing variable names, Operators, Structure of C program, Input /output statements in C-Formatted and Unformatted I/O

UNIT-II

Control statements: Decision making statements: if, if else, else if ladder, switch statements. Loop control statements: while loop, for loop and do-while loop. Jump Control statements: break, continue and goto.

UNIT-III

Derived data types in C: Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays -Declaration, Initialization and Memory representation.

Strings: Declaring & Initializing string variables; String handling functions, Character handling functions

UNIT-IV

Functions: Function Prototype, definition and calling. Return statement. Nesting of functions. Categories of functions. Recursion, Parameter Passing by address & by value. Local and Global variables. Storage classes: automatic, external, static and register.

Pointers: Pointer data type, Pointer declaration, initialization, accessing values using pointers. Pointer arithmetic. Pointers and arrays, pointers and functions.

UNIT-V

Dynamic Memory Management: Introduction, Functions-malloc, calloc, realloc, free Structures: Basics of structure, structure members, accessing structure members, nested structures, array of structures, structure and functions, structures and pointers. Unions - Union definition; difference between Structures and Unions.

Text Books:

1. E. Balagurusamy, ―Programming in ANSI C‖, Tata McGraw Hill, 6th Edn, ISBN-13: 978- 1-25- 90046-2

2. Herbert Schildt, ―Complete Reference with C, Tata McGraw Hill, 4th Edn., ISBN- 13: 9780070411838, 2000

3. Computer fundamentals and programming in C, REEMA THAREJA, OXFORD UNIVERSITY PRESS

Reference Books:

1. E Balagurusamy, COMPUTING FUNDAMENTALS & C PROGRAMMING – Tata McGraw-Hill, Second Reprint 2008, ISBN 978-0-07-066909-3.

2. Ashok N Kamthane, Programming with ANSI and Turbo C, Pearson Edition Publ, 2002.

3. Henry Mullish&Huubert L.Cooper: The Spirit of C An Introduction to
modern Programming, Jaico Pub. House,1996.

4. Y kanithkar, let us C BPB, 13 th edition-2013, ISBN:978-8183331630,656 pages.

	Pithapur Rajahs Government College(A)::Kakinada Department of Computer Science	**Program:** I B.Sc. (Artificial Intelligence) **Semester: II**
Minor Course - 1	Course Name**: Problem Solving Using C**	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	2	2	20
II	1	2	25
III	1	1	20
IV	1	1	15
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College (A) :: Kakinada **Department of Computer Science**	**Program:** I B.Sc. (AI) **Semester: II**
Minor Course - 1	Course Name: **Problem Solving Using C**	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
Time: 2 Hours		**Max Marks: 50M**

Section -I

Answer any three of the following questions. Must attempt at least one question from each part. Each question carries 10 Marks. 3 X 10 30M

Part – A

1. Demonstrate the Block diagram of computers?
2. Demonstrate loop/ iterative statements in C
3. What is a String? Describe the various string handling functions in C

Part – B

4. What is a Data Type? Describe the different Data Types in C and provide examples for each
5. Demonstrate storage classes in c
6. What is dynamic memory allocation? Explain dynamic memory allocation in C

Section II

Answer any four of the following questions. Each question carries 5 marks. 4 X 5 = 20M

7. What is typecasting? Explain with example?
8. Explain the basic structure of C program
9. Demonstrate switch statement in C
10. Write a C program to find a given number is prime or not
11. Develop a C program to find largest number in an array of numbers
12. What is recursion? Write a recursive program to find factorial of a number
13. Compare and contrast structure and union

	Pithapur Rajahs Government College (A):: Kakinada Department of Computer Science	Program: I B.Sc. (Artificial Intelligence) Semester : II
Minor Course – 1	Course Name: **Problem solving using C Lab**	
	Hours Allocated: 2hrs/week	Credits: 1

LABLIST

1. A. Write a program to calculate simple & compound interest

   B. Write a C program to interchange two numbers.

2. Find the biggest of three numbers using C.

3. Write a c program to find the sum of individual digits of a positive integer.

4. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.

5. Write a c program to check whether a number is Armstrong or not.

6. Write a c program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

7. Write a c program that implements searching of given item in given list

8. Write a c program that uses functions to perform the following: Addition of two matrices. Multiplication of two matrices.

9. Write a program for concatenation of two strings.

10. Write a program for length of a string with and without String Handling functions

11. Write a program to demonstrate Call by Value and Call by Reference mechanism

12. Write a Program to find GCD of Two numbers using Recursion

13. Write a c program to perform various operations using pointers.

14. Write a c program to read data of 10 employees with a structure of 1. employee id 2. Aadhar no, 3. title, 4. joined date, 5. salary, 6. date of birth, 7. gender, 8. department.

15. Write a Program to demonstrate dynamic arrays using Dynamic Memory Management function

	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** II B.Sc. (AI) **Semester:** III
Minor Course - 2	Course Name: **Object Oriented Programming using Java**	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

- Understand and apply the principles of Object-Oriented Programming (OOP) in Java.
- Develop Java applications using fundamental programming constructs, control structures, and user input/output.
- Gain hands-on experience with classes, objects, inheritance, polymorphism, and encapsulation.
- Learn to work with interfaces, packages, and exception handling mechanisms for robust programming.
- Understand and implement multithreading, file I/O, and serialization in Java.

Course Outcomes:

- Differentiate between procedural and object-oriented programming paradigms and apply OOP concepts in solving real-world problems.
- Develop basic Java programs using data types, control statements, arrays, strings, and command line arguments.
- Implement classes, methods, constructors, and utilize inheritance and polymorphism for code reuse and flexibility.
- Apply the concepts of interfaces, packages, and handle runtime errors using Java‘s exception handling mechanism.
- Demonstrate the use of threads, synchronization, and perform file operations using Java I/O streams and serialization.

UNIT-I

OOPs Concepts and Java Programming: Introduction to Object-Oriented concepts, procedural and object-oriented programming paradigm

Java programming: An Overview of Java, Java Environment, Data types, Variables, constants, scope and life time of variables, operators, type conversion and casting, Accepting Input from the Keyboard, Reading Input with Java.util.Scanner Class, Displaying Output with System.out.printf(), Displaying Formatted Output with String.format(), Control Statements

UNIT-II

Arrays, Command Line Arguments, Strings-String Class Methods.

Classes & Objects: Creating Classes, declaring objects, Methods, parameter passing, static fields and methods, Constructors, and ‗this‘ keyword, overloading methods and access

Inheritance: Inheritance hierarchies, super and subclasses, member access rules, _super' keyword, preventing inheritance: final classes and methods, the object class and its methods.

Polymorphism: Dynamic binding, method overriding, abstract classes and methods;

UNIT-III

Interface: Interfaces VS Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface;

Packages: Defining, creating and accessing a package, understanding CLASSPATH, importing packages.

Exception Handling: Benefits of exception handling, the classification of exceptions, exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, exception specification, built in exceptions, creating own exception sub classes.

UNIT-IV

Multithreading: Differences between multiple processes and multiple threads, thread states, thread life cycle, creating threads, interrupting threads, thread priorities, synchronizing threads, inter thread communication.

Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and writing Files, The Console class, Serialization

UNIT-V

GUI Programming with Swing- Introduction, MVC architecture, components, containers. Understanding Layout Managers - Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout.

Event Handling- The Delegation event model- Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes, Inner classes, Anonymous Inner classes.

Text Book(s)

- Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill.
- Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

Reference Books:

1. Cay S. Horstmann, ―Core Java Fundamentals‖, Volume 1, 11 th Edition, Prentice Hall, 2018.

2. Paul Deitel, Harvey Deitel, ―Java SE 8 for programmers‖, 3rd Edition, Pearson, 2015.

3. S. Malhotra, S. Chudhary, Programming in Java, 2nd edition, Oxford Univ. Press.**Suggested**

Co-Curricular Activities & Evaluation Methods:

Unit 1: Activity: Quiz on Object-Oriented Programming Concepts and Java Constructs

Evaluation Method: Quiz Performance and Knowledge Retention.

Unit 2: Activity: Object-Oriented Programming Assignment: Class Implementation

Evaluation Method: Assignment Completion and Correctness

Unit 3: Activity : Hands-on Lab Activity: Creating and Using Custom Java Packages

Evaluation Method: Lab Performance and Correctness of Code Implementation

Unit 4: Activity: Case Study Discussion on where multi-threading is crucial

Evaluation Method: Critical thinking, problem-solving, and presentation skills.

Unit 5: Activity: GUI design contest using Java Swings

Evaluation Method: GUI design, Visual appearance and user friendliness, usability, and adherence to event handling principles.

	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** II B.Sc. (AI) **Semester:** III
Minor Course - 2	Course Name: **Object Oriented Programming using Java**	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	1	2	20
II	2	1	25
III	1	2	20
IV	1	1	15
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** II B.Sc. (AI) **Semester:** III
Minor Course – 2	Course Name: **Object Oriented Programming using Java**	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
TIME: 2 Hrs		**Max. Marks**: 50

SECTION-I

Answer any THREE questions (Must attempt at least one from each Part). Each question carries 10 Marks. **3X10=30M**

PART-A

1. Define Operators and explain different types of operators.
2. Explain types of inheritance with example.
3. Explain checked and unchecked exceptions.

PART-B

4. Explain variables and different types of types of variables.
5. Explain life cycle of Thread.
6. Explain briefly about MVC architecture.

SECTION-II

Answer any FOUR questions. Each question carries 5 Marks. **5X4=20M**

7. List and explain data types with example.
8. How to create a java structure with example.
9. Explain about this keyword.
10. How do you access command-line arguments in java
11. What is exception handling?
12. Explain inter thread communication.
13. Explain about containers.

	Pithapur Rajahs Government College(A)::Kakinada Department of Computer Science	**Program:** II B.Sc. (AI) **Semester:** III
Minor Course – 2	Course Name: **Object Oriented Programming using Java Lab**	
	Hours Allocated: 2hrs/week	Credits: 1

LABLIST

1. Write a Java program to print Fibonacci series using for loop.
2. Write a Java program to calculate multiplication of 2 matrices.
3. Create a class Rectangle. The class has attributes length and width. It should have methods that calculate the perimeter and area of the rectangle. It should have read Attributes method to read length and width from user.
4. Write a Java program that implements method overloading.
5. Write a Java program for sorting a given list of names in ascending order.
6. Write a Java program that displays the number of characters, lines and words in a text file.
7. Write a Java program to implement various types of inheritance

   i. Single ii. Multi-Level iii. Hierarchical iv. Hybrid
8. Write a java program to implement runtime polymorphism.
9. Write a Java program which accepts withdraw amount from the user and throws an exception ―In Sufficient Funds‖ when withdraw amount more than available amount.
10. Write a Java program to create three threads and that displays ―good morning‖, for every one second, ―hello‖ for every 2 seconds and ―welcome‖ for every 3 seconds by using extending Thread class.
11. Write a Java program that creates three threads. First thread displays ―OOPS‖, the second thread displays ―Through‖ and the third thread Displays ―JAVA‖ by using Runnable interface.
12. Implement a Java program for handling mouse events when the mouse entered, exited, clicked, pressed, released, dragged and moved in the client area.
13. Implement a Java program for handling key events when the key board is pressed, released, typed.
14. Write a Java swing program that reads two numbers from two separate text fields and display sum of two numbers in third text field when button ―add‖ is pressed.
15. Write a Java program to design student registration form using Swing Controls. The form which having the following fields and button SAVE Form Fields are: Name, RNO, Mail id, Gender, Branch, Address.

	Pithapur Rajahs Government College(A)::Kakinada Department of Computer Science	**Program:** II B.Sc. (Artificial Intelligence) **Semester : IV**
Minor Course - 3	Course Name: **Database management system**	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

To familiarize with concepts of database design

Course Outcomes:

- Differentiate between database systems and file – based systems
- Design a database using ER model
- Use relational model in database design
- Use SQL commands for creating and manipulating data stored un databases.
- Write PL/SQL programs to work with databases.

UNIT – I

Overview of Database Management System: Introduction to data, information, database, database management systems, file-based system, Drawbacks of file-Based System, database approach, Classification of Database Management Systems, advantages of database approach, Various Data Models, Components of Database Management System, three schema architecture of data base, costs and risks of database approach.

UNIT – II

Entity-Relationship Model: Introduction, the building blocks of an entity relationship diagram, classification of entity sets, attribute classification, relationship degree, relationship classification, reducing ER diagram to tables, enhanced entity-relationship model (EER model), generalization and specialization, IS A relationship and attribute inheritance, multiple inheritance, constraints on specialization and generalization, advantages of ER modelling.

UNIT – III

Relational Model: Introduction, CODD Rules, relational data model, concept of key, relational integrity, relational algebra, relational algebra operations, advantages of relational algebra, limitations of relational algebra, relational calculus, tuple relational calculus, domain relational Calculus (DRC), Functional dependencies and normal forms up to 3rd normal form.

UNIT – IV

Structured Query Language: Introduction, Commands in SQL, Data Types in SQL, Data Definition Language, Selection Operation, Projection Operation, Aggregate functions, Data Manipulation Language, Table Modification Commands, Join Operation, Set Operations, View, Sub Query

UNIT – V

PL/SQL: Introduction, Shortcomings of SQL, Structure of PL/SQL, PL/SQL Language Elements, Data Types, Operators Precedence, Control Structure, Steps to Create a PL/SQL, Program, Iterative Control, Procedure, Function, Database Triggers, Types of Triggers.

Text Books:

1. Operating System Principles by Abraham Silberschatz, Peter Baer Galvin and Greg Gagne (7th Edition) Wiley India Edition.

Reference Books:

1. Database Management Systems by Raghu Ramakrishnan, McGraw hill
2. Principles of Database Systems by J. D. Ullman
3. Fundamentals of Database Systems by R. Elmasri and S. Navathe
4. SQL: The Ultimate Beginners Guide by Steve Tale.

	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** III B.Sc. (Artificial Intelligence) **Semester :** V
Minor Course - 5	Course Name: **Database management system**	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	2	1	20
II	1	2	25
III	1	2	20
IV	1	1	15
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** II B.Sc. (Artificial Intelligence) **Semester:** IV
Minor Course – 3	Course Name: **Database management system**	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
Time: 2 hours		**Max Marks: 50M**

SECTION – I

Answer any three of the following questions. Must attempt at least one question from each part.

Each question carries 10 Marks. **3 X 10 = 30M**

Part-A

1. Describe three schema architecture?
2. Discuss about building blocks of Entity-Relationship diagram.?
3. Discuss about relational algebra? Explain the operations of Relational Algebra?

Part-B

4. Explain database approach? And its advantages & cost and risk of database approach?
5. Explain about SQL commands (DDL, DML) & Table Modification Commands?
6. Describe the Structure of PL/SQL?

SECTION-II

Answer any four of the Following questions. Each question carries 5 Marks **4 X 5 = 20M**

7. Explain about data models?
8. Explain the design constraints on the generalization and specialization?
9. Explain about IS A relationship and attribute inheritance, multiple inheritance?
10. List out the CODD‘s Rules
11. Explain about i) Candidate key ii) Primary key iii) Foreign key iv) Super key
12. Write about datatypes in SQL?
13. Describe steps to create a PL/SQL program?

	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** II B.Sc. (AI) **Semester:** IV
Minor Course – 3	Course Name: **Database management system Lab**	
	Hours Allocated: 2hrs/week	Credits: 1

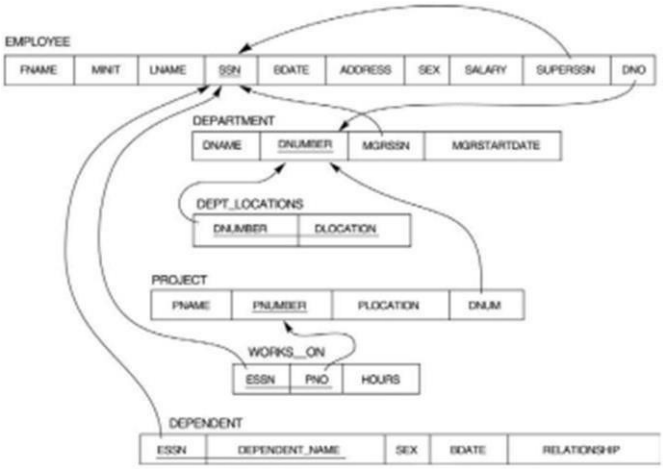
LABLIST

1. Draw ER diagram for hospital administration

2. Creation of college database and establish relationships between tables

3. Relational database schema of a company is given in the following figure.

Relational Database Schema - COMPANY



Questions to be performed on above schema

1. Create above tables with relevant Primary Key, Foreign Key and other constraints
2. Populate the tables with data
3. Display all the details of all employees working in the company.
4. Display ssn, lname, fname, address of employees who work in department no 7.
5. Retrieve the Birthdate and Address of the employee whose name is 'Franklin T. Wong'
6. Retrieve the name and salary of every employee
7. Retrieve all distinct salary values
8. Retrieve all employee names whose address is in _Bellaire‘
9. Retrieve all employees who were born during the 1950s
10. Retrieve all employees in department 5 whose salary is between 50,000 and 60,000(inclusive)

11. Retrieve the names of all employees who do not have supervisors
12. Retrieve SSN and department name for all employees
13. Retrieve the name and address of all employees who work for the 'Research' department
14. For every project located in 'Stafford', list the project number, the controlling department number, and the department manager's last name, address, and birth date.
15. For each employee, retrieve the employee's name, and the name of his or her immediate supervisor.
16. Retrieve all combinations of Employee Name and Department Name
17. Make a list of all project numbers for projects that involve an employee whose last nameis 'Narayan‘ either as a worker or as a manager of the department that controls the project.
18. Increase the salary of all employees working on the 'Product X' project by 15%. Retrieve employee name and increased salary of these employees.
19. Retrieve a list of employees and the project name each works in, ordered by the employee's department, and within each department ordered alphabetically by employeefirst name.
20. Select the names of employees whose salary does not match with salary of any employeein department 10.
21. Retrieve the employee numbers of all employees who work on project located in Bellaire, Houston, or Stafford.
22. Find the sum of the salaries of all employees, the maximum salary, the minimum salary,and the average salary. Display with proper headings.
23. Find the sum of the salaries and number of employees of all employees of the _Marketing‘ department, as well as the maximum salary, the minimum salary, and the average salary in this department.
24. Select the names of employees whose salary is greater than the average salary of all employees in department 10.
25. Delete all dependents of employee whose ssn is _123456789‘.
26. Perform a query using alter command to drop/add field and a constraint in Employee table.

	Pithapur Rajahs Government College(A)::Kakinada Department of Computer Science	**Program:** II B.Sc. (Artificial Intelligence) **Semester :** IV
Minor Course - 4	Course Name: **Object Oriented Software Engineering**	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

- Introduce the fundamental concepts of Object-Oriented Programming (OOP) and their relevance in software engineering.
- Provide a comprehensive understanding of object-oriented analysis and design (OOAD) through Unified Modeling Language (UML).
- Develop the ability to gather, analyze, and specify software requirements using modern object-oriented techniques.
- Familiarize students with the software development life cycle (SDLC) and test-driven development (TDD) approaches.
- Equip students with practical knowledge for software construction, maintenance, evolution, and reengineering of object-oriented systems.

Course Outcomes:

Up on successful completion of the course, a student will be able to:

- Understand and apply the fundamental principles of Object-Oriented Programming (OOP) concepts and Unified Modeling Language (UML) basics, in the development of software solutions.
- Analyze and specify software requirements, develop use cases and scenarios, apply object- oriented analysis and design (OOAD) principles
- Familiar with the concept of test-driven development(TDD) and its practical implementation
- Analyze and Evaluate Software Maintenance and Evolution Strategies
- Apply Advanced Object-Oriented Software Engineering Concepts

UNIT-I

Introduction to Object-Oriented Programming: Overview of software engineering, Introduction to Object-Oriented Programming (OOP)concepts (classes, objects, inheritance, polymorphism), Unified Modelling Language (UML) basics, Introduction to software development process and software development life cycle (SDLC).

UNIT-II

Requirements Analysis and Design: Requirements analysis and specification, Use cases and scenarios, Object-oriented analysis and design (OOAD), Design patterns, UML modelling techniques (class diagrams, sequence diagrams, state machine diagrams, activity diagrams)

UNIT-III

Software Construction and Testing: Software construction basics, Object-oriented design principles, Object-oriented programming languages (Java, C++, Python), Software testing basics (unit testing, integration testing, system testing), Test-driven development (TDD)

UNIT-IV

Software Maintenance and Evolution: Software maintenance basics, refactoring techniques Software version control, Code review and inspection, Software evolution and reengineering

UNIT-V

Advanced Topics in Object-Oriented Software Engineering: Model-driven engineering (MDE), Aspect-oriented programming (AOP), Component-based software engineering (CBSE), Service- oriented architecture (SOA), Agile software development and Scrum methodologies.

Text Book(s)

- AnIntroductiontoObject-OrientedAnalysisandDesignandtheUnifiedProcess,3rd Edition, Craig Larman, Prentice-Hall.
- Programming in Java by Sachin Malhotra, Oxford University Press

Reference Books:

- Requirements engineering: processes and techniques,G.Kotonyaand,I.Sommerville,1998, Wiley
- Design Patterns,E.Gamma, R.Helm,R.Johnson,andJ. Vlissides
- The Unified Modeling Language Reference anual,J.Rumbaugh,I.JacobsonandG. Booch, Addison Wesley

	Pithapur Rajahs Government College(A)::Kakinada Department of Computer Science	**Program:** II B.Sc. (AI) **Semester :** IV
Minor Course - 4	Course Name: **Object Oriented Software Engineering**	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	1	2	20
II	2	1	25
III	1	2	20
IV	1	1	15
V	1	1	15

Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** II B.Sc. (Artificial Intelligence) **Semester :** IV
Minor Course – 4	Course Name: **Object Oriented Software Engineering**	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
Time: 2 hours		**Max Marks: 50M**

SECTION –I

Answer any three of the following questions. Must attempt at least one question from each part. Each question carries 10 Marks. 3 X 10 =30M

PART-A

1. Define Software Engineering? Discuss about features of OOP in OOSE.
2. Explain bout the Software Requirements Analysis and explain its characteristics
3. Define Software Testing? Explain the various types of Software Testing‘s?

PART-B

4. Explain the about Software Development Life Cycle (SDLC) phases?
5. Demonstrate on the various activities in Software Maintenance.
6. Define MDE? Explain the various characteristics of MDE.

SECTION-II

Answer any FOUR questions. Each question carries 5 Marks. 4X5=20M

7. Discuss about Structural Modeling and Behavioral Modeling diagram in UML?
8. Define Design pattern? List out various types of Design pattern
9. Demonstrate on the OOA?
10. Explain about Test-Driven Development (TDD)?
11. Write about Software Construction fundamentals?
12. Define Code Inspection? And Explain it.
13. Explain about various phases of Agile Software Development?

	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** II B.Sc. (Artificial Intelligence) **Semester :** IV
Minor Course – 4	Course Name: **Object Oriented Software Engineering Lab**	
	Hours Allocated: 2hrs/week	Credits: 1

LAB LIST

1. Develop an IEEE standard SRS document. Also develop risk management and project plan (Gantt chart).
2. Understanding of System modeling: Data model i.e. ER – Diagram and draw the ER Diagram with generalization, specialization and aggregation of specified problem statement
3. Understanding of System modeling: Functional modeling: DFD level 0 i.e. Context Diagram and draw it
4. Understanding of System modeling: Functional modeling: DFD level 1 and DFD level 2 and draw it.
5. Identify use cases and develop the use case model.
6. Identify the business activities and develop an UML Activity diagram.
7. Identity the conceptual classes and develop a domain model with UML Class diagram.
8. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
9. Draw the state chart diagram.
10. Identify the user interface, domain objects, and technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
11. Implement the technical services layer.
12. Implement the domain objects layer.
13. Implement the user interface layer.
14. Draw component and deployment diagrams

	Pithapur Rajahs Government College(A)::Kakinada Department of Computer Science	**Program:** III B.Sc. (AI) **Semester :** V
Minor Course - 5	Course Name: **Web Applications Development using PHP & MYSQL**	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

To enable students to understand open-source tools to create dynamic web pages, implement user interactivity, and gain proficiency in developing web sites

Course Outcomes:

On successful completion of the course, students will be able to

- Write simple programs in PHP.
- Understand how to use regular expressions, handle exceptions, and validate data using PHP.
- Apply In-Built functions and Create User defined functions in PHP programming.
- Write PHP scripts to handle HTML forms.
- Know how to use PHP with a MySQL database and can write database driven web pages.

UNIT-I

The building blocks of PHP: Introduction to PHP, tags and basic output, variables, superglobal variables, data types, Operators and Expressions, Constants, **Control Flow in PHP:** Switching Flow, Loops, Code Blocks and Browser Output. **Working with Functions:** Creating functions, calling functions, returning the values from User- defined Functions, Variable Scope, arguments of functions

UNIT-II

Working with Arrays: Creating Arrays, Associative and multidimensional arrays, Some Array-Related Functions. **Working with Objects:** Creating Objects, Accessing Object Instances, **Working with Strings**, **Dates and Time:** Formatting strings with PHP, Manipulating Strings with PHP, Using Date and Time Functions in PHP.

UNIT-III

Working with Forms: Creating Forms, Client-side vs. server-side validation, Accessing Form Input with User defined Arrays, Combining HTML and PHP code on a single Page, Using Hidden Fields to save state, Redirecting the user, Sending Mail on Form Submission, and Working with File Uploads, Managing files on server, Exception handling.

UNIT-IV

Working with Cookies and User Sessions: Introducing Cookies, setting a Cookie with PHP, Session Function Overview, starting a Session, working with session variables, passing session IDs in the Query String, Secure session management, Destroying Sessions and Unsetting Variables, Using Sessions in an Environment with Registered Users.

UNIT-V

Interacting with MySQL using PHP: MySQLi vs. PDO (PHP Data Objects, connecting to MySQL with PHP, Working with MySQL Data. Planning and Creating Database Tables, Creating Menu, Creating Record Addition Mechanism, Viewing Records, Creating the Record Deletion Mechanism.

Text Book(s)

- Julie C. Meloni, SAMS Teach yourself PHP MySQL and Apache, Pearson Education (2007).
- Steven Holzner , PHP: The Complete Reference, McGraw-Hill

Reference Books:

- Robin Nixon, Learning PHP, MySQL, JavaScript, CSS & HTML5, Third Edition O'reilly, 2014
- Xue Bai Michael Ekedahl, The web warrior guide to Web Programming, Thomson (2006).

Suggested Co-Curricular Activities & Evaluation Methods:

Unit 1: Activity: Create an infographic explaining client-server architecture and different server-side scripting languages.

Evaluation: Accuracy, design, clarity, creativity, and use of visuals.

Unit 2: Activity: Give a presentation on open-source frameworks used in the LAMP model.

Evaluation: Content knowledge, organization, clarity, presentation skills, visuals, and audience engagement.

Unit 3: Activity: Solve coding challenges using PHP.

Evaluation: Accuracy, functionality, efficiency, code readability, and problem-solving approach.

Unit 4: Activity: Group discussion on Session Management.

Evaluation: Participation, knowledge sharing, critical thinking, and understanding of Session Management.

Unit 5: Activity: Hands-on lab session practicing MySQL queries.

Evaluation: Performance and correctness of query implementation.

	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** III B.Sc. (AI) **Semester :** V
Minor Course - 5	Course Name: **Web Applications Development using PHP & MYSQL**	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
Section-II (Section-II Short Questions)	7	4	5	20

UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
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Total Questions: 6 (Essay) + 7 (Short) = 13

Questions to Answer: 3 (Essay) + 4 (Short) = 7

Total Marks before Choice: 95

Final Exam Marks: 50

Choice Percentage: 47.36% [(95-50)/95 × 100]

	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** III B.Sc. (AI) **Semester :** V
Minor Course – 5	Course Name: **Web Applications Development using PHP & MYSQL**	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
TIME:2H		**MAX MARKS:50M**

SECTION-I

Answer any THREE questions (Must attempt at least one from each Part). Each question carries 10 Marks.

PART-A

1. Describe PHP data types with suitable examples. How does automatic type conversion differ from type casting?
2. Explain the different types of arrays in PHP (indexed, associative, and multidimensional) with suitable code examples.
3. Describe any ten commonly used string manipulation functions in PHP with examples.

PART-B

4. Explain how form input can be accessed using user-defined arrays in PHP with example.
5. Explain cookies in PHP. How are cookies created, retrieved, and deleted?
6. Explain the process of inserting, viewing, and deleting records in a PHP-MySQL application.

SECTION-II

Answer any FOUR questions. Each question carries 5 Marks.

7. Define superglobal variables in PHP. Mention any three commonly used superglobal with their purpose.
8. Briefly discuss conditional statements in PHP
9. List any five important PHP date/time functions and explain their purpose.
10. What are hidden fields in forms? Give an example.
11. Discuss how HTML and PHP code can be combined on a single page.
12. How do you destroy a session in PHP? Explain with an example.
13. Differentiate between MySQLi and PDO.

	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** III B.Sc. (AI) **Semester :** V
Minor Course – 5	Course Name**: Web Applications Development using PHP & MYSQL Lab**	
	Hours Allocated: 2hrs/week	Credits: 1

LABLIST

1. Write a PHP program to Display ―Hello‖
2. Write a PHP Program to display the today‘s date.
3. Write a PHP program to display Fibonacci series.
4. Write a PHP Program to read the employee details.
5. Write a PHP program to prepare the student marks list.
6. Create student registration form using text box, check box, radio button, select, submit button. And display user inserted value in new PHP page.
7. Create Website Registration Form using text box, check box, radio button, select, submit button. And display user inserted value in new PHP page.
8. Write PHP script to demonstrate passing variables with cookies.
9. Write a PHP script to connect MySQL server from your website.
10. Write a program to keep track of how many times a visitor has loaded the page.
11. Write a PHP application to perform CRUD (Create, Read, Update and Delete) operations on a database table.
12. Create a web site using any open-source framework built on PHP and MySQL – It is a team activity wherein students are divided into multiple groups and each group comes up with their own website with basic features.

	Pithapur Rajahs Government College(A)::Kakinada Department of Computer Science	**Program:** III B.Sc. (AI/PHYSICS) **Semester :** V
MINOR-6	Course Name **: INTERNET OF THINGS**	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

To enable students to understand basic IoT constructs, create IoT solutions to real world problems using IoT

Course Outcomes:

On successful completion of the course, students will be able to

- Understand various concepts, terminologies and applications of IoT
- Learn how to build IoT devices with development boards
- Understand various Wireless protocols for IoT
- Learn how to use various sensors and actuators & develop IoT solutions using Arduino
- Develop and Connect IoT with Cloud Platforms.

UNIT -I

Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M. Applications of IoT: Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.

UNIT -II

Sensors Networks : Definition, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, RaspberriPi Development Kit, RFID Principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT.

UNIT- III

Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet and Modbus. IP Based Protocols for IoT: IPv6, 6LowPAN, LoRA, RPL, REST, AMPQ, CoAP, MQTT. Edge connectivity and protocols.

UNIT IV

Arduino Simulation Environment: Arduino Uno Architecture, Setting up the IDE, Writing Arduino Software, Arduino Libraries, Basics of Embedded C programming for Arduino, Interfacing LED, push button and buzzer with Arduino, Interfacing Arduino with LCD. **Sensor & Actuators with Arduino**: Overview of Sensors working, Analog and Digital Sensors, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensors with Arduino, Interfacing of Actuators with Arduino, Interfacing of Relay Switch and Servo Motor with Arduino.

UNIT V

Developing IOT's: Implementation of IoT with Arduino, Connecting and using various IoT Cloud Based Platforms such as Blynk, Thingspeak, AWS IoT, Google Cloud IoT Core etc. Cloud Computing, Fog Computing, Privacy and Security Issues in IoT.

Additional Inputs:

IoT Capstone Project Lab Experiments Network programming hands on guide. Hands-on exercises on IoT hardware and software.

Text Books:

1. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Sudip Mishra, Anandarup Mukherjee, Arijit Roy: Introduction to IOT, Cambridge University Press.
3. Internet of Things- Dr Surya Durbha & Dr Jyoti Joglekar, Oxford University Press.

Reference Books:

1. Daniel Minoli, ― ―Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications‖, ISBN: 978-1-118-47347-4, Willy Publications
2. Pethuru Raj and Anupama C. Raman, ―The Internet of Things: Enabling Technologies, Platforms, and Use Cases‖, CRC Press

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** III B.Sc. (AI/PHYSICS) **Semester :** V
MINOR-6	Course Name **:INTERNET OF THINGS**	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

Section	Questions Given	To Answer	Marks Each	Total
Section-I (Part-A and Part-B Essay Questions)	6	3	10	30
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UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
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	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** III B.Sc. (AI/PHYSICS) **Semester :** V
MINOR-6	**Course Name: INTERNET OF THINGS**	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
TIME:2Hrs		**MAX MARKS:50M**

SECTION-I

Answer any THREE questions (Must attempt at least one from each Part). Each question carries 10 Marks. **3X10=30M**

PART-A

1. Explain the architecture of IoT with a neat diagram and discuss its components.
2. Discuss various enabling technologies that support IoT.
3. Explain the different types of sensors and actuators used in IoT.

PART-B

4. What is edge connectivity? Explain the protocols used for edge devices.
5. Explain the architecture of Arduino Uno with a neat block diagram.
6. Describe how cloud computing and fog computing support IoT applications.

SECTION-II

Answer any FOUR questions. Each question carries 5 Marks. **4X5=20M**

7. Define data consolidation and explain its significance in IoT.
8. Explain the CoAP and MQTT protocols with use cases in IoT.
9. Describe the concept of IP addressing in IoT networks and how it is handled.
10. Define 6LoWPAN and its importance in low-power devices.
11. What is the use of MAC (Media Access Control) in IoT?
12. Define layered attacker model with an example.
13. What is NodeMCU and why is it popular in IoT?

	Pithapur Rajahs Government College(A)::Kakinada **Department of Computer Science**	**Program:** III B.Sc. (AI/PHYSICS) **Semester :** V
MINOR-6	**Course Name: INTERNET OF THINGS LAB**	
	Hours Allocated: 2 hrs./week	**Credits:** 1

LABLIST

1. Understanding Arduino UNO Board and Components
2. Installing and work with Arduino IDE
3. Blinking LED sketch with Arduino
4. Simulation of 4-Way Traffic Light with Arduino
5. Using Pulse Width Modulation
6. LED Fade Sketch and Button Sketch
7. Analog Input Sketch (Bar Graph with LEDs and Potentiometre)
8. Digital Read Serial Sketch (Working with DHT/IR/Gas or Any other Sensor)
9. Working with Adafruit Libraries in Arduino
10. Spinning a DC Motor and Motor Speed Control Sketch
11. Working with Shields
12. Design APP using Blink App or Things peak API and connect it LED bulb.
13. Design APP Using Blynk App and Connect to Temperature, magnetic Sensors