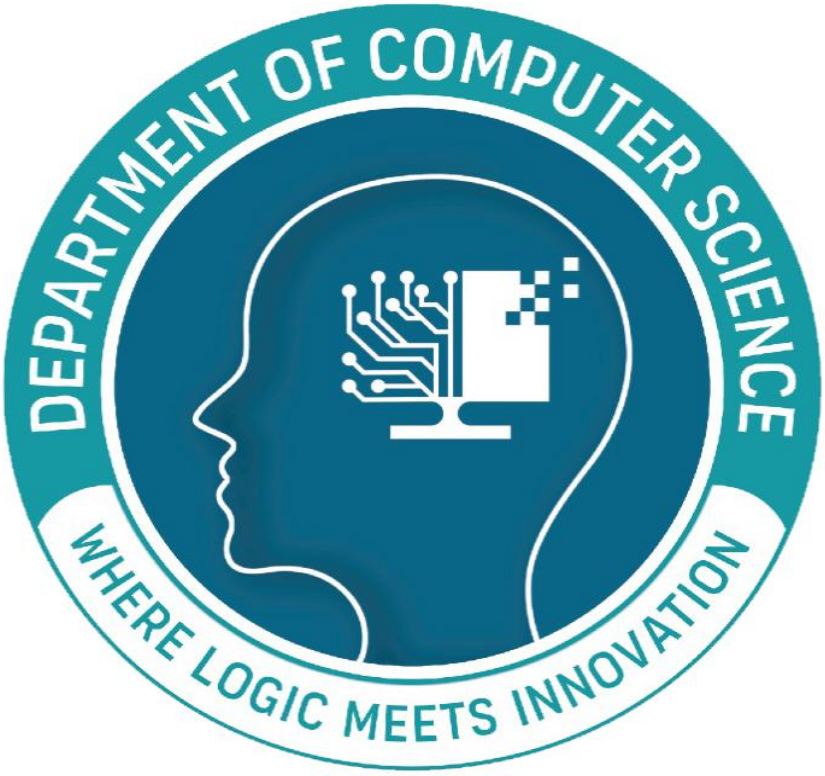
PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) KAKINAI

Affiliated to Adikavi Nannaya University

Rajamahendravaram



DEPARTMENT OF COMPUTER SCIENCE

BOARD OF STUDIES

2025-2026

Programme: Internet of Things (Single Major)

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. Internet of Things** 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	Dr. K V Sobha Rani, Lecturer in Computer Science, GDC, Ramachandrapuram	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	Ms. K Aswita III B.Sc. (IoT)	Student Member
15	A Rajesh, II B.Sc. (IoT)	Student Member

The above members are requested to attend the BoS meeting on 07-08-2025 AN 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 Department

Vision:

- To be a premier destination for computer science education and innovation, dedicated to shaping highly employable and socially responsible professionals who drive technological progress and positive change.

Mission:

- **Quality Education:** To provide a rigorous, current computer science curriculum that builds strong theoretical and practical skills for professional growth.
- **Techno-savvy Students:** To enhance critical thinking, creativity, and problem-solving to prepare students for real-world challenges.
- **Industry-Academia Collaboration:** To collaborate with industry leaders to offer internships and apprenticeships, making students industry-ready.
- **Social Responsibility:** To encourage ethical practices and societal contributions, guiding students to address global challenges.

P. R. Government College (Autonomous), Kakinada

Department of Computer Science

Board of Studies – 2025-26 (Internet of Things Program)

The Meeting of the **Board of Studies in Computer Science** was held in the Department of Computer Science on **07 August 2025 AN** 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 for effective delivery of curriculum in the Internet of Things (IoT) Program.
2. **Departmental Academic Activities (2025–26)** – Planning of seminars, workshops, conferences, training programs, faculty development programs (FDPs), and student development initiatives in IoT.
3. **Curriculum Revision and Updation** – Review and necessary modifications of the existing syllabi in IoT.
4. **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):
        a) Project Work – 10 Marks
        b) Assignments – 5 Marks
        c) Seminar/Presentation – 5 Marks
        d) Viva on Theory – 3 Marks
        e) Clean & Green Activities and Attendance – 2 Marks
5. **Paper Setters / Subject Experts** – Preparation and approval of panel for examinations and related Board of Studies deliberations.
6. **Research and Extension Activities** – Encouraging student research projects, industry collaborations, internships, and community outreach initiatives in IoT.
7. **Skill Development and Employability Enhancement** – Introduction of certificate, add-on, and value-added courses in emerging IoT domains such as Smart Cities, Industrial IoT, and IoT Security.
8. **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.

9. Any Other Matter with the Permission of the Chair.

RESOLUTIONS

1. **Implementation of Pedagogical Practices**
   - It was resolved to adopt the Outcome-Based Education (OBE) framework for all IoT courses.
   - Faculty members shall prepare syllabus blueprints and two sets of model question papers
   - for each IoT course.
   - Innovative methods such as ICT-enabled learning, project-based learning, and blended learning will be integrated into teaching practices.
2. **Departmental Academic Activities (2025–26)**

   The BoS resolved to organize:
   - One student workshops
   - One National Seminar on "IoT for Smart and Sustainable Systems."
   - One Faculty Development Program (FDP) on "IoT Security and Privacy."
   - Student Development Programs (hackathons, hardware prototyping challenges, and IoT internships).
3. **Curriculum Revision and Updation**
   - It was resolved to update the IoT curriculum by including electives in Industrial IoT, Edge **Computing, and IoT Security.**
   - The final-year laboratory syllabi shall be revised to introduce **hands-on projects in IoT Protocols, Cloud Platforms, and Smart Devices.**
4. **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

5. **Panel of Examiners / Paper Setters / Subject Experts**
   - The BoS approved the proposed panel of **external examiners, question paper setters, and subject experts.**

6. **Research and Extension Activities**

- It was resolved to encourage IoT-based research projects guided by faculty.
- Students shall be motivated to present IoT papers in conferences/seminars and publish in UGC CARE/Scopus indexed journals.

7. **Skill Development and Employability Enhancement**

The BoS approved the introduction of **certificate and value-added courses** in:

- IoT with Arduino and Raspberry Pi
- Industry partnerships shall be explored for **course delivery and internship opportunities.**

8. **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 corrective measures taken to improve curriculum and teaching quality.

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

The Board of Studies meeting for the Internet of Things program under the Department of Computer Science was held on **07-08-2025 (Afternoon)** 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	Dr. K V Sobha Rani, Lecturer in Computer Science, GDC, Ramachandrapuram	University Nominee	
3	Sri. G B V Padmanadh, GDC, Mummidivaram	Subject Expert-1, Lecturer in Computer Science	07/8/25
4	Dr. K Srinivas, Professor & HoD, Dept. of CSE, BVCITS(A), Batlapalem.	Subject Expert-2, Lecturer in Computer Science and Engineering	7/8/2025
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	J. Lakshmi Gayathri
11	Sri. Aditya Sai Ganesh Pappu	Member	
13	Sri Sakala Apparao, Consultant, Cap Gemini	Student Alumni Member	-
14	Ms. K Aswita III B.Sc. (IoT)	Student Member	
15	A Rajesh, II B.Sc. (IoT)	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	Government Degree College for Men, Srikakulam
2	Smt. Naga Subramanyeswari	ASD Women's College ,Kakinada
3	Sri. D.Suneel Kumar	GDC(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. (INTERNET OF THINGS)

S.No	Semester	Course Code	Titleofthe 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	Problem Solving Using C	50	50	3	--	-	3
4			Problem Solving Using C Lab	50	--	-	-	2	1
5		LSC I	AI Fundamentals	50	50	4	-	-	4
6			AI Fundamentals Lab	-	-	-	-	2	0
7	SEM-II	Major-3	Python Programming and Data Structures	50	50	3	--	-	3
8			Python programming and Data Structures lab	50	--	-	-	2	1
9		Major-4	Fundamentals of IoT and Applications	50	50	3	--	-	3
10			Arduino Lab	50	--	-	-	2	1
11		LSC 2	Applications Of Artificial Intelligence	50	50	3	-	-	3
12			Applications Of Artificial Intelligence	50	--	-	-	2	1
13	SUMMER		Community service Project	100	--	--	--	--	4
14	SEM-III	Major-5	Python for Data Science	50	50	3	--	-	3
15			Python for Data Science Lab	50	--	-	-	2	1
16		Major-6	Data Communications and Computer networks	50	50	3	--	-	3
17			Network Simulator-2 Lab	50	--	--	--	2	1
18		Major-7	Data Structures using 'C'	50	50	3	--	--	3
19			Data structures using C Lab	50	--	--	--	2	1
20		Major-8	Digital Logic Design	50	50	3	--	--	3
21			Digital Logic Design Lab	50	--	--	--	2	1
22	SEM-IV	Major-9	Java Programming for IoT	50	50	3	--	-	3
23			Java Programming for IoT Lab	50	--	-	-	2	1
24		Major-10	Operating Systems	50	50	3	-	-	3
25			OS & UNIX programming Lab	50	--	--	--	2	1

26		Major-11	Computer Organization & Architecture	50	50	3	-	-	3
27			Computer Organization &Architecture Lab	50	--	-	-	2	1

28	INTERNSHIP			100	--	-	-	-	4
29	SEM-V	Major-12	RFID and wireless sensor networks	50	50	3	-	-	3
30			RFID and wireless sensor networks lab	50	--	-	-	2	1
31		Major-13	IoT Architecture and its protocol	50	50	3	-	-	3
32			Internet of things lab	50	--	-	-	2	1
33	SEM-V	Major-14	Sensors and Actuator device for IoT	50	50	3	-	-	3
34			Sensors and Actuator device for IoT Lab	50	--	-	-	2	1
35		Major-15	Implementing IoT with Raspberry Pi	50	50	3	-	-	3
36			Raspberry Pi Lab	50	--	-	-	2	1
37	SEM-VI	APPRENTICESHIP		200	--	-	-	-	12

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.)Internet of Things

Program Specific Outcomes (PSOs)

After completion of the program, the student is able to

PSO1: Experiment and prepare programming concepts and provide new ideas and innovations towards research and societal issues in the field of Internet of things.

PSO2: Analyses and develop computer systems connected together using IoT network protocols, and also work towards making them more secure and efficient using block chain, machine learning algorithms, fog and edge computing for efficient design of computer-based systems of varying complexity. Finally specify, design, develop, test and maintain usable systems that behave reliably and efficiently.

PSO3: Apply standard and advanced Internet of things-based concepts, practices and strategies in order to develop sustainable products using AI-based technology to deliver a quality product for home automation.

PSO4: Apply standard and advanced Internet of things-based concepts, practices and strategies in order to develop real time IOT devices.

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. (IoT) Semester: I
Major-1	**Course Name:** Computer Fundamentals and Office Automation	
	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, Evolution, Block Diagram and Generations. 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. (IoT) **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. (IoT) **Semester:** I
Major-1	**Course Name: Computer Fundamentals and Office Automation**	
	Hours Allocated: 3hrs/week	Credits: 3
Model Question 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. (IoT) **Semester:** I
Major-1	**Course Name**: Computer Fundamentals and Office Automation	
	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 Rajah's Government College(A) Kakinada Department of Computer Science	Program: I B.Sc.(IoT) Semester: I
Major2	Course Name: Problem Solving Using C	
	Hours Allocated: 3hrs/week	Credits: 3

Learning Objectives:

- Understand the fundamentals of computer programming, Apply structured problem- solving approaches using algorithms, flowcharts, and C programming constructs.
- Develop efficient logic using decision-making, loop, and jump control statements.
- Utilize derived data types like arrays and strings for modular program design.
- Design and implement modular solutions using functions, recursive logic, pointer operations, and dynamic memory management.
- Handle complex data structures including structures, unions, and text file operations.

Learning Outcomes:

On Completion of the course, students will be able to-

- Understand basic computing concepts, programming paradigms and write structured C programs.
- Apply control flow statements to solve logical and repetitive tasks in C.
- Implement arrays and string operations to manage and manipulate data efficiently.
- Design modular code using functions, recursion, and appropriate parameter passing.
- Utilize pointers and memory operations for effective data handling. Demonstrate competence in dynamic memory allocation and text file processing.

UNIT-I

Introduction to computer programming:

Introduction, 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:

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

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

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. Working with text files - modes: opening, reading, writing and closing text files.

Text Books:

1. Programming in ANSI C, E. Balagurusamy, Tata McGraw Hill, 6 th Edn,
2. Computer fundamentals and programming in C, Reema Theraja, Oxford University Press

Reference Books:

1. Let us C, Y Kanetkar, BPB publications
2. Head First C: A Brain-Friendly Guide, David Griffiths, Dawn Griffiths

	Pithapur Rajah's Government College(A)::Kakinada Department of Computer Science	**Program:** I B.Sc. (IoT) **Semester:** I
MAJOR 2	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	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 B.Sc. (IoT) **Semester:** I
MAJOR -2	Course Name: Problem Solving Using C Lab	
	Hours Allocated: 2hrs/week	Credits: 1

List of Experiments

1. Write a program to check whether the given number is Armstrong or not.
2. Write a program to find the sum of individual digits of a positive integer.
3. Write a program to generate the first n terms of the Fibonacci sequence.
4. Write a program to find both the largest and smallest number in a list of integer values
5. Write a program to demonstrate change in parameter values while swapping two integer variables using Call by Value & Call by Address
6. Write a program to perform various string operations.
7. Write a program to search an element in a given list of values.
8. Write a program that uses functions to add two matrices.
9. Write a program to calculate factorial of given integer value using recursive functions
10. Write a program for multiplication of two N X N matrices.
11. Write a program to sort a given list of integers in ascending order.
12. Write a program to calculate the salaries of all employees using the Employee (ID, Name, Designation, Basic Pay, DA, HRA, Gross Salary, Deduction, Net Salary) structure.
    a. DA is 30 % of Basic Pay
    b. HRA is 15% of Basic Pay
    c. Deduction is 10% of (Basic Pay + DA)
    d. Gross Salary = Basic Pay + DA+ HRA
    e. Net Salary = Gross Salary - Deduction
13. Write a program to read / write the data from / to a file.
14. Write a program to reverse the contents of a file and store in another file.
15. Write a program to create Book (ISBN,Title, Author, Price, Pages, Publisher) structure and store book details in a file and perform the following operations
    a. Add book details
    b. Search a book details for a given ISBN and display book details, if available
    c. Update a book details using ISBN
    d. Delete book details for a given ISBN and display list of remaining Books

	Pithapur Rajah's Government College(A)::Kakinada **Department of Computer Science**	**Program:** I B.Sc. (IoT) **Semester:** I
MAJOR -2	Course Name: Problem Solving Using C	
	MODEL QUESTION PAPER	
Time: 2Hrs		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.

3X10=3

0M Part – A

1. What is a flowchart? Explain different symbols used in flowcharts.
2. What is an Operator? Explain different types of Operators in detail?
3. What are control statements? Explain different looping statements in C with syntax and examples

Part – B

4. What is a String? Describe the various string handling functions in C
5. What is Pointer Data Type? Explain in detail?
6. What are structures? Explain structure declaration, initialization, and accessing members with suitable examples

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 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

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
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UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
I	1	2	20
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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: 0

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 Rajah's Government College(A) Kakinada Department of Computer Science	**Program:** I B.Sc. (IoT) **Semester :** II
Major-3	Course Name: Python Programming And Data Structures	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives

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

Course Outcomes

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

- Explain the basic features, syntax, data types, and operators of Python programming.
- Apply control flow constructs, functions, and modules to develop structured Python programs.
- Demonstrate the use of sequences, sets, and dictionaries for effective data handling and manipulation.
- Implement file handling techniques and apply exception handling mechanisms for robust applications.
- 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 Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** I B.Sc. (IoT) **Semester :** II
Major- 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
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UNIT-WISE DISTRIBUTION:

UNIT	Essay Qs (10m)	Short Qs (5m)	Total Marks
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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. (IoT) **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 Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** I B.Sc. (IoT) **Semester :** II
Major- 3	**Course Name:** Python Programming and Data Structures	
	Hours Allocated: 2hrs/week	Credits: 1

Lab Experiments:

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
    a. Write a program to find the largest of three numbers using if-elif-else.
    b. Write a program to check whether a number is prime or not using loops.
    c. Write a program to illustrate the use of loop control statements (break, continue, pass).
3. Functions and Recursion
    a. Write a program to define a function to calculate factorial of a number (using recursion).
    b. 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 Rajah's Government College(A) Kakinada Department of Computer Science	Program: I B.Sc. (IoT) Semester : II
Major- 4	**Course Name:** Fundamentals of IoT and Applications	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

- To study fundamental concepts of IoT
- To understand roles of sensors in IoT
- To Learn different protocols used for IoT design
- To be familiar with data handling and analytics tools in IoT
- Appreciate the role of big data, cloud computing and data analytics in a typical IoT system.
- Understand the role of IoT in various domains of Industry.

Syllabus:

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.

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, Modbus.

IP Based Protocols for IoT : IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT. Edge connectivityand protocols

UNIT-IV

Data Handling& Analytics: Introduction, Bigdata, Types of data, Characteristics of Big data, Data handling Technologies, Flow of data, Data acquisition, Data Storage, Introduction to Hadoop. Introduction to data Analytics, Types of Data analytics, Local Analytics, Cloud analytics and applications

UNIT-V

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.

Text Books:

1. HakimaChaouchi, — —The Internet of Things Connecting Objects to the Web‖ ISBN : 978-1- 84821-140-7, Wiley Publications
2. Olivier Hersent, David Boswarthick, and Omar Elloumi, — —The Internet of Things: Key Applications and Protocols‖, WileyPublications
3. Vijay Madisetti and ArshdeepBahga, — —Internet of Things (A Hands-on-Approach)‖, 1st Edition, VPT, 2014.
4. J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media, 2016.
5. Keysight Technologies, —The Internet of Things: Enabling Technologies and Solutions for Design and Test‖, Application Note, 2016.

Reference Books:

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

1. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press

Web Links:

1. https://onlinecourses.nptel.ac.in/noc17_cs22/course
2. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

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

MODEL BLUE PRINT

EXAM STRUCTURE:

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	Pithapur Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** I B.Sc. (IoT) **Semester :** II
Major- 4	**Course Name**: Fundamentals of IoT and Applications	
	MODEL QUESTION PAPER	Credits: 3
Time: 2Hrs		Max.Marks:50M

SECTION – I

Answer any three of the following questions. Must attempt atleast one question from each part . Each question carries 10 Marks.

(3x10=30M)

Part-A

1. What is IoT? Explain characteristics of IoT?
2. Explain the architecture of IoT?
3. Explain the types of actuators with example?

Part-B

4. What is edge connectivity? Write its applications
5. Explain Hadoop in detail
6. Write the role of IoT in home automations &health and life cycle?

SECTION-II

Answer any four of the following questions .Each question carries 5 marks (4X5=20M)

7. Write the history of IoT?
8. Explain the role of internet in Iot?
9. What is RFID? Explain its components?
10. Explain about networking nodes?
11. Explain about z-wave?
12. Explain descriptive analytics?
13. Explain working of IoT in Logistics?

	Pithapur Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** I B.Sc. (IoT) **Semester :** II
Major- 4	**CourseName**: Arduino Lab	
	Hours Allocated: 3hrs/week	Credits: 3

List of Experiments

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. Interfacing Arduino with Cloud (Thingspeak API)

	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:** I B.Sc. (AI/IOT/DS)
LSC2	**Applications Of Artificial Intelligence**	**Semester:** II
	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=90776953 31310534831-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=3

0M 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.

SEMESTER-III

	Pithapur Rajah's Government College(A) Kakinada Department of Computer Science	**Program:** II B.Sc. (IoT) **Semester :** III
MAJOR 5	**Course Name**: PYTHON FOR DATA SCIENCE	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objective:

The objective of this course is to study main elements of python programming and perform data analysis using data structures and tools in python.

- On Completion of this course, the students will be able to-
- To Understand Features and basic concepts of python.
- To learn control structures in python and apply them to real world problems.
- To implement functions and modules in python.
- To understand data structures in python oops concepts
- To construct data and perform data analysis.

UNIT-I

Basics of Python

Features of python, literal constants-numbers, variables, identifiers, data types, input operation, comments, operators, operations on strings, other data types, type conversion. Selection or conditional branching statements-if, if else, nested if, if elif else, loops or iterative statements-while, for, nested loops, break, continue, pass, else statement with loops.

UNIT-II

Functions and Modules

Functions-Definition and call, return statements, anonymous function-LAMBDA, recursive functions. **Modules-** Using existing modules, making own modules, packages in python, Names of standard library modules.

UNIT-III

Data Structures

List-Accessing lists, updating lists, nested lists, basic list operations, list methods, loops in lists.

Tuples -Creation, Accessing, updating, deletion in tuples and basic tuple operations.

Sets- creation, set operations.

Dictionaries-creation, accessing, adding and modifying items, deleting items.

UNIT-IV

Object Oriented Programming concepts:

Oops concept- Introduction, Classes and Objects, Class method Inheritance Introduction Inheriting classes in python Types of Inheritance, Error and Exception Handling.

UNIT-V

Data Analysis:

Data preparation using pandas and series: pandas data frame basics**,** Creating your own data, Series, Data frames, Making changes to series and data frames **Plotting:** Matplotlib Introduction, Univariate plots-Histograms

	Pithapur Rajah's Government College(A) Kakinada Department of Computer Science	**Program:** II B.Sc. (IoT) **Semester :** III
MAJOR 5	Course Name: PYTHON FOR DATA SCIENCE	
	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	1S5
IV	1	1	15
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: II B.Sc. (IoT) Semester : III
MAJOR 5	Course Name: PYTHON FOR DATA SCIENCE	
	Hours Allocated: 3hrs/week	Credits: 3
MODEL QUESTION PAPER		
Time: 2Hrs		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 python loop/Iterative statements
2. What is the lambda function? Write the characteristics of a lambda function.
3. Explain the concept of classes and objects in Python. Provide an example demonstrating the creation of a class and instantiation of objects.

Part - B

4. Describe the features of python.
5. What is dictionary? Explain the methods available in dictionary.
6. Explain how Data Frames organize data and facilitate operations such as filtering, aggregation, and visualization.

Section II

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

7. Describe type conversion in python
8. Demonstrate python data types
9. Define function in python and state its advantages
10. Design a program using functions to swap two numbers.
11. Differentiate between list and tuple in python
12. Demonstrate the role of constructors in Python classes.
13. Explain the fundamental components and functionality of Pandas Data Frames.

	Pithapur Rajah's Government College(A) Kakinada Department of Computer Science	**Program:** II B.Sc. (IoT) **Semester :** III
MAJOR 5	Course Name: PYTHON FOR DATA SCIENCE LAB	
	Hours Allocated: 2hrs/week	Credits: 1

LAB PROGRAMS LIST

1. Write a program to read and print values of variables of different data types.
2. Write a program to find the roots of quadratic equations.
3. Write a program to find largest of 3 numbers.
4. Write a program to check whether a given number is prime or not.
5. Write a program to generate Fibonacci series.
6. Write a program to find whether a given number is Armstrong or not.
7. Write a program using functions to swap two numbers.
8. Write a program to find factorial of a number using recursion.
9. Write a program to find square root of a given number using math module.
10. i. Write a program to generate 10 random integers between 1to100 using random module.
    ii. Write a program to generate 10 random integers between 1to100 using random module.
11. Create a list and perform different operations on it.
12. Create a tuple and perform different operations on it.
13. Create a set and perform different operations on it.
14. Create a dictionary and perform different operations on it.
15. Import pandas and create a data frame and perform operations on it.
16. Generate histogram using Matplotlib.

	Pithapur Rajah's Government College(A)::Kakinada Department of Computer Science	**Program:** II B.Sc. (IoT) **Semester :** III
MAJOR 6	Course Name: Data Communications and Computer Networks	
	Hours Allocated: 3hrs/week	Credits: 3

Learning Objectives:

- Appreciate the use of computer networking in various walks of life, describe the types of networks, network configurations and network topologies. Also Write the OSI and TCP/IP reference models for networking.
- Responsibilities of data link layer, its implementation and associated protocols, algorithms/pseudo codes.
- The various techniques used to access a shared channel in the network and IEEE specifications for LANs.
- Networking devices, back bone networks and Internet Protocol(IP) addressing.
- Responsibilities of network, transport and application layers.

Learning Outcomes:

On Completion of the course, the students will be able to-

- Computer networks, list network configurations, types, topologies, the applications of computer networks in different fields, network models and description of physical layer.
- Reason the need for flow and error control at the data link layer and explain the associated protocols.
- Enumerate the shared channel access methods, associated protocols and Wired& Wireless LAN standards and implementations.
- The types of networking devices/equipments and also explain the addressing scheme used at the network layer.
- How network layer, transport layer and application layer facilitates the transfer of message from one node to another in a global network

UNIT–I

Introduction to Data communications: Network Criteria, point-to-point and multi point connection, physical topology, Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Wireless Networks, protocols and standards.

Network Models: Layered tasks, Connection-Oriented and Connectionless Services, Service Primitives, The OSI Reference Model, The TCP/IP Reference Model, Comparison of the OSI and TCP/IP Reference Models, addressing.

UNIT–II

Physical Layer: Basis for Data Communication: Transmission of digital signals: Bit rate, bit length, baseband and broadband transmission, transmission impairment, data rate limits, performance, Guided Transmission Media Twisted Pair Coaxial Cable and Fiber Optics

Data Link Layer: Framing, Error Control, Flow Control, Error-Detection and correction: Introduction, Error detection using CRC. Data Link Protocols: Simplest Protocol, Stop-and-Wait Protocol, Stop-and- Wait ARQ, Go Back-N ARQ, Selective Repeat ARQ, HDLC.

UNIT–III

Multiple Accesses, Random Access: ALOHA, Carrier Sense Multiple Access (**CSMA**) Protocols, CSMA with Collision Detection, CSMA with Collision Avoidance.

Controlled Access: Reservation, Polling and Token Passing. **Channelization:** FDMA, TDMA, CDMA. **Wired LAN:** Ethernet, IEEE standards, Standard Ethernet. Changes in the standards, Fast Ethernet, Gigabit Ethernet, Wireless LAN (802.11).

UNIT–IV

Connecting LANs, Backbone and Virtual LANs: Connecting devices, Back bone Networks, Virtual LANs. Network Layer: Need for network layer, Logical addressing, Ipv4 addresses, Ipv6 addresses, Ipv4 and Ipv6 datagram, Transition from Ipv4 to Ipv6.

UNIT–V

Network Layer: Delivery, Forwarding, Types of Routing protocols, Unicast Routing Protocols. **The Transport Layer:** Process to process Delivery, User Datagram Protocol(UDP) and TCP. **Application layer:** Domain namespace, Distribution of namespace, Resolution.

Text Book(s)

1. Data communications and Networking-4 th edition Beharouz A.Forouzan, TMH

Reference Books:

1. Data Communications and Computer Networks By Prakash C.Gupta, PHI Publishers.
2. Computer Networks By Andrew S.Tanenbaum, Pearson Education.
3. Wireless Technologies Circuits, Systems and Devices by Krzysztof Iniewski CRC Press.
4. Wireless Networking Technology: From Principles to Success full Implementation by Stephen A. Rackley

Web Links

1. https://nptel.ac.in/courses/106/105/106105082/
2. https://nptel.ac.in/courses/117/105/117105076/

	Pithapur Rajah's Government College(A)::Kakinada Department of Computer Science	**Program:** II B.Sc. (IoT) **Semester :** III
MAJOR 6	Course Name: Data Communications And Computer Networks	
	Hours Allocated: 3hrs/week	Credits: 3

MODEL BLUE PRINT

EXAM STRUCTURE:

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	Pithapur Rajah's Government College(A)::Kakinada **Department of Computer Science**	**Program:** II B.Sc. (IoT) **Semester :** III
MAJOR 6	Course Name: Data Communications And Computer Networks	
	Hours Allocated: 3hrs/week	Credits: 3
MODEL QUESTION 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 functions of various layers OSI model?
2. Demonstrate various network topologies in computer network
3. Explain GO-BACK-N-ARQ with neat diagram?

PART-B

4. What is random access? Justify CSMA/CD protocols how much needed in Data transmission.
5. What is a network? Explain back-bone networks
6. What is TCP and UDP? Compare TCP and UDP with example?

SECTION-II

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

7. Demonstrate various types of networks
8. Classify transmission impairment
9. What is framing? Determine what is the need for framing?
10. Explain differences between FDMA&CDMA
11. Explain about transition from IPv4 to IPv6
12. Demonstrate types of routing protocols
13. Illustrate TCP/IP utilities?

	Pithapur Rajah's Government College(A)::Kakinada **Department of Computer Science**	**Program:** II B.Sc. (IoT) **Semester:** III
MAJOR 6	Course Name: DATA COMMUNICATIONS AND COMPUTER NETWORKS LAB	
	Hours Allocated: 2hrs/week	Credits: 1

List of Experiments

List of Experiments (NS2/QUALNET/BWSIM/MATLAB)

1. Study of Network Devices in detail
2. Study of Network IP and basic network command and network configuration commands
3. Wired and Wireless network scenario creation
4. Simulation of Four Node Point To Point Network
5. Transmission Of Ping Message
6. Implement various Topologies
7. Study of Routing Protocols
8. Study of performance of MAC Protocols
9. UDP and TCP Simulation
10. Call establishment in cellular network
11. Handover in cellular network
12. Study of performance comparison of TCP and UDP using NS-2

	Pithapur Rajah's Government College(A)::Kakinada Department of Computer Science	**Program:** II B.Sc. (IoT) **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
- Demonstrate different methods for traversing trees

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**- Linearsearch, 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. Data Structures: APseudo Code Approach, 2/e, Richard F.Gilberg, BehrouzA. 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 Rajah's Government College(A)::Kakinada Department of Computer Science	**Program:** II B.Sc. (IoT) **Semester :** III
MAJOR 7	Course Name: DATA STRUCTURES USING 'C'	
	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	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:** II B.Sc. (IoT) **Semester :** III
MAJOR 7	Course Name: DATA STRUCTURES USING 'C'	
	Hours Allocated: 3hrs/week	Credits: 3
MODEL QUESTION 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. 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 Rajah's Government College(A)::Kakinada **Department of Computer Science**	**Program:** II B.Sc. (IoT) **Semester :** III
MAJOR 7	Course Name: DATA STRUCTURES USING 'C' LAB	
	Hours Allocated: 2hrs/week	Credits: 1

List of Experiments:

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 Rajah's Government College(A)::Kakinada Department of Computer Science	**Program:** II B.Sc. (IoT) **Semester :** III
MAJOR 8	Course Name: Digital Logic Design	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objective

- To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, theory of Boolean algebra and map method for minimization of switching functions.
- To introduce the basic tools for design of combinational and sequential digital logic.
- To learn simple digital circuits in preparation for computer engineering.

Course Outcomes

A student who successfully fulfills the course requirements will have demonstrated:

- An ability to define different number systems, binary addition and subtraction, 2'scomplement

  representation and operations with this representation.
- An ability to understand the different switching algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays.
- Students will be able to design various sequential circuits starting from flip-flop to registers and counters.

UNIT- I

Digital Systems and Binary Numbers

Digital Systems, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit codes: BCD, EXCESS 3, alphanumeric codes, 9's complement, 2421, etc..

UNIT -II

Concept of Boolean algebra

Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms. Gate level Minimization Map Method, Three-Variable K-Map,

Four Variable K-Maps. Products of Sum Simplification, Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation, Exclusive-OR Function.

UNIT- III

Combinational Logic

Introduction, Analysis Procedure, Binary Adder–Subtractor, Binary Multiplier, Decoders, Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, Magnitude Comparator, HDL Models of Combinational Circuits. Realization of Switching Functions Using PROM, PAL and PLA.

UNIT- IV

Synchronous Sequential Logic

Introduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops, Truth and Excitation Tables, RS, JK, T and D Flip Flops, Truth and Excitation Tables, Conversion of Flip Flops.

UNIT -V

Registers and Counters

Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter.

TEXT BOOKS:

1. Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA.
2. Fundamentals of Logic Design, 5/e, Roth, Cengage.

REFERENCE BOOKS:

1. Digital Logic and Computer Design, M.Morris Mano, PEA.
2. Digital Logic Design, Leach, Malvino, Saha, TMH.
3. Modern Digital Electronics, R.P. Jain, TMH.

	Pithapur Rajah's Government College(A)::Kakinada Department of Computer Science	**Program:** II B.Sc. (IoT) **Semester :** III
MAJOR 8	Course Name: Digital Logic Design	
	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: II B.Sc. (IoT) Semester : III
MAJOR 8	Course Name: Digital Logic Design	
	Hours Allocated: 3hrs/week	Credits: 3
MODEL QUESTION PAPER		
Time: 2Hrs		**Max.Marks:50M**

SECTION-A

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

PART-I

1. Describe the process of arithmetic addition and subtraction in binary systems. Discuss any challenges or limitations associated with these operations.
2. Compare and contrast different 4-bit codes such as BCD, EXCESS 3, and alphanumeric codes. Discuss their applications and advantages.
3. Explain the basic theorems and properties of Boolean algebra. How are these principles applied in digital circuit design?

PART-II

4. Describe the basic components of combinational logic circuits. Explain the analysis procedure for designing such circuits.
5. Discuss the truth tables and excitation tables of various flip-flops. Explain how they are used in the design and analysis of sequential circuits.
6. Describe the operation of shift registers and their applications in digital systems. Discuss different types of shift registers.

SECTION-B

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

7. What are signed binary numbers? How are they represented and manipulated in digital systems?
8. What are the differences between binary, octal, and hexadecimal numbers? Provide examples for each conversion.
9. Define Boolean functions and discuss the importance of canonical and standard forms in Boolean algebra.
10. Explain the concept of Priority Encoder. How is it used in digital systems?
11. Compare and contrast different methods of gate-level minimization such as Products of Sum Simplification and Sum of Products Simplification.
12. Define a shift register. How is it different from a standard register?
13. Define the term "register" in the context of digital systems. How is a register different from a counter?

	Pithapur Rajah's Government College(A)::Kakinada **Department of Computer Science**	**Program:** II B.Sc. (IoT) **Semester :** III
MAJOR 8	Course Name: Digital Logic Design Lab	
	Hours Allocated: 2hrs/week	Credits: 1

List of Experiments

1. Verification of Basic Logic Gates.
2. Implementing all individual gates with Universal Gates NAND & NOR.
3. Design a circuit for the given Canonical form, draw the circuit diagram and verify the De- Morgan laws.
4. Design a Combinational Logic circuit for 8x1 MUX and verify the truth table.
5. Verify the data read and data write operations for the IC 74189.
6. Construct Half Adder and Full Adder using Half Adder and verify the truth table.
7. Design a 4-bit Adder/Subtractor.
8. Design and realization of 4-bit comparator.
9. Design and implement a 3 to 8 decoder using gates.
10. Design and realization of a 4-bit Gray to Binary and Binary to Gray converter.
11. Implementation of Master Slave Flip-Flop with J-K Flip- Flop and verify the truth table for race around condition.
12. Design a Decade Counter and verify the truth table.
13. Design and implement a 4-bit shift register using Flip flops.
14. Design and verify the 4-bit synchronous.

SEMESTER-IV

	Pithapur Rajah's Government College(A) Kakinada Department of Computer Science	**Program:** II B.Sc. (Internet of things) **Semester:** IV
MAJOR 9	Course Name: Java Programming	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

The learning objectives of this course are:

- To identify Java language components and how they work together in applications
- To learn the fundamentals of object-oriented programming in Java, including definingclasses, invoking methods, using class libraries.
- To learn how to extend Java classes with inheritance and dynamic binding and how to useexception handling in Java applications
- To understand how to design applications with threads in Java
- To understand how to use Java APIs for program development

Course Outcomes:

By the end of the course, the student will be

- Able to realize the concept of Object-Oriented Programming & Java ProgrammingConstructs
- Able to describe the basic concepts of Java such as operators, classes, objects, inheritance,packages, Enumeration and various keywords
- Apply the concept of exception handling and Input/ Output operations
- Able to design the applications of Java & Java applet
- Able to Analyze& Design the concept of Event Handling and Abstract Window Toolkit

UNIT I

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style. Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator? Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested forLoop, for–Each for Loop, Break Statement, Continue Statement.

UNIT II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this. Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Function a Interfaces, Annotations.

UNIT IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java. Lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto- unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.

UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class StringBuilder. Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread- Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J,JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface, Creating JDBC Application, JDBC Batch Processing, JDBC Transaction Management

Text Books:

1) JAVA one step ahead, Anitha Seth, B.L.Juneja,Oxford.
2) The complete Reference Java, 8th edition, Herbert Schildt,TMH.
3) JAVA Programming for Core and Advanced Learners, Sagayaraj, Denis, Karthik, Gajalakshmi, Universities Press.

References Books:

1) Introduction to java programming, 7th edition by Y Daniel Liang,Pearson
2) Constructive JAVA Programming, Sagayaraj, Denis, Karthik, Gajalakshmi, UniversitiesPress.

e- Resources:

1) https://nptel.ac.in/courses/106/105/106105191/
2) https://www.w3schools.com/java/java_data_types.asp

	Pithapur Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** II B.Sc. (Internet of things) **Semester:** IV
MAJOR-9	Course Name: Java Programming	
	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	1S5
IV	1	1	15
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:** II B.Sc. (Internet of things) **Semester:** IV
MAJOR 9	Course Name: Java programming	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
Time: 2Hrs		Max.Marks:50M

SECTION-A

Answer any three from the following atleast one question from the each part 3X10=30M

PART-I

1. Explain the significance of command line arguments in Java programs. Provide examples to illustrate their usage.
2. Discuss the importance of programming style in Java. How does adhering to a consistent style enhance code readability and maintainability?
3. Describe the concept of access control for class members in Java. How does encapsulation enhance the security and integrity of Java programs?

PART-II

4. Explain the process of dynamic change of array size in Java. Provide an example demonstrating the resizing of an array.
5. Explain the importance of exception handling in Java programs. Discuss the hierarchy of standard exception classes in Java.
6. Discuss the difference between String, String Buffer, and StringBuilder classes in Java. Provide scenarios where each class is preferred.

SECTION-B

Answer any FOUR from the following **4X5=20M**

7. What are escape sequences in Java? Provide three examples.
8. Explain the difference between static variables and instance variables in Java.
9. What is method overloading? Provide an example demonstrating method overloading in Java.
10. What is the significance of the keyword "this" in Java? Provide a scenario where its usage is necessary.
11. What is the difference between abstract classes and interfaces in Java?
12. What is auto-boxing and auto-unboxing in Java? Provide an example demonstrating their usage.
13. What is multithreading in Java? Explain the difference between process-based and thread-based multitasking.

	Pithapur Rajah's Government College(A)Kakinada Department of Computer Science	Program: II B.Sc. (Internet of things) Semester: IV
MAJOR 10	**Course Name:** Java programming Lab	
	Hours Allocated: 2hrs/week	Credits: 1

Exercise - 1 (Basics)

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program to sort for an element in a given list of elements using merge sort.

d) Write a JAVA program using String Buffer to delete, remove character.

Exercise - 3 (Class, Objects)

a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.

b) Write a JAVA program to implement constructor.

Exercise - 4 (Methods)

a) Write a JAVA program to implement constructor overloading.

b) Write a JAVA program implement method overloading.

Exercise - 5 (Inheritance)

a) Write a JAVA program to implement Single Inheritance

b) Write a JAVA program to implement multi-level Inheritance

c) Write a java program for abstract class to find areas of different shapes

Exercise - 6 (Inheritance - Continued)

a) Write a JAVA program give example for "super" keyword.

b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise - 7 (Exception)

a) Write a JAVA program that describes exception handling mechanism

b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)

a) Write a JAVA program that implements Run time polymorphism

b) Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise – 9 (User defined Exception)

a) Write a JAVA program for creation of Illustrating throw

b) Write a JAVA program for creation of Illustrating finally

c) Write a JAVA program for creation of Java Built-in Exceptions

d) d)Write a JAVA program for creation of User Defined Exception

Exercise – 10 (Threads)

a) Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)

b) Write a program illustrating is A live and join()

c) Write a Program illustrating Daemon Threads.

Exercise - 11 (Threads continuity)

a) Write a JAVA program Producer Consumer Problem

b) Write a case study on thread Synchronization after solving the above producer consumer problem

Exercise – 12 (Packages)

a) Write a JAVA program illustrate class path

b) Write a case study on including in class path in your OS environment of your package.

c) Write a JAVA program that import and use the defined your package in the previous Problem

Exercise - 13 (Applet)

a) Write a JAVA program to paint like paint brush in applet.

b) Write a JAVA program to display analog clock using Applet.

c) Write a JAVA program to create different shapes and fill colors using Applet.

	Pithapur Rajah's Government College(A) Kakinada Department of Computer Science	**Program:** II B.Sc. (Internet of things) **Semester:** IV
MAJOR 10	Course Name: Operating System	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives

- To understand the services provided by and the design of an operating system.
- To understand what a process is and how processes are synchronized and scheduled.
- To understand different approaches to memory management.
- To understand the structure and commands in unix
- Students should be able to understand shell programming

Course Outcomes:

Upon successful completion of this course should have the knowledge and skills

- Analyze the services and functions of operating systems
- Analyze the concepts of processes in operating system and illustration of the scheduling of processor for a given problem instance.
- Analyze memory management techniques, concepts of virtual memory
- To understand Introduction to Unix:- Architecture of Unix, Features of Unix , Unix Commands
- To understand **Shell programming and** Simple shell program examples

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, stty, 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 BOOK:

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

REFERENCES 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

- 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 and contribution of students shall be ensured (team activity))

B. General

1. Group Discussion
2. 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 Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** II B.Sc. (Internet of things) **Semester:** IV
Course 7	Course Name: OPERATING 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	1	2	20
II	2	1	25
III	1	1	1S5
IV	1	1	15
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 Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** II B.Sc. (Internet of things) **Semester:** IV
MAJOR 10	Course Name: Operating System	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
Time: 2Hrs		Max.Marks:50M

SECTION -I

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

Part – A

1. What are the different types of OS? Explain.
2. What is meant by Real-Time operating system? Its functions and types?
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 of the following questions. Each question carries 5 marks.

4 X 5 = 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 Department of Computer Science	**Program:** II B.Sc. (Internet of things) **Semester:** IV
MAJOR 10	**Course Name:** Operating System Lab	
	Hours Allocated: 2hrs/week	Credits: 1

LAB Experiments

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. (Internet of things) **Semester:** IV
MAJOR 11	Course Name: Computer Organization & Architecture	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

The course objectives of Computer Organization are to discuss and make student familiar with the

- Principles and the Implementation of Computer Arithmetic
- Operation of CPUs including RTL, ALU, Instruction Cycle and Busses
- FundamentalsofdifferentInstructionSetArchitecturesandtheirrelationshiptothe CPU Design
- Memory System and I/O Organization
- Principles of Operation of Multiprocessor Systems and Pipelining

Course Outcomes:

By the end of the course, the student will

- Develop a detailed understanding of computer systems
- Cite different number systems, binary addition and subtraction, standard, floating-point,and micro operations
- Develop a detailed understanding of architecture and functionality of central processing unit
- Exemplify in a better way the I/O and memory organization
- Illustrate concepts of parallel processing, pipelining and inter processor communication

UNIT I

Basic Structure of Computers: Basic Organization of Computers, Historical Perspective, Bus Structures, Data Representation: Data types, Complements, Fixed Point Representation. Floating, Point Representation. Other Binary Codes, Error Detection Codes.

Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

UNIT II

Register Transfer Language and Micro operations: Register Transfer language. Register Transfer Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit. Basic Computer Organization and Design: Instruction Codes, Computer Register, Computer Instructions, Instruction Cycle, Memory – Reference Instructions. Input –Output and Interrupt, Complete Computer Description.

UNIT III

Central Processing Unit: General Register Organization, STACK Organization. Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer. Micro programmed Control: Control Memory, Address Sequencing, Micro Program example, Design of Control Unit.

UNIT IV

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory. Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

UNIT V

Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures, Inter Processor Arbitration. **Pipeline**: Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor.

Text Books:

1. Computer System Architecture, M. Morris Mano, Third Edition, Pearson,2008.
2. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 5/e, McGrawHill,2002.

Reference Books:

1. Computer Organization and Architecture, William Stallings, 6/e, Pearson,2006.
2. Structured Computer Organization, Andrew S. Tanenbaum, 4/e, Pearson,2005.
3. Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer,2006.

e- Resources:

1) https://nptel.ac.in/courses/106/105/106105163/

2)http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf

	Pithapur Rajahs Government College(A) Kakinada Department of Computer Science	**Program:** II B.Sc. (Internet of things) **Semester:** IV
MAJOR-9	Course Name: Computer Organization & Architecture	
	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	1S5
IV	1	1	15
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 Rajahs Government College(A) Kakinada **Department of Computer Science**	**Program:** II B.Sc. (Internet of things) **Semester:** IV
MAJOR 11	**Course Name: Computer Organization & Architecture**	
	Hours Allocated: 3hrs/week	Credits: 3
Model Paper		
Time: 2Hrs		Max.Marks:50M

SECTION-A

Answer any **three** from the following each part atleast **ONE** question answer 3X10=30M

PART-I

1. Discuss the historical perspective of computer organization and its evolution over time.
2. Explain the significance of bus structures in computer architecture and their role in data transfer.
3. Discuss the various micro-operations involved in arithmetic, logic, and shift operations.

PART-II

4. Explain the concept of addressing modes and their role in data transfer and manipulation.
5. Discuss the memory hierarchy and the role of different memory types in computer systems.
6. Explain the concept of parallel processing and its significance in pipeline architecture.

SECTION-B

Answer any **FOUR** Questions from the following 4X5=20M

7. Explain the concept of parallel processing and its significance in pipeline architecture.
8. Define register transfer and give an example.
9. Explain the instruction cycle in computer architecture.
10. What is a stack organization in CPU architecture?
11. Describe a multiplication algorithm used in computer arithmetic.
12. What are the characteristics of auxiliary memory?
13. What is the purpose of inter processor arbitration in multiprocessor systems?

	Pithapur Rajahs Government College(A)Kakinada Department of Computer Science	**Program:** II B.Sc. (Internet of things) **Semester:** IV
MAJOR 11	**Course Name:** Computer Organization & Architecture Lab	
	Hours Allocated: 2hrs/week	Credits: 1

List of Experiments:

1. Realization of Boolean Expressions using Gates
2. Design and realization logic gates using universal gates
3. Design a JK Flip-Flop, Edge triggered J-K NAND Flip Flop and show its functionality
   Handle race condition and clock gating in your circuit.
4. Design a 4 – bit Adder / Subtractor
5. Combinational logic circuits: Implementation of Boolean functions using logic gates
6. Arithmetic operations using logic gates; Implementation of Multiplexers, Demultiplexers, Encoders, Decoders; Implementation of Boolean functions using Multiplexers/Decoders
7. Study of sequential logic circuits: Implementation of flip flops, Verify the excitation tables of various FLIP-FLOPS.
8. Design and realization a Synchronous and Asynchronous counter using flip-flops
9. Design and realization of an 8-bit parallel load and serial out shift register using flipflops
10. Implementation of counters, Design and realization a Synchronous and Asynchronous counter using flip-flops
11. Design and realization of 4x1 mux, 8x1mux using 2x1 mux
    Write assembly language programs in 8086 for the following: (MASAM can also be used)

SEMESTER-V

	Pithapur Rajah's Government College(A) Kakinada **Department of computer science**	**Program:** III B.Sc. (Internet of Things) **Semester:** V
MAJOR-12	**Course Name:** RFID and Wireless Sensor Networks	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

- Understand and designing Radio frequency identification (RFID) systems, middleware architectures for real-world applications.
- Understanding RFID and related Architectures, RFID Principles and security issues
- Determine road map for transformation of flexible electronics from foils to textiles
- Understanding the implementation, challenges and design constraints of WSN
- Knowing about the MAC layer and routing protocols in WSN
- Modelling of WSN for interfacing with IoT platform.
- Knowing Security threats and resolution methods in WSN

Course Outcomes:

- Students will be familiar with RFID technology, various components involved.
- Getting familiar with various RFID standards, Students learn various Security issues involved in RFID.
- Students learn about Wireless Sensor Networks
- Familiar with WSN protocols routing algorithms.
- Various Security issues involved in Wireless Sensor Networks.

UNIT I

Introduction of RFID, Automatic Identification Systems, A Comparison of Different ID Systems, Components of an RFID System, Differentiation Features of RFID Systems, Transponder Construction Formats, Frequency, Range and Coupling, Active and Passive Transponders, Information Processing in the Transponder, Selection Criteria for RFID Systems, Fundamental Operating Principles.

UNIT II

Frequency Ranges and Radio Licensing Regulations, Coding and Modulation, Data Integrity, Multi-Access Procedures – Anticollision, Security of RFID Systems, Attacks on RFID System.

UNIT III

Wireless Sensor Networks- Introduction, Challenges and Constraints, Applications, Node Architecture, Operating Systems, Physical Layer.

UNIT IV

Medium Access Control: Characteristics of MAC Protocols in Sensor Networks, Contention-Free MAC Protocols, Contention-Based MAC Protocols, Network Layer: Various Routing Protocols.

UNIT V

Security in WSN: Challenges of Security in Wireless Sensor Networks, Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, IEEE 802.15.4 and ZigBee Security

TEXT BOOKS:

1. RFID Handbook, Klaus Finkenzeller,WILEY & SONS
2. Fundamentals of Wireless Sensor Networks: theory and practice by Waltenegus Dargie, Christian Poellabauer

REFERENCE TEXT BOOKS:

1. RFID and Sensor Networks Architecture, Protocols, Security and integration by Yan Zhang, Laurence T. Yang, Jining.
2. Ian F. Akyildiz, and Mehmet Can Vuran, Wireless Sensor Networks, 2010, Wiley, USA.
3. IBM Bluemix: The Cloud Platform for Creating and Delivering Applications, http://www.redbooks.ibm.com/redpapers/pdfs/redp5242.pdf
4. Wireless Sensor Networks Technology, protocols and applications by KAZEM SOHRABY, DANIEL MINOLI TAIEB ZNATI, JOHN WILEY & SONS, INC Publication.
5. REILLY, RFID Essentials By Bill Glover, Himanshu Bhatt.
6. W. Dargie and C. Poellabauer, Fundamentals of Wireless Sensor Networks, 2010, Wiley, USA.
7. Holger Karl and Andreas Willig, Protocols and Architectures for Wireless Sensor Networks, 2011, Wiley, USA.

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. Computerised adaptive testing, literature surveys and evaluations,

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

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	Pithapur Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** III B.Sc. (Internet of Things) **Semester:** V
MAJOR-12	**Course Name:** RFID and Wireless Sensor Networks	
	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 **Department of computer science**	**Program:** III B.Sc. (Internet Of Things) **Semester:** V
MAJOR-12	**Course Name:** RFID and Wireless Sensor Networks	
	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). 3X10=30M

PART-A

1. Delineate the fundamental operating principals of RFID?
2. Demonstrate multi-access procedures in anti-collision?
3. Describe the NODE architecture.

PART-B

4. Write about various challenges and constraints of Wireless Sensor Networks.
5. Explain characteristics of MAC protocols.
6. Discuss the security attacks in sensor networks.

SECTION-II

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

7. What is the difference between Active and Passive Transponders?
8. Explain Criteria for RFID Systems.
9. Discuss about Open issues in RFID Security.
10. Write a short on Data Integrity.
11. Explain the application areas of WSN
12. What is Physical Layer?
13. Write about Zigbee security Explain various types of addressing.

	Pithapur Rajahs Government College(A) Kakinada **Department of computer science**	**Program:** III B.Sc. (Internet of Things) **Semester:** V
MAJOR-12	**Course Name:** RFID and Wireless Sensor Networks Lab	
	Hours Allocated: 2 hrs./week	**Credits:** 1

List of Experiments

1. Introduction to network simulators used for wireless Ad Hoc and Sensor Networks.
2. Introduction to TCL scripting: demonstration of one small network simulation script.
3. To study various trace file formats of network simulators.
4. To implement and compare various MAC layer protocols.
5. To implement and compare AODV and DSR routing algorithms in MANET
6. To implement DSDV routing algorithms in MANET
7. To implement signal strength based link management routing protocols.
8. To calculate and compare average throughput for various TCP variants
9. To implement and compare various routing protocols for wireless sensor networks

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	Pithapur Rajah's Government College(A) Kakinada **Department of computer science**	**Program:** III B.Sc. (Internet of Things) **Semester :** V
MAJOR-13	**Course Name**: Iot Architecture And Its Protocols	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
- Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).
- Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming).
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.

Course Outcomes:

- Understand about IoT overview including requirements.
- Learn IoT related protocols and specifications.
- Develop a project of IoT mock-up application of their own.

UNIT I

Introduction to the Internet of Things (IoT) Overview of WSN, IoT, IoT Conceptual Framework, IoT Architectural View, Technology Behind IoT, Sources of IoT, M2M Communication. IoT/M2M Systems Layers and Design Standardization, Communication Technologies, Data Enrichment, Data Consolidation and Device Management at Gateway. Examples of IoT, Ease of Designing and Affordability Use Case Studies: Smart Home, Smart City, Precision Agriculture

UNIT II

IoT Sensors and Devices Sensing the Real-world using Analog and Digital Sensors, MEMS, LIDAR, Depth, ultrasonic, etc. Industrial IoT, Automotive IoT, Actuator, RFID Technology. Cloud computing Paradigm for Data Collection, Storage and Computing, Everything as a Service and Cloud Service Models for IoT.

UNIT III

IoT Networks and Protocols Introduction, Web Communication Protocols: Constrained Applications Protocol (CoAP), Lightweight Machine-to-Machine Communication; Message Queue Telemetry Transport (MQTT). Introduction to Internet Connectivity Principles, Internet Connectivity, Internet Based Communication, IP Addressing in the IoT, Media Access Control, 6LowPAN and LoRa WAN. Application Layer Protocols: HTTP, HTTPS, FTP and Telnet.

UNIT IV

Advance topics in IoT Security and Privacy Requirements, Threat Analysis, IoT Layered Attacker Model, Access Control and Secure Message Communication, Security Models. hardware-based security ,IoT.

UNIT V

Hardware (development Boards): Raspberry pi, Arduino, Node MCU, etc, GPIO and Interfacing, Programming and Tools, Hands-On Implementation.

Additional Inputs:

IoT Capstone Project Lab Experiments Network programming hands on guide. Hands-on exercises on IoT hardware and software.

Text Books:

1) Raj Kamal, "Internet of Things: Architecture and Design Principles". TMH Publications, 2017.
2) Ovidiu Vermesan & Peter Friess, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers Series in Communications, 2017.

Reference Books:

1) Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)

Assessment Methods:

- Formal Examinations.
- Lab Practical Examination.
- Presentations.
- Simple Project.

	Pithapur Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** III B.Sc. (Internet of Things) **Semester :** V
MAJOR-13	**Course Name:** Iot Architecture And Its Protocols	
	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: III B.Sc. (Internet of Things) Semester : V
MAJOR-13	**Course Name:** Iot Architecture And Its Protocols	
	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

1. Define IoT. Explain the conceptual framework and architectural view of IoT
2. Explain M2M communication and differentiate it from IoT communication.
3. Explain the working of analog and digital sensors in IoT applications.

PART-B

4. Describe the concept of IP addressing in IoT networks and how it is handled.
5. Write about secure message communication and access control mechanisms.
6. Describe GPIO pin configuration and interfacing techniques with IoT hardware

SECTION-II

Answer any FOUR questions. Each question carries 5 Marks.

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 Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** III B.Sc. (Internet of Things) **Semester :** V
MAJOR-13	**Course Name:** Iot Architecture And Its Protocols	
	Hours Allocated: 2 hrs./week	**Credits:** 1

Lab List

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 Potentio metre)
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. Interfacing Arduino with Cloud (Thingspeak API)

	Pithapur Rajah's Government College(A) Kakinada Department of Computer Science	**Program:** III B.Sc. (Internet of Things) **Semester :** V
MAJOR-14	**Course Name:** Sensors And Actuator Devices For Iot	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

Course Outcomes:

- Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved.
- Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules
- Market forecast for IoT devices with a focus on sensors
- Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi
- Introduction to Internet of Things- Definition and Characteristics of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT I

Introduction to Internet of Things- Definition and Characteristics of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT II

IoT and M2M- Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT III

IoT Physical Devices and Endpoints- Introduction to Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

UNIT IV

Controlling Hardware- Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor.

UNIT V

IoT Physical Servers and Cloud Offerings– Introduction to Cloud Storage models and communication APIs Web server – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

Text Books:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759
3. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

Reference Books:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 Editors OvidiuVermesan
2. Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014
3. N. Ida, Sensors, Actuators and Their Interfaces, Sci Tech Publishers, 2014.

	Pithapur Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** III B.Sc. (Internet of Things) **Semester :** V
MAJOR-14	**Course Name:** Sensors And Actuator Devices For IoT	
	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:** III B.Sc. (Internet of Things) **Semester :** V
MAJOR-14	**Course Name:** Sensors And Actuator Devices For IoT	
	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

1. Define the Internet of Things (IoT). Discuss its key characteristics with relevant examples
2. Explain the physical design of IoT in detail. How do sensors and actuators function in an IoT system?
3. Explain the concept of M2M communication. How is it different from IoT?

PART-B

4. Describe the steps to install and set up Raspberry Pi for IoT development.
5. Explain the working and interfacing of a servo motor and DC motor in an IoT project
6. Explain different cloud storage models used in IoT systems

SECTION-II

Answer any FOUR questions. Each question carries 5 Marks.

7. Define IoT Protocols with examples
8. Expand M2M and explain it ?
9. Define NETCONF in brief.
10. Write a Python code snippet to blink an LED using Raspberry Pi.
11. Name two interfaces supported by Raspberry Pi.and Explain?
12. What is the difference between a unipolar and bipolar stepper motor?
13. What is a RESTful API?

	Pithapur Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** III B.Sc. (Internet of Things) **Semester :** V
MAJOR-14	**Course Name:** Sensors And Actuator Devices For Iot Lab	
	Hours Allocated: 2 hrs./week	**Credits:** 1

Lab List

1. Execute various Linux commands in command terminal window on Raspberry Pi: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo,cron, chown, chgrp, ping etc.
2. Run some Python programs on Raspberry Pi:
   a. Read your name and print Hello message with name.
   b. Read two numbers and print their sum, difference, product and division.
   c. Word and character count of a given string.
   d. Area of a given shape (rectangle, triangle and circle) reading shape and appropriate
   e. values from standard input.
   f. Print a name 'n' times, where name and n are read from standard input, using for and
   g. while loops.
   h. Handle Divided by Zero Exception.
   i. Print current time for 10 times with an interval of 10 seconds.
   j. Read a file line by line and print the word count of each line.
   k. Light an LED through Python program.
   l. Get input from two switches and switch on corresponding LEDs.
   m. Flash an LED at a given on time and off time cycle, where the two times are taken from a
   n. file.
   o. Flash an LED based on cron output (acts as an alarm).
3. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.
4. Access an image through a Raspberry Pi web cam.
5. Control a light source using web page.
6. Implement an intruder system that sends an alert to the given email.
7. Get the status of a bulb at a remote place (on the LAN) through web.
8. Get an alarm from a remote area (through LAN) if smoke is detected

	Pithapur Rajah's Government College(A) Kakinada Department of Computer Science	**Program:** III B.Sc. (Internet Of Things) **Semester:** V
MAJOR-15	**Course Name:** Implementing IoT with Raspberry Pi	
	Hours Allocated: 3hrs/week	Credits: 3

Course Objectives:

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

- This program aims to train students to be equipped with a solid theoretical foundation, systematic professional knowledge and strong practical skills in the Raspberry Pi.
- After doing this course, students should be able to design and deploy multiple IoT devices that could connect to the gateway.
- Acquainting students with the basic web app creation.
- Working with Big Data Processing Techniques.
- Developing Mobile App for IoT application**.**

Course Outcomes (Learning Outcomes):

After completing this course, students will be able to:

- Appreciate the development technology for IoT.
- Familiar with Basic Concepts of Linux.
- Design real time IoT Devices.
- Familiar with basic foundations of Python Programming and libraries.
- Comprehend the basic concepts of Mobile Cloud Computing.
- Develop a Mobile App for IoT applications.

UNIT I

Getting Started with Raspberry Pi: Basic functionality of Raspberry Pi B+ board, setting up the board, configuration and use, implications of an operating system on the behavior of the Raspberry Pi as an IoT device, booting Raspberry Pi 3, Downloading an Operating System, format an SD card and booting the OS, Basics of Linux and its use, main features including navigating the file system and managing processes, text based user interface through the shell, overview of the graphic user interface for Raspbian Linux distribution.

UNIT II

Interfacing Hardware with the Raspberry Pi, Raspberry Pi Remote Access, operate the Raspberry Pi in “headless mode”, Bash Command line, operating Raspberry Pi without needing a GUI interface. Basics of the Python programming language, programming on the Raspberry Pi. Python on Raspberry Pi, Python Programming Environment, Python Expressions, Strings, Functions and Function arguments, Lists, List Methods, Control Flow.

UNIT III

Communication with devices through the pins of the Raspberry Pi, RPi.GPIO library, Python Functions, setting up the pins, General purpose IO Pins, Protocol Pins, GPIO Access, applying digital voltages, and generating Pulse Width Modulated signals, Tkinter Python library, accessing pins through a graphic user interface

UNIT IV

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage models and communication APIs. Webserver – Web server for IoT, Cloud for IoT, Python web application framework. Designing a RESTful web API. Connecting to APIs

UNIT V

IoT Design using Raspberry Pi IoT Applications based on Pi, LAMP Web-server, GPIO Control over Web Browser, Creating Custom Web Page for LAMP, Communicating data using on- board module, Home automation using Pi, Node-RED, MQTT Protocol, Using Node-RED Visual Editor on Rpi.

TEXT BOOKS:

1. Simon Monk, “Programming the Raspberry Pi: Getting Started with Python”, January 2012, McGraw Hill Professional
2. The official raspberry Pi Projects Book https://www.raspberrypi.org/magpi issues/Projects_Book_v1.pdf

REFERENCE BOOKS:

1. Eben Upton and Gareth Halfacree, “Raspberry Pi User Guide”, August 2016, 4th edition, John Wiley & Sons

2. lex Bradbury and Ben Everard, “Learning Python with Raspberry Pi”, Feb 2014, JohnWiley & Sons

3. Michael Margolis, “Arduino Cookbook”, First Edition, March 2011, O'Reilly Media, Inc

Co-curricular Activities:

- Mini Project – Build a smart home automation system using Raspberry Pi and sensors.
- Hands-on Workshop – GPIO pin interfacing and sensor data collection using Python.
- Guest Lecture – Talk by an IoT industry expert or embedded systems engineer.
- Tech Expo Participation – Present a Raspberry Pi IoT solution at a local or college-level tech fest.
- Online Certification – Complete an IoT course with Raspberry Pi from platforms like Coursera or NPTEL

Continuous assessment:

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

- Weekly evaluation based on hands-on lab tasks like sensor interfacing and GPIO programming.
- Mini project using Raspberry Pi to implement an IoT solution, with demonstration.
- Periodic quiz or internal test covering both theory and practical knowledge.
- Assignments or reports on project work, component usage, or circuit setup.
- Viva or oral questioning related to project understanding and IoT concepts.

	Pithapur Rajah's Government College(A) Kakinada Department of Computer Science	**Program:** III B.Sc. (Internet Of Things) **Semester:** V
MAJOR-15	**Course Name:** Implementing IoT with Raspberry Pi	
	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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	Pithapur Rajah's Government College(A) Kakinada **Department of Computer Science**	**Program:** III B.Sc. (Internet Of Things) **Semester: V**
Major-15	Course Name: Implementing IoT with Raspberry Pi	
	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

1. Explain the steps to set up the Raspberry Pi board along with configuration and usage.
2. Discuss the basics of the Linux operating system and explain how to manage files and processes.
3. Explain the basic Python programming environment on Raspberry Pi with suitable examples.

PART-B

4. Explain how GPIO pins are accessed and controlled using Python on the Raspberry Pi.
5. Discuss the introduction to cloud storage models and their applications in IoT.
6. Describe the process of designing an IoT application using Raspberry Pi and LAMP server.

SECTION-II

Answer any FOUR questions. Each question carries 5 Marks.

7. Write the basic functionality of Raspberry Pi B+ Board.
8. Write a short note about Text based user interface through the shell.
9. Explain Raspberri Pi remote access.
10. Define expressions and statements in Python with examples.
11. Write the purpose of Protocol Pins.
12. What is the purpose of a Webserver in IoT?
13. What is LAMP web server?

	Pithapur Rajah's Government College(A)::Kakinada **Department of Computer Science**	**Program:** III B.Sc. (Internet Of Things) **Semester:** V
Major-15	Course Name: Implementing IoT with Raspberry Pi Lab	
	Hours Allocated: 2hrs/week	Credits: 1

Lab List

1. Getting started with Raspberry Pi, Install Raspbian on your SD card
2. Linux basic commands.
3. Coding simple programs in Python.
4. How to use Python-based IDE (integrated development environments) for the Raspberry Pi and how to trace and debug Python code on the device
5. How to have your Raspberry Pi interact with online services through the use of public APIs and SDKs
6. Understanding the connectivity of Raspberry-Pi with IR sensor. Write an application to detect obstacle and notify user using LEDs.
7. Design APP Using MIT App Inventor and Connect to Temperature Sensor

Certificate Course in
Indian Mathematics & Foundations of Machine Learning

Duration: 30 Hours

Eligibility: Students of AI / Data Science / IoT / CSE

Type: Certificate Course with IKS Component (As per NEP 2020)

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1. Course Objectives

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

1. Understand key ideas from **Indian Mathematics** (number theory, combinatorics, geometry, series methods) and relate them to modern computational thinking.
2. Build strong foundations in **Linear Algebra, Probability, Statistics and Optimization**, essential for Machine Learning.
3. Apply classical mathematical thinking to understand modern **ML algorithms**, including regression, clustering, and PCA.
4. Recognize how traditional Indian approaches to pattern recognition, counting, and approximation inform modern analytics and learning systems.
5. Develop the ability to solve ML problems with mathematical rigor and contextual understanding rooted in India's knowledge systems.

2. Course Outcomes (COs)

After completing the course, students will be able to:

CO1: Explain fundamental concepts from Indian Mathematics and connect them to computational problem-solving.

CO2: Apply essential mathematical tools (linear algebra, probability, optimization) used in AI/ML.

CO3: Demonstrate understanding of ML algorithms such as linear regression, logistic regression, k-means, and PCA.

CO4: Use Indian mathematical techniques (series, approximations, combinatorics) to reason about numerical methods and iterative algorithms.

CO5: Integrate mathematical foundations with machine learning tasks to analyse datasets and derive insights.

Syllabus

UNIT 1: Indian Mathematics & Foundations of ML (6 Hours)

- Historical survey of Indian Mathematics: number theory, combinatorics, geometry.
- Algorithmic thinking in ancient mathematical texts.
- Overview of Machine Learning: supervised vs. unsupervised learning.
- How mathematical thinking forms the foundation for ML.

Unit Outcomes (UO1):

- Understand contributions from Indian Mathematics and map them to modern computational ideas.
- Explain the role of mathematics in ML model building.
- Identify areas where traditional combinatorial and geometric reasoning support ML tasks.

UNIT 2: Indian Mathematics – Number Theory, Combinatorics & Algorithms

- Modular arithmetic, residues, divisibility (Indian number theory tradition).
- Combinatorial counting methods → applications in ML (search, optimization).
- Approximation methods, infinite series, and early Indian trigonometric/geometry approaches.
- Linking Indian algorithms with modern algorithmic principles.

Unit Outcomes (UO2):

- Apply combinatorial and number-theoretic reasoning to algorithmic problems.
- Explain the link between traditional approximation methods and iterative ML solvers.
- Understand how pattern-based mathematical thinking translates into algorithm design.

UNIT 3: Linear Algebra for Machine Learning

- Vectors, matrices, linear transformations, systems of equations.
- Rank, subspaces, orthogonality.
- Eigenvalues, eigenvectors, diagonalization.
- Singular Value Decomposition (SVD).
- Principal Component Analysis (PCA).

Unit Outcomes (UO3):

- Perform matrix operations and understand geometric interpretations.
- Apply eigenvalues/eigenvectors and SVD in dimensionality reduction.
- Relate linear algebra tools directly to ML models such as PCA and regression.

UNIT 4: Probability, Statistics & Optimization for ML

- Probability axioms, Bayes' theorem.
- Random variables and distributions (normal, binomial).
- Joint, marginal, and conditional distributions.
- Covariance, correlation matrices.
- Central Limit Theorem & LLN.
- Gradients, Hessians, gradient descent.
- Constrained optimization (Lagrange multipliers).

Unit Outcomes (UO4):

- Apply probability and statistical concepts to model uncertainty in ML.
- Use covariance and correlation to analyse dataset structure.
- Understand optimization strategies behind ML algorithms such as gradient descent.

UNIT 5: ML Algorithms & Indian Mathematical Perspective

- Supervised learning: Linear Regression, Logistic Regression.
- Unsupervised learning: k-Means, PCA interpretation.
- Indian mathematics insights for pattern recognition and combinatorial reasoning.
- Approximation methods → gradient-based ML methods.
- Case studies, datasets, and mini-project ideas.

Unit Outcomes (UO5):

- Implement basic ML algorithms with mathematical understanding.
- Connect Indian mathematical thinking to modern ML concepts like clustering and pattern recognition.
- Analyse case studies where Indian knowledge principles inspire modern computational models.

4. Pedagogy

- Lectures + hands-on problem solving
- ML demonstrations using Python
- Flipped classroom
- Case studies linking IKS and ML
- Mini–project at the end

5. Assessment Scheme

- Internal Assessment / Assignments – 30M
- Final Examination – 70M

6. Mapping with IKS

This course integrates IKS by:

- Introducing classical Indian mathematical techniques and concepts.
- Linking Indian combinatorics, geometry, series, and algorithmic methods to ML theory.
- Demonstrating how India’s historical mathematical advances form part of the conceptual foundation of modern computational thinking.
- Encouraging students to critically compare traditional and modern approaches.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A),KAKINADA
DEPARTMENT: COMPUTER SCIENCE
ACADEMIC YEAR:2025-2026

SL.NO	ACTIVITY	UNITS	TIME-LINE
1	SEMINAR/WORKSHOP	1	December
2	MOU'S	2	November
3	CERTIFICATE COURSES	2	Per Year
4	RESEARCH PAPERS	6	Apr-26
5	WEBSITE UPDATION	Up To Date	Up To Date
6	GUEST LECTURES	2	Per Semester One
7	INDUSTRIAL VISIT	1	January
8	EXTENSION LECTURES	1	March
9	STUDENT EXCHANGE PROGRAMS	1	December
10	IMPORTANT DAYS	9	Particular Day
	National IT Professional Day		3rd Tue, September
	World Computer Security day		30th Nov
	World Computer Literacy Day		2nd Dec
	National Technology Day		6th Jan
	World Data Privacy Day		28th Jan
	Safer Internet Day		9th Feb
	National Science Day		28th Feb
	World Backup day		31st Mar
	World IoT Day		9th April