From
Dr. M. Sreedevi,
Assoc. Prof & Chairman-BOS (PG), KCDC,
S. V. University,
Tirupati.

To
The Principal,
Krishna Chaitanya Degree College (A),
Nellore -524003.

Sir,

Sub. : KCDC, Nellore-BOS Computer Science Submission of revised syllabus for M.Sc. (Computer Science) Major (P.G)-Reg.

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Under the subject Cited the B.O.S of Computer Science (P.G) had met on 18-11-2025 at 02:30 PM in Online to revise the syllabus for M.Sc. (Computer Science) Major for the Academic Year 2025-2026. I am here with submitting the syllabus for M.Sc. (Computer Science) Major after the discussion of the BOS by online, confirming the Rules and Regulations laid down by the A.P.S.C.H.E. & VSU. The Revised Syllabus along with Model Papers and signatures of B.O.S members, are Enclosed.

Thanking you,

**Dr. M. Sreedevi**
(**Chairman – BoS**)

**Members:**

1 **Prof.N.Geethanjali,**
Professor, Dept. of Computer Science & Technology,
Sri Krishnadevaraya University, Anantapur.

2 **Dr. N. Krishna Kumar,**
Associate Professor, Dept. of Computer Applications,
University Institute of Computer Science & Applications,
Guru Nanak University, Khanapur, Hyderabad.

3 **Dr. N. Srinadh Reddy,**
Vice-Principal & Associate Professor,
Dept. of Computer Science & Engg.,
PBR VITS, Kavali, Nellore (Dt).

4 **Sri Sk. Mamjanshawali,**
Dept. of Computer Science,
Krishna Chaitanya Degree College, Nellore

5 **Sri S. Naveen Kumar,**
Dept. of Computer Science,
Krishna Chaitanya Degree College, Nellore

6 **Smt. P. Reshma,**
Dept. o f Computer Science,
Krishna Chaitanya Degree College, Nellore

7 **Ms.Sandhya Veluru,**
Director & CIO,uynite, Bangalore.

8 **Sri.E.Purushotham,**
Team Leader, Accenture, Bangalore.

# KRISHNA CHAITANYA
## DEGREE COLLEGE

(Autonomous)

# ACADEMIC REGULATIONS
# COURSE STRUCTURE
# AND
# DETAILED SYLLABUS

## For

## M.Sc (Computer Science With Artificial Intelligence)

***(w.e.f. 2025-2026)***

# KRISHNA CHAITNAYA DEGREE COLLEGE

**(AUTONOMOUS)**

**(Recognized by UGC under 2(f), Accredited by NAAC, Affiliated to V.S.University, Nellore)**

| SEMESTER – I | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S.No** | **Course Category** | **Code** | **Title of the course** | **Courses** | **H/W** | **C** | **SEE** | **IA** | **Total Marks** |
| 1 | Core Course | R25CAI 101 | Core Course - 1 | Introduction to Artificial Intelligence &Data Science | 4 | 4 | 70 | 30 | 100 |
| 2 | Core Course | R25CAI 102 | Core Course – 2 | A) Operating System<br>B) Data Structures Using C | 4 | 3 | 50 | 25 | 75 |
| 3 | Core Course | R25CAI 103 | Core Course - 3 | A) Computer Networks<br>B) Mathematical and Statistical Foundation | 4 | 3 | 50 | 25 | 75 |
| 4 | Practical | R25CA I 104 | Practical -1 (Related to CC 2 & 3) | Core Course- 2& 3 | 6 | 2 | 35 | 15 | 50 |
| 5 | Skill Oriented Course | R25CAI 105 | Skill Oriented Course -1 | A) Object Oriented Programming Using Java<br>B) Cyber Security | 4 | 3 | 50 | 25 | 75 |
| 6 | Skill Oriented Course | R25CAI 106 | Skill Oriented Course -2 | A) Python Programming<br>B) Database Management System | 4 | 3 | 50 | 25 | 75 |
| 7 | Practical | R25CAI 107 | Practical -2 (Related to SOC 1 & 2) | Skill Oriented Course- 1& 2 | 6 | 2 | 35 | 15 | 50 |
| 8 | Open Online Transdisciplinary Course | R25CAI 108 | MOOCS/Open Online Elective | MOOCS/Open Online Transdisciplinary Course - 1 | - | 2 | - | - | - |
| 9 | Audit Course | R25CAI 109 | Indian Knowledge Systems – 1 | a) Indian history &culture<br>b) Yoga & meditation | 4 | **0** | 0 | 0 | 0 |
| **Total** | | | | | **36** | **22** | **340** | **160** | **500** |

**NOTE:** Every student should submit the certificate related to MOOCS / Open online elective on or before the final year result without fail.

# KRISHNA CHAITNAYA DEGREE COLLEGE

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| SEMESTER – II | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S.No** | **Course Catogory** | **Code** | **Title of the course** | **Courses** | **H/W** | **C** | **SEE** | **IA** | **Total Marks** |
| 1 | Core Course | R25CAI 201 | Core Course – 4 | Artificial Intelligence | 4 | 4 | 70 | 30 | 100 |
| 2 | Core Course | R25CAI 202 | Core Course – 5 | A) Cloud computing<br>B) Design and analysis of algorithms | 4 | 3 | 50 | 25 | 75 |
| 3 | Core Course | R25CAI 203 | Core Course – 6 | A) Data mining and data warehousing<br>B) Full stack Development | 4 | 3 | 50 | 25 | 75 |
| 4 | Practical | R25CAI 204 | Practical -3 (Related to CC 5 & 6) | Core Course- 5 & 6 | 6 | 2 | 35 | 15 | 50 |
| 5 | Skill Oriented Course | R25CAI 205 | Skill Oriented Course -3 | A) Principles of Data Science<br>B) Internet of things | 4 | 3 | 50 | 25 | 75 |
| 6 | Skill Oriented Course | R25CAI 206 | Skill Oriented Course -4 | A) Software Engineering<br>B) Deep learning | 4 | 3 | 50 | 25 | 75 |
| 7 | Practical | R25CAI 207 | Practical -4 (Related to SOC 3 & 4) | Skill Oriented Course- 3 & 4 | 6 | 2 | 35 | 15 | 50 |
| 8 | Open Online Transdisciplinary Course | R25CAI 208 | MOOCS/ Open Online Elective | MOOCS/Open Online Transdisciplinary Course – 2 | - | 2 | - | - | - |
| 9 | Audit Course | R25CAI 209 | Indian Knowledge Systems – 2 | c) Sanskrit and classical Languages<br>d) Ayurveda | 4 | **0** | 0 | 0 | 0 |
| **Total** | | | | | **36** | **22** | **340** | **160** | **500** |

**NOTE:** Every student should submit the certificate related to MOOCS / Open online elective on or before the final year result without fail.

# SEMESTER-1

## MSCS 101: INTRODUCTION TO ARTIFICIAL INTELLIGENCE & DATA SCIENCE

| Programme | MSC(CS With AI) | Semester | First | | |
|---|---|---|---|---|---|
| Course Code | 101 | Course Name | **INTRODUCTION TO ARTIFICIAL INTELLIGENCE & DATA SCIENCE** | | |
| Course category | CORE COURSE(CC)-1 | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**Course Objectives:**

1. Understand the Fundamentals of AI.
2. Apply Search Techniques to Problem Solving.
3. Represent Knowledge Logically and Perform Inference.
4. Understand the Foundations of Data Science.
5. Perform Data Collection, Cleaning, and Preprocessing.

**UNIT-I**

**Introduction:** what is AI? Foundations of AI, History of AI, characteristics of AI, Applications of AI, Intelligent Agents and Environment, problem solving Agents, problem formulation, search strategies.

**UNIT-2**

**Knowledge and Reasoning:** Knowledge-based Agents, Knowledge Representation, Reasoning and Logic, Propositional Logic, First-order Logic, inference in First order Logic, Forward and Backward chaining.

**UNIT-3**

**Introduction to Data Science:** what is Data Science? Scope, Big Data and Data Analytics vs Data Science, Data science life cycle, Applications of Data science, Roles: Data Scientist, Data Analyst, Data Engineer.

**UNIT-4**

**Data Collection and Preprocessing:** Types of Data: Structured, Semi-structured, Unstructured, Data Collection Techniques, Data Cleaning (Missing Data, Duplicates, Outliers), Data Transformation and Normalization. Feature Engineering.

**Text Books:**

1. An Introduction to Artificial Intelligence & Data Science by Mr. Ajay Sudhir Ladkat
2. Stuart Russel, Peter Norving, "Artificial Intelligence: A modern Approach", 2nd Edition, Pearson Education,2007.

3. Elaine Rich, Kevin Knight, Shivashankar B. Nair, "ARTIFICIAL INTELLIGENCE" , published by TATA McGraw-Hill(TMH).
4. Laura lgual & Santi Segui, "Introduction to Data Science", published by Springer.
5. Cathy O'Neil and Rachel Schutt, "Doing Data Science", published by O'Reilly.

**References:**

1. E. Rich and K. Knight, "ARTIFICIAL INTELLIGENCE", 3rd Edition, TMH,2017.
2. Dan W.Patterson, "AI & Expert Systems", PHI,2015.
3. Wes Mckinney, "Python for Data Analysis", published by O'Reilly.
4. Joel Grus, " Data Science from Scratch" published by O'Reilly.

**Course Outcomes :** After completion of the course student able to

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | Explain fundamental concepts, history, and applications of Artificial Intelligence in various domains such as natural language processing, robotics, and expert systems | K1 |
| CO2 | Formulate real-world problems using appropriate search strategies (e.g., BFS, DFS, A*) and evaluate their performance in terms of time and space complexity. | K2 |
| CO3 | Represent knowledge using logical methods such as propositional logic and first-order predicate logic, and perform inference using forward and backward chaining. | K4 |
| CO4 | Understand the fundamental concepts and workflow of data science, including data collection, preparation, analysis, modelling, and interpretation. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO2 | - | 3 | 2 | - | - | - | - | - | - | - | 2 | 2 | - |
| CO3 | 3 | 3 | - | - | - | - | - | - | - | - | 3 | - | |
| CO4 | 3 | - | 3 | - | - | - | - | - | - | - | - | 3 | - |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

## MSCS 102 A: OPERATING SYSTEM

| Programme | MSC(CS With AI) | Semester | First | | |
|---|---|---|---|---|---|
| Course Code | 102 | Course Name | **OPERATING SYSTEM** | | |
| Course category | CORE COURSE(CC)-2 B (Elective) | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**Course Objectives**

- To understand the fundamental concepts and techniques of Operating Systems.
- To study the concepts in process management and concurrency control mechanisms.
- To understand the concepts in memory managements and deadlocks
- To study on file management and storage structures.
- Identify the components and management aspects of Real time, Embedded operating Systems.

**UNIT -1**

Operating System Overview, Process Description and Control: Operating System Objectives and Functions, The Evolution of Operating System, Major Achievements, Developments Leading to Modem Operating Systems, Microsoft Windows Overview. Traditional UNIX Systems, Modem UNIX Systems, Linux. Process, Process States, Process Description, Process Control, Execution of the Operating System, Security Issues.

**UNIT-2**

Threads, SMP, and Microkernel, Virtual Memory: Processes and Threads, Symmetric Multiprocessing (SMP), Microkernels, Windows Vista Thread and SMP Hours Management, Linux Process and Thread Management, Hardware and Control structures, Operating System Software.

Concurrency Mutual Exclusion and Synchronization: Principles of Concurrency, Mutual Exclusion: Hardware Support, Semaphores, Monitors. Message Passing. Readers/Writers Problem. Concurrency Deadlock and Starvation: Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance. Deadlock Detection. An Integrated Deadlock Strategy.

**UNIT -3**

Memory Management: Memory Management Partitioning, Paging, Segmentation. Security Issues. Uni-processor Scheduling: Types of Scheduling, Traditional UNIX Scheduling. Multiprocessor and Real-Time Scheduling: Multiprocessor Scheduling, Real-Time Scheduling, Linux Scheduling, UNIX PreclsSl) Scheduling.

Embedded Operating Systems: Embedded Systems, Characteristics of Embedded Operating Systems, eCOS, TinyOS, Computer Security Concepts, Threats, Attacks, and Assets, Intruders, Malicious

Software Overview, Viruses, Worms, and Bots, Rootkits.

**UNIT - 4**

Kernel Organization: Using Kernel Services, Daemons, Starting the Kernel, Control in the Machine , Modules and Device Management, MODULE Organization, MODULE Installation and Removal, Process and Resource Management, Running Process Manager, Creating a new Task , IPC and Synchronization, The Scheduler , Memory Manager , The Virtual Address Space, The Page Fault Handler , File Management. The windows NT/2000/XP kernel: Introduction, The NT kernel, Objects , Threads, Multiplication Synchronization, Traps, Interrupts and Exceptions.

**Text Books:**

1. William Stallings: Operating Systems: Intemals and Design Principles, 6th Edition. Prentice Hall.
2. Gary Nutt: Operating Systems, 3rd Edition, Pearson, 2014.

**Reference books:**

1. Silberschatz, Galvin, Gagne: Operating System Concepts, 8th Edition, Wiley, 2008
2. Andrew S. Tanenbaum, Albert S. Woodhull: Operating Systems, Design and Implementation, 3rd Edition, Prentice Hall, 2006.
3. Pradeep K Sinha: Distribute Operating Systems, Concept and Design, PHI, 2007

**Course Outcomes :** After completion of the course student able to

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | Demonstrate the Mutual exclusion, Deadlock detection of operating system. | K1 |
| CO2 | Learn the various resource management techniques for operating systems. | K2 |
| CO3 | Identify the different features of real time and mobile operating system. | K4 |
| CO4 | Modify existing open source kernels in terms of functionality or features used. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | - | - | - | - | - | - | 1 | - | 3 |
| CO2 | 3 | - | - | - | - | - | - | - | - | - | - | 2 | 3 |
| CO3 | - | 3 | 2 | - | - | - | - | - | - | - | - | 1 | - |
| CO4 | - | 3 | - | - | - | 2 | - | - | - | - | 2 | - | - |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

# KRISHNA CHAITNAYA DEGREE COLLEGE

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## MSCS 102 B: DATA STRUCTURES USING C

| Programme | MSC(CS With AI) | Semester | First | | |
|---|---|---|---|---|---|
| Course Code | 102 | Course Name | **DATA STRUCTURES USING C** | | |
| Course category | CORE COURSE(CC)-2 A (Elective) | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**Course Learning Objectives:**

1. To impart the basic concepts of data structures and algorithms
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs
4. To understanding about writing algorithms and systematic approach in solving problems with the help of fundamental data structures.

**UNIT-I:**

Data Structures – Introduction to Data Structures, abstract data types. Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, circularly linked lists-Operations for Circularly linked lists, doubly linked list implementation, insertion, deletion and searching operations, applications of linked lists.

**UNIT-II:**

Stack ADT- definition, operations, array and linked implementations in C, applications-infix to postfix conversion, Postfix expression evaluation, recursion implementation. Queue ADT- definition and operations, array and linked Implementations in C, Circular queuesInsertion and deletion operations, Deque (Double ended queue) ADT, array and linked implementations in C

**UNIT-III:**

Searching and Sorting – Searching-linear and binary search methods Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort comparison of sorting and searching methods.

**UNIT-IV:**

Trees – Definitions, tree representation, properties of trees, Binary tree, Binary tree representation, binary tree properties, binary tree traversals, binary tree implementation, applications of trees.

**TEXT BOOKS:**

1. Data Structures Using C by Vaibhav Arjunrao Parjane, Ganesh Nandkishor Jorvekar , Kishor Pandurang Jadhav, Rina Suresh Patil
2. Fundamentals of Data structures in C, 2nd Edition, E.Horowitz, S.Sahni and Susan AndersonFreed, Universities Press.

2. Data structures A Programming Approach with C, D.S.Kushwaha and A.K.Misra, PHI.

**REFERENCE BOOKS:**

1. Data structures: A Pseudo code Approach with C, 2nd edition, R.F.GilbergAndB.A.Forouzan, Cengage Learning.

2. Data structures and Algorithm Analysis in C, 2nd edition, M.A.Weiss, Pearson.

3. Data Structures using C, A.M.Tanenbaum,Y. Langsam, M.J.Augenstein, Pearson.

4. Data structures and Program Design in C, 2nd edition, R.Kruse, C.L.Tondo and B.Leung,Pearson

**Course Outcomes :** After completion of the course student able to

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | Ability to analyze algorithms and algorithm correctness. | K1 |
| CO2 | Ability to summarize searching and sorting techniques | K2 |
| CO3 | Ability to describe stack, queue and linked list operation. | K4 |
| CO4 | Ability to have knowledge of trees and graphs concepts. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO2 | 3 | 3 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | 3 | - |
| CO4 | 3 | 3 | 3 | 3 | - | 3 | 3 | - | - | 2 | 3 | 3 | 3 |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

## MSCS 103 A: COMPUTER NETWORKS

| Programme | MSC(CS With AI) | Semester | First | | |
|---|---|---|---|---|---|
| Course Code | 103 | Course Name | **COMPUTER NETWORKS** | | |
| Course category | CORE COURSE(CC)-3 A (Elective) | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**Course Objectives:**

- To understand the fundamentals of Computer Networks.
- To get familiarized with Various Layers of Computer Networks.
- To understand the working principles of Various Protocols
- To get familiarized with Network security

**Unit-1**

Introduction: Uses of Computer Networks, Network Hardware, Network Software, Reference Models, , Example Networks. APRANET, NSFNET, Internet, Network Topology, Network Architecture, Physical Layer: Transmission media.

**Unit-2**

The Data Link Layer: Data Link Layer design issues, Error Detection and Correction Methods, Elementary Data Link Protocols, Sliding Window Protocols Protocol, Channel Allocation Multiple Access protocols Wireless LANs, Bluetooth, RFID.

**Unit-3**

The Network Layer: Network Layer design issues, Routing algorithms, Congestion Control algorithms, Quality of Service, Internetworking Network Layer in Internet.
The Transport Protocols: Transport Service, Transport Protocols, Internet Transport Protocols, UDP, TCP, Performance issues.

**Unit-4**

The Application Layer: Application Layer design issues, Domain Name System, Electronic Mail, and World Wide Web. Other Applications, Network Security, Basic Cryptography, Symmetric and Asymmetric Cryptography.

**Text Books:**

1. Computer Networks, by Bhushan Trivedi
2. Andrew S. Tanenbaum, Computer Networks, 5th edition, 2014.
3. William Stallings, Cryptography and Network Security: Principles and Standards, Prentice Hall India, 4th Edition, 2005.

**Reference Books**

Behrouz Forouzan, Data Communications and Networking, McGraw Hill, 4th Edition, 2017.

**Course Outcomes :** After completion of the course student able to

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | Ability to understand the various hardware and software components of computer networks. | K1 |
| CO2 | Ability to understand the layered network architecture | K2 |
| CO3 | Ability to configure networks and debug issues in networks. | K4 |
| CO4 | Ability to configure application layer | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 3 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO3 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO4 | - | 3 | 2 | - | - | - | - | - | - | - | 2 | - | - |

1-Low, 2-Medium, 3-High

## MSCS 103 B: MATHEMATICAL AND STATISTICAL FOUNDATION

| Programme | MSC(CS With AI) | Semester | First | | |
|---|---|---|---|---|---|
| Course Code | 103 | Course Name | **MATHEMATICAL AND STATISTICAL FOUNDATION** | | |
| Course category | CORE COURSE(CC)-3 B (Elective) | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**Course Objectives:**

1.Understand the mathematical fundamental courses like Data mining, Network protocols, security, Software engineering, Computer that is prerequisites for variety of analysis of Web traffic, Computer security, Software engineering, distributed systems bioinformatics, Computer architecture, operating systems, Machine learning.

2. Develop the understanding of the mathematical and logical basis to many modern techniques in computer science technology like machine learning, programming language design, and concurrency.

3. Study various sampling and classification problems.

**Course Outcomes:**

- Make use of mathematical logic to solve problems
- Analyze the concepts and perform the operations related to sets,
- Identify basic counting techniques to solve combinatorial problems.
- Evaluate solutions by using recurrence relations.

**UNIT -1:**

Basic Probability and Random Variables: Random Experiments, Sample Spaces Events, the concept of Probability the Axioms of probability, Some important Theorems on probability assignment of Probabilities, Conditional Probability Theorems on conditional Probability, Independent Events, Bayes Theorem or Rule.

**UNIT -2:**

Tests of Hypothesis and Significance: Statistical Decisions Statistical Hypotheses, Null Hypotheses Tests of Hypotheses and Significance Type I and Type II Error Level of Significance Tests involving the Normal Distribution One- Tailed and Two-Tailed Tests, The Chi- Square Test for Goodness of Fit.

**UNIT -3:**

Algebraic Structures and Number Theory: Algebraic Systems, Examples, General Properties, Semi Group and Monoids, Homomorphism of semi groups and Monoids, Group, Subgroup, Abelian Group,

Homomorphism, Isomorphism. Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm.

**UNIT-4:**

Graph Theory: Basic Concepts of Graphs, Sub Graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multi graphs, planar Graphs, Euler's Formula, Spanning Trees, Algorithms for spanning trees (Problems only and Theorems without proofs)

**TEXT BOOKS:**

1. Foundation Mathematics ofr Computer Science, 1 Edition, John Vince, Spinge, 2015. 2. Probability & Satistics, 3rd Edition, Murray R. Spiegle, John J.Schiller and R. Alu srinivasa, Schaum's outline series, Tata McGraw-Hill Publishers, 2018.

3. Probability and Statistics with Reliability, 2 nd Edition, K. Trivedi. Wiley.2011

4. Discrete Mathematics and its Application with combinatory and Graph Theory, 7the edition, H.Rosen, Tata McGraw Hill.2003.

**ReferenceBooks:**

1. Probability and Computing: Randomized Algorithms and probabilistic analysis 1st edition , john Vince, M.Mitzenmacher and E.Upfal,2005.

2. Applied combinatory, 6th Edition, AlaTucker, Wiley, 2012

**Course Outcomes :** After completion of the course student able to

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | Make use of mathematical logic to solve problems | K1 |
| CO2 | Analyze the concepts and perform the operations related to sets, | K2 |
| CO3 | Identify basic counting techniques to solve combinatorial problems. | K4 |
| CO4 | Evaluate solutions by using recurrence relations. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 3 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO3 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO4 | - | 3 | 2 | - | - | - | - | - | - | - | 2 | - | - |

1-Low, 2-Medium, 3-High

# KRISHNA CHAITNAYA DEGREE COLLEGE

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## MSCS 105 A: OBJECT ORIENTED PROGRAMMING WITH JAVA

| Programme | MSC(CS With AI) | Semester | First | | |
|---|---|---|---|---|---|
| Course Code | 104 | Course Name | **OBJECT ORIENTED PROGRAMMING WITH JAVA** | | |
| Course category | SKILL ORIENTED COURSE(SOC)-1 B (Elective) | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

***Course Objective:***

To understand evolution of Java, Java Working Principles and to solve java problems using Object Oriented Programming concepts.

**UNIT – I**

Introduction to Java – Features, JVM, Parts of Java, First step towards Java Programming.

**Fundamentals of OOP :** Introduction, Object Oriented paradigm, Basic Concepts of OOP and Data Types, Literals, Operators in Java, Control Statements, Input and Output

**UNIT – II**

Arrays – Types of Arrays, Three Dimentional Arrays, arrayname.length, Comand Line Arguments, Strings, StringBuffer and StringBuilder–Creating StringBuffer Objects, StringBuffer Class Methods, StringBuilder Class, StringBuilder Class Methods, Introduction to OOPs - Problems in Procedure Oriented Approach, features of OOP system

**UNIT – III**

Classes and Objects – Object Creation, Initializing the Instance Variables, Access Specifiers, Constructors, Methods in Java, Relationship between Objects, Inheritance, Polymorphism,Type Casting, Abstract Classes, Interfaces

**UNIT – IV**

Packages, Exception Handling, Wrapper Classes, Streams and Files, Treads, applets,Graphics Programming using AWT

**TEXT BOOK**


1. Core JAVA An Integrated Approach by Dr. R. Nageswara Rao, Dreamtech Publication, 2014 Edition.


***Reference Books:***


1. Herbert Schildt, "Java: The Complete Reference", 12th Edition, Tata McGraw-Hill, 2022.
2. Java Core Concepts And Applications by Trilochan Tarai, Wiley India, 2019.

Cay S. Horstmann, Gary Cornell, "Core Java", Volume I-Fundamentals, 9th Edition, Pearson

**Course Outcomes :** After completion of the course student able to

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | Ability to apply classes, objects, members of a class and relationships among them needed for a specific problem. | K1 |
| CO2 | Ability to Write Java application programs using OOP principles and proper program structuring. | K2 |
| CO3 | Ability to apply the concepts of inheritance, Interfaces and packages in different applications | K4 |
| CO4 | Ability to write Efficient programs that handle exceptions | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 3 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO3 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO4 | - | 3 | 2 | - | - | - | - | - | - | - | 2 | - | - |

1-Low, 2-Medium, 3-High

## MSCS 105 B: CYBER SECURITY

| Programme | MSC(CS With AI) | Semester | First | | |
|---|---|---|---|---|---|
| Course Code | 104 | Course Name | CYBER SECURITY | | |
| Course category | SKILL ORIENTED COURSE(SOC)-1 A (Elective) | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**Course objectives:**

- To understand various types of cyber-attacks and cyber-crimes
- To learn threats and risks within context of the cyber security
- To have an overview of the cyber laws & concepts of cyber forensics
- To study the defensive techniques against these attacks

**UNIT I**

FUNDAMENTALS OF CYBER SECURITY: Introduction-Cyber Security and its problem-Intervention Strategies: Redundancy, Diversity and Autarchy.

**UNIT II**

ISSUES IN CYBER SECURITY: Private ordering solutions, Regulation and Jurisdiction for global Cyber security, Copy Right-source of risks, Pirates, Internet Infringement, Fair Use, postings, criminal liability, First Amendments, Data Loss.

**UNIT III**

INTELLECTUAL PROPERTY RIGHTS: Copy Right-Source of risks, Pirates, Internet Infringement, Fair Use, postings, Criminal Liability, First Amendments, Losing Data, Trademarks, Defamation, Privacy-Common Law Privacy, Constitutional law, Federal Statutes, Anonymity, Technology expanding privacy rights.

**UNIT IV**

PROCEDURAL ISSUES: Duty of Care, Criminal Liability, Procedural issues, Electronic Contracts & Digital Signatures, Misappropriation of information, Civil Rights, Tax, Evidence.

LEGAL ASPECTS OF CYBER SECURITY: Ethics, Legal Developments, Late 1990 to 2000,Cyber security in Society, Security in cyber laws case. studies, General law and Cyber Law-a Swift Analysis.

***Text book:***

Jonathan Rosenoer,"Cyber Law: The law of the Internet", Springer-Verlag, 1997.

**REFERENCE BOOK:**

Mark F Grady, Fransesco Parisi, "The Law and Economics of Cyber Security", Cambridge University Press, 2006.

**Course Outcomes :** After completion of the course student able to

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | Analyze cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks. | K1 |
| CO2 | Interpret and forensically investigate security incidents | K2 |
| CO3 | Apply policies and procedures to manage Privacy issues 4.Design and develop secure software modules | K4 |
| CO4 | Studies, General law and Cyber Law-a Swift Analysis. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 3 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO3 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO4 | - | 3 | 2 | - | - | - | - | - | - | - | 2 | - | - |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

## MSCS 106 A: PYTHON PROGRAMMING

| Programme | MSC(CS With AI) | Semester | First | | |
|---|---|---|---|---|---|
| Course Code | 105 | Course Name | **PYTHON PROGRAMMING** | | |
| Course category | SKILL ORIENTED COURSE(SOC)-2 B (Elective) | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**Course Objectives:**

1. Introduce the foundational concepts of Python programming including its syntax, IDEs, and control structures.
2. Develop proficiency in modular programming using functions, lambda expressions, recursion, and Python's built-in modules and packages.
3. Explore core data structures like strings, lists, tuples, and dictionaries for effective data manipulation.
4. Teach exception handling mechanisms and the use of regular expressions for pattern matching and text processing.
5. Enable students to interact with files and databases using Python to build real-world applications involving persistent storage and data retrieval.

**UNIT – I**

**Introduction to Python:** introduction to python, Features of Python Language, installing Python, Python virtual machine(PVM) Environment Setup, python syntax, running a python script

**Data Types:** Numeric data types: int, float, complex, string data type, python variables, Expressions, comment statements.

**Operators**-Arithmetic operators, Assignment operators, Comparison operators, Logical operators, Identity operators, Membership operators, Bitwise operators

**Standard I/O Operations,** python casting

**UNIT-II**

**Control statements**- Conditional branching: if, if-else, nested if, if-elif-else statements, Iterative statements: while loop, for loop, nested loops, pass statement, continue statement, break statement, and else statement used with loops, Programming using Python conditional

and loops block

**Strings and Regular expressions:** Introduction to strings, String operations, Built-in string methods and functions, comparing strings, Functions in regular expression.

**Functions:** Introduction, function definition, creating a function, Function Calling, declaration and defining functions, variable scope and lifetime, built-in functions

**UNIT – III**

**Sequences: Lists :** Creating lists, accessing values in lists, list operations, **Tuples :** Creating Tuples, accessing values in Tuples, Tuple operations, **Sets :** Creating a set, accessing values in Set, Set operations, and **Dictionaries:** Creating a dictionary, Accessing values in Dictionary, Dictionary operations

**Object Oriented Programming:** Classes and Objects, Class method and self argument, The __Init Method, Class Variables and Object Variables, The__Del__Method, Public and Private Data Members Private Methods

**UNIT - IV**

**Inheritance and polymorphism:** Inheriting Classes in Python, Polymorphism and Method Overriding, Types of Inheritance

**Exception Handling:** Introduction, Handling exceptions, multiple except blocks and multiple exceptions, finally block.

**Text Books:**

1. "Reema Thareja", Python Programming using problem solving approach, First Edition, Oxford higher Education.

**Reference Books:**

**1.** Bhasin, Harsh,Textbook of Computer Science with Python XI, New Age International (P) Ltd., Publishers

2. Kenneth A. Lambert, Fundamentals of Python
3. James Payne, Beginning Python using Python 2.6 and Python 3
4. Charles Dierach, Introduction to Computer Science using Python

**Course Outcomes :** After completion of the course student able to

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | Write and execute structured Python programs using variables, expressions, and flow control statements. | K1 |
| CO2 | Implement modular code leveraging functions, argument types, recursion, and reusable libraries. | K2 |
| CO3 | Manipulate and organize data efficiently using Python's string operations and complex data structures. | K4 |
| CO4 | Handle runtime errors and apply regular expressions for robust and flexible program behavior. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 3 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO3 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO4 | - | 3 | 2 | - | - | - | - | - | - | - | 2 | - | - |

1-Low, 2-Medium, 3-High

## MSCS 106 B: DATA BASE MANAGEMENT SYSTEM

| Programme | MSC(CS With AI) | Semester | First | | |
|---|---|---|---|---|---|
| Course Code | 105 | Course Name | **DATABASE MANAGEMENT SYSTEM** | | |
| Course category | SKILL ORIENTED COURSE(SOC)-2 A (Elective) | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**Course Objectives:**

The objective(s) of this course is to,

- Introduce fundamental concepts, terminology and application of databases.
- Teach design concepts and creation of relational databases.
- Teach basic and advanced SQL commands.
- Provide overview of database programming and procedural languages.
- Provide overview of transaction management, database recovery and security.

**UNIT-I**

File System Vs. DBMS - Database System Applications - View of Data-Database language – Database design – ER Model _ Relational Model – Network Data Model – Hierarchical Data Model – Data Storage & Querying – Data Architecture.

**UNIT-II**

Relational Model – Structure of Relational Databases – Relational Algebra and Calculus – SQL – Basic Structure – Set Operations – Aggregate Functions – Null Values – Nested Queries – Complex Queries – Views – Modification of the Database- Advanced SQL – Triggers.

**UNIT-III**

Functional Dependencies - Features of Relational designs – Decomposition and Normalization using Functional Dependencies and Multi valued Dependencies – Join dependencies- Domain key Normal form.

**UNIT-IV**

Transaction Management – Transactions – Concurrency.Distributed Databases – Homogeneous and Heterogeneous Databases – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control. Case Study : Oracle – Introduction – Basics elements of SQL – Operators – Expression Functions – SQL Statements – PL/SQL- Triggers – Cursor.

**Text Books:**

1. FUNDAMENTALS OF DATABASE SYSTEM,7th Edition, by Elmasri amez, Navathe Shamkant

2. Abraham Silberschatz, Henry F. Korth and S. Sudarshan- "Database System Concepts", Fifth Edition, McGraw-Hill, 2006.

**References Books:**

1. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", Tata McGraw-Hill Publishing Company, 2003.

2. Ramez Elmasri and Shamkant B. Navathe, "Fundamental Database Systems", Third Edition, Pearson Education, 2003.

3. Hector Garcia–Molina, Jeffrey D.Ullman and Jennifer Widom- "Database System Implementation"- Pearson Education- 2000.

**Course Outcomes :** After completion of the course student able to

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | Construct an Entity-Relationship (E-R) model from specifications and transform it to a relational model. | K1 |
| CO2 | Design databases and apply normalization constraints. | K2 |
| CO3 | Construct queries in SQL or Relational Algebra to perform CRUD (Create, Retrieve, Update and Delete) operations on database. | K4 |
| CO4 | Understand and apply the concepts of procedural languages. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 3 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO3 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO4 | - | 3 | 2 | - | - | - | - | - | - | - | 2 | - | - |

1-Low, 2-Medium, 3-High

# KRISHNA CHAITNAYA DEGREE COLLEGE

**(AUTONOMOUS)**

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| **Programme** | **M.Sc. Computer Science With AI** | **Semester** | **First** | |
|---|---|---|---|---|
| **Course Code** | **CC-102A P** | **Course Name** | **Operating Systems Lab** | |
| Course Category | Practical | Hours/Week | L | P |
| | | | 0 | 4 |
| | | Credits | 2 | |

**List of Programmes**

1. Write a C Program to Simulate the following CPU Scheduling algorithms
   a) Round Robin
   b) SJF
   c) FCFS
   d) Priority
2. Write a C Program to Simulate all file allocation strategies.
   a) Sequential
   b) Indexed
   c) Linked
3. Write a C Program to simulate MVT and MFT
4. Write a C Program to simulate all File organization techniques.
   a) Single level directory
   b) Two level
   c) Hierarchical
   d) DAG
5. Write a C Program to simulate Bankers Algorithm for Dead Lock Avoidance.
6. Write a C Program to simulate Bankers Algorithm for Dead Lock Prevention
7. Write a C Program to simulate Bankers Algorithm Dead Lock Prevention.
8. Write a C program to simulate all Page replacement algorithms.
   a) FIFO
   b) LRU
   c) LFU
9. Write a C program to Simulate Paging Techniques of memory management.
10. Write a C program to simulate the following contiguous memory allocation Techniques
    a) Worst fit b) Best fit c) First fit

**Course Outcomes :** After completion of the course student able to write programs

| | **Course Outcome Description** | **Knowledge Level** |
|---|---|---|
| CO1 | Understand the syntaxes for queries, procedures and functions | K2 |
| CO2 | Apply queries, procedures and functions for a need | K3 |
| CO3 | Analyze effectives of different normal forms implementation | K4 |
| CO4 | Design a commercial relational database system | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

**COURSE AND PROGRAMME OUTCOMES MAPPING**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | - | - | - | - | - | - | - | 3 | 3 | 3 |
| CO2 | 3 | - | - | - | 2 | - | - | - | - | - | 3 | 3 | 3 |
| CO3 | 3 | - | 2 | - | - | - | - | - | - | - | 3 | 2 | 3 |
| CO4 | 3 | - | - | 2 | - | - | - | - | - | - | 3 | 3 | 3 |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

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| **Programme** | **M.Sc. Computer Science With AI** | **Semester** | **First** | |
|---|---|---|---|---|
| **Course Code** | **CC-102B P** | **Course Name** | **Data Structures using C Lab** | |
| Course Category | Practical ( Elective Foundation) | Hours/Week | L | P |
| | | | 0 | 4 |
| | | Credits | 2 | |

**List of Programmes**

1. Write a Program to implement the Stack operations using an array
2. Write a Program to implement the Stack operations using Linked List.
3. Write a Program to implement the Queue operations using an array.
4. Write a Program to implement the Queue operations using Linked List.
5. Write a program for Binary Search Tree Traversals
6. Write a program to search an item in a given list using the following Searching Algorithms
   a. Linear Search
   b. Binary Search.
7. Write a program for implementation of the following Sorting Algorithms
   a. Bubble Sort
   b. Quick Sort
8. Write a program for implementation of the following Sorting Algorithms
   a. Insertion Sort
   b. Merge Sort
9. Write a program to implement Depth First Search graph traversal.
10. Write a program to implement Breadth First Search graph traversal.

**Course Outcomes :** After completion of the course student able to write programs

| | **Course Outcome Description** | **Knowledge Level** |
|---|---|---|
| CO1 | Understand various algorithms implantation process of different data structures | K2 |
| CO2 | Apply suitable data stature for a need | K3 |
| CO3 | Analyse space and time complexity of various different data structures' operations | K4 |
| CO4 | Develops applications for implantations of different data structures' operations | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

**COURSE AND PROGRAMME OUTCOMES MAPPING**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| CO3 | 3 | 2 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| CO4 | 3 | 2 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

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| **Programme** | **M.Sc. Computer Science With AI** | **Semester** | **First** | |
|---|---|---|---|---|
| **Course Code** | **CC-103A P** | **Course Name** | **Computer networks Lab** | |
| Course Category | Practical | Hours/Week | L | P |
| | | | 0 | 4 |
| | | Credits | 2 | |

**List of Programmes**

1. Study of network devices (Router, Switch, Hub, etc.) in detail and connect the computers in Local Area Network.
2. Write a program to implement the data link layer framing methods such as
   a) character stuffing b) bit stuffing
3. Write a program to implement data link layer framing method checksum.
4. Write a program for Hamming Code generation for error detection and correction.
5. Write a program for congestion control using leaky bucket algorithm.
6. Write a UDP client-server program to send a message from client to server and display the received message at the server side.
7. Write a program to implement Dijksra's algorithm to compute shortest path through a graph.
8. Write the steps to Packet capture and analysis using Wireshark
9. DHCP server configuration
10. DNS server configuration

**Course Outcomes :** After completion of the course student able to write programs

| | **Course Outcome Description** | **Knowledge Level** |
|---|---|---|
| CO1 | Understand the client and server configuration | K2 |
| CO2 | Understanding siocket programming | K3 |
| CO3 | How to get the IP configuration and ping | K4 |
| CO4 | Configuring the network | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

**COURSE AND PROGRAMME OUTCOMES MAPPING**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | - | - | - | - | - | - | - | 3 | 3 | 3 |
| CO2 | 3 | - | - | - | 2 | - | - | - | - | - | 3 | 3 | 3 |
| CO3 | 3 | - | 2 | - | - | - | - | - | - | - | 3 | 2 | 3 |
| CO4 | 3 | - | - | 2 | - | - | - | - | - | - | 3 | 3 | 3 |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

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| **Programme** | **M.Sc. Computer Science With AI** | **Semester** | **First** | |
|---|---|---|---|---|
| **Course Code** | **S0C-105A P** | **Course Name** | **Java Programming Lab** | |
| Course Category | Practical ( Elective Foundation) | Hours/Week | L | P |
| | | | 0 | 4 |
| | | Credits | 2 | |

**List of Programmes**

1. Write a Java Program which performs sorting of group of integer values using bubble sort technique.
2. Write a Java Program which accepts elements of a matrix and displaying its transpose.
3. Write a Java Program in which we take a 3D array which consists of department wise student marks. There are 3 departments and in each department, there are 2 students and each student has marks in 3 subjects. We want to calculate total marks of each student.
4. Write a Java Program for testing a string whether it is a palindrome or not.
5. Write a Java Program to illustrate constructors.
6. Write a Java Program to illustrate overloading & overriding methods in Java.
7. Write a Java Program to illustrate the implementation of multiple inheritance using interfaces in Java.
8. Write a Java Program which tells the use of try, catch and finally block.
9. Write a Java Program where the Consumer thread checks whether the data production is over or not every 10 milliseconds.
10. Write Java Program to creates an applet with some background color and foreground color with a message. The message string is stored in message and is displayed in paint()method.

**Course Outcomes :** After completion of the course student able to write programs

| | **Course Outcome Description** | **Knowledge Level** |
|---|---|---|
| CO1 | Able to analyze Object oriented design principles and proper program structuring using Java | K4 |
| CO2 | Understand the concept of packages, polymorphism, interface, and inheritance. | K2 |
| CO3 | Implement error handling techniques using exception handling and develop programs using class and inputs from keyboard. | K3,K6 |
| CO4 | Develop Multithreaded and event driven using AWT and Swing components. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

**COURSE AND PROGRAMME OUTCOMES MAPPING**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O1 | 3 | 3 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| O2 | 3 | 3 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| O3 | 3 | 2 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| O4 | 3 | 2 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |

-Low, 2-Medium, 3-High

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| **Programme** | **M.Sc. Computer Science With AI** | **Semester** | **First** | |
|---|---|---|---|---|
| **Course Code** | **SOC-105B P** | **Course Name** | **CYBER SECURITY LAB** | |
| Course Category | Practical (Elective Foundation) | Hours/Week | L | P |
| | | | 0 | 4 |
| | | Credits | 2 | |

**List of Programmes**

1. Introduction to Kali Linux and Cybersecurity Tools.
2. Information Gathering using Nmap and WHOIS
3. Network Traffic Analysis using Wireshark
4. Footprinting and Scanning
5. Password Cracking using John the Ripper
6. Web Application Testing using DVWA or OWASP Juice Shop
7. Cross Site Scripting (XSS) Attack Simulation
8. Vulnerability Scanning using Nessus or OpenVAS
9. Man-in-the-Middle (MITM) Attack using Ettercap
10. Creating and Detecting a Reverse Shell using Netcat

**Course Outcomes :** After completion of the course student able to write programs

| | **Course Outcome Description** | **Knowledge Level** |
|---|---|---|
| CO1 | Able to analyse security tools | K4 |
| CO2 | Understand the concept of network traffic and analysis | K2 |
| CO3 | Develop Web Application Testing using DNS spoofing and session hijacking | K3,K6 |
| CO4 | Creating and Detecting a Reverse Shell using Netcat | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

**COURSE AND PROGRAMME OUTCOMES MAPPING**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| CO3 | 3 | 2 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| CO4 | 3 | 2 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

# KRISHNA CHAITNAYA DEGREE COLLEGE

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| **Programme** | **M.Sc. Computer Science With AI** | **Semester** | **First** | |
|---|---|---|---|---|
| **Course Code** | **SOC-106A P** | **Course Name** | **Python Programming Lab** | |
| Course Category | Practical ( Elective Foundation) | Hours/Week | L | P |
| | | | 0 | 4 |
| | | Credits | 2 | |

**List of Programmes**

1. Write a program to perform various string operations
2. Write a program to implement user defined functions
3. Write a program to perform various operations on Lists and Directories.
4. Write a program to implement the following array operations
   a. Creating Array
   b. Inserting elements
   c. Searching for an element
   d. Deleting an elements
   e. Updating an element
5. Write a program to create **Person** and **Student** classes for reading, displaying details by implement inheritance between the classes
6. Write a program in python to Find simple interest
7. Write a program in python to Find compound interest
8. Write a program in python to Check Armstrong Number
9. Write a program in python to Check whether a number is Prime or not
10. Write a program in python for Sum of squares of first n natural numbers

**Course Outcomes :** After completion of the course student able to write programs

| | **Course Outcome Description** | **Knowledge Level** |
|---|---|---|
| CO1 | Able to understand control structures and use python data types | K2 |
| CO2 | Impart knowledge on object oriented skills in python. | K1 |
| CO3 | Implement error handling techniques using exception handling | K3 |
| CO4 | Explore the utility of strings and functions in modular programming using python | K4 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

**COURSE AND PROGRAMME OUTCOMES MAPPING**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 2 |
| CO2 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | - | 2 | 3 |
| CO3 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | 2 | - | - |
| CO4 | 3 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | 2 |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

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| **Programme** | **M.Sc. Computer Science With AI** | **Semester** | **First** | |
|---|---|---|---|---|
| **Course Code** | **SOC-106B P** | **Course Name** | **Database Management Lab** | |
| Course Category | Practical ( Elective Foundation) | Hours/Week | L | P |
| | | | 0 | 4 |
| | | Credits | 2 | |

**List of Programmes**

1. Create a table with constraints in SQL
2. Create a view in SQL
3. Combine multiple tables using Joins in SQL
4. Program for Finding Armstrong number using PL/SQL
5. Program for String palindrome using PL/SQL
6. Program for Generating Fibonacci using PL/SQL
7. Program for finding factorial of a number by using procedure using PL/SQL
8. Program for Book program using parameterized cursor using PL/SQL
9. Program for Exception handling program using PL/SQL
10. Program for Database trigger for avoiding manipulations on Sunday using PL/SQL

**Course Outcomes :** After completion of the course student able to write programs

| | **Course Outcome Description** | **Knowledge Level** |
|---|---|---|
| CO1 | Able to understand Command and queries | K2 |
| CO2 | Impart knowledge on SQL | K1 |
| CO3 | Implement functions and procedures in PL/SQL | K3 |
| CO4 | Explore the utility of cursors and triggers | K4 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

**COURSE AND PROGRAMME OUTCOMES MAPPING**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 2 |
| CO2 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | - | 2 | 3 |
| CO3 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | 2 | - | - |
| CO4 | 3 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | 2 |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

# KRISHNA CHAITNAYA DEGREE COLLEGE

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**SEMESTER-2**

## MSCS 201: ARTIFICIAL INTELLIGENCE

| Programme | MSC(CS With AI) | Semester | Secound | | |
|---|---|---|---|---|---|
| Course Code | 201 | Course Name | **ARTIFICIAL INTELLIGENCE** | | |
| Course category | CORE COURSE(CC)-4 | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**Course Objectives**

The objectives of this course are to:

1. Introduce the fundamental concepts, scope, and applications of Artificial Intelligence.
2. Provide knowledge of intelligent agents and basic knowledge representation techniques.
3. Develop understanding of reasoning methods, expert systems, and fuzzy logic concepts.
4. Familiarize students with basic Machine Learning approaches and learning models.
5. Explain neural network fundamentals and modern AI application areas such as NLP.

**UNIT – I**

**Introduction to Artificial Intelligence & Knowledge Representation Basics**

Definition and scope of Artificial Intelligence, **Intelligent agents**: concept, types, and environments. Introduction to knowledge representation, Types of knowledge, Propositional logic, Predicate (logic basics), Inference rules.

**UNIT – II**

**Reasoning and Expert Systems & fuzzy logic**

Reasoning in AI, Forward chaining, backward chaining, **Expert systems:** Structure, Working, Applications. **Fuzzy logic concepts:** Crisp sets vs fuzzy sets, Membership functions, Fuzzy rules.

**UNIT – III**

**Machine Learning Fundamentals**

**Introduction to Machine Learning:** Definition, Applications of Machine learning in real life, Learning vs programming, **Types of learning**: Supervised learning, Unsupervised learning, Reinforcement learning. Simple learning models.

**UNIT – IV**

**Neural Networks and AI Applications**

**Neural networks:** basic concepts, artificial neuron model, Introduction to Deep Learning, Natural Language Processing (overview), Real-world applications of AI.

**TEXT BOOKS**


1. **Stuart Russell and Peter Norvig**, *Artificial Intelligence: A Modern Approach*, Pearson Education.
2. **Elaine Rich, Kevin Knight, and Shivashankar B. Nair**, *Artificial Intelligence*, Tata McGraw-Hill.


**REFERENCE BOOKS**


1. **George J. Klir and Bo Yuan**, *Fuzzy Sets and Fuzzy Logic: Theory and Applications*, Prentice Hall.
2. **Ethem Alpaydin**, *Introduction to Machine Learning*, MIT Press.

3. **Simon Haykin**, *Neural Networks and Learning Machines*, Pearson Education.
4. **Nils J. Nilsson**, *Artificial Intelligence: A New Synthesis*, Morgan Kaufmann.

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | Define Artificial Intelligence concepts and explain intelligent agents and their environments. | K1 |
| CO2 | Represent knowledge using propositional and predicate logic and apply inference rules. | K2 |
| CO3 | Analyze reasoning techniques, expert systems, and fuzzy logic for handling uncertainty in AI problems. | K4 |
| CO4 | Identify and differentiate between various Machine Learning techniques and simple learning models. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO2 | - | 3 | 2 | - | - | - | - | - | - | - | 2 | 2 | - |
| CO3 | 3 | 3 | - | - | - | - | - | - | - | - | 3 | - | |
| CO4 | 3 | - | 3 | - | - | - | - | - | - | - | - | 3 | - |

1-Low, 2-Medium, 3-High

# KRISHNA CHAITNAYA DEGREE COLLEGE

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## MSCS 202 A: CLOUD COMPUTING

| Programme | MSC(CS With AI) | Semester | **Secound** | | |
|---|---|---|---|---|---|
| Course Code | 202 | Course Name | **CLOUD COMPUTING** | | |
| Course category | CORE COURSE(CC)-5 A (Elective) | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**Course Objectives**

- To provide students with the fundamentals and essentials of Cloud Computing.
- To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
- To enable students exploring some important cloud computing driven commercial systems and applications.
- To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

**UNIT-I**

Introduction Definition of Cloud – Evolution of Cloud Computing – Benefits of Cloud Computing Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics -Elasticity in Cloud – On-demand Provisioning.

**UNIT-II**

Cloud Enabling Technologies: Service Oriented Architecture – REST and Systems of Systems – Web Services Publish Subscribe Model – Basics of Virtualization – Types of Virtualization-Implementation Levels of Virtualization – Virtualization Structures-Tools and mechanisms.

**UNIT-III**

Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.

Cloud Architecture & Services: Layered Cloud Architecture Design –Public, Private and Hybrid Clouds Cloud computing models: laaS – PaaS – SaaS, cloud delivery models, cloud deployment models.

**UNIT-IV**

AWS & Networking: Introduction to AWS, AWS Global infrastructure, Google cloud platform, network switches - virtual private cloud (VPC) , VPC and Subnets , IP addressing in AWS, AWS security groups, EC2 instance types. EC2 pricing models.

ICloud Storage –Advantages of Cloud Storage – Cloud Storage Providers – S3 (Simple Storage Service) - S3 Features.

**Text Books:**


1. Handbook of Cloud Computing By Dr.Anand Nayyar (Editor), First Edition 2019, BPB Publication, India
2. DevOps for Dummies@ , 2nd IBM Limited edition published by john wiley & sons, 2015
3. Kai Hwang, Geoffrey C Fox, Jack J Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.

4. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management,and Security", CRC Press, 2010.

**Reference books:**

1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpe
2. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.

**Course Outcomes :** After completion of the course student able to

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing. | K1 |
| CO2 | Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost. | K2 |
| CO3 | Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing. | K4 |
| CO4 | Analyze various cloud programming models and apply them to solve problems on the cloud. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | - | - | - | - | - | - | 1 | - | 3 |
| CO2 | 3 | - | - | - | - | - | - | - | - | - | - | 2 | 3 |
| CO3 | - | 3 | 2 | - | - | - | - | - | - | - | - | 1 | - |
| CO4 | - | 3 | - | - | - | 2 | - | - | - | - | 2 | - | - |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

# KRISHNA CHAITNAYA DEGREE COLLEGE

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## MSCS 202 B: DESIGN AND ANALYSIS OF ALGORITHMS

| Programme | MSC(CS With AI) | Semester | **Secound** | | |
|---|---|---|---|---|---|
| Course Code | 202 | Course Name | **DESIGN AND ANALYSIS OF ALGORITHMS** | | |
| Course category | CORE COURSE(CC)-5 B (Elective) | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**Course Objectives:**

1. To introduce the concepts of algorithm and performance analysis.
2. To understand different algorithm design strategies for solving various problems.
3. To provide fundamental knowledge on Complexity Theory.

**UNIT-I**

**Introduction-** Algorithm, Pseudo Code for expressing algorithms, Performance Analysis- Space Complexity, Time Complexity, Asymptotic Notations. Disjoint Sets- disjoint set operations, union and find algorithms.

**UNIT- II**

**Divide and Conquer**- General method, Applications-Binary Search, Merge Sort and Quick Sort.
**Greedy Method**- General Method, Applications- Job Sequencing with deadlines, 0/1 Knapsack Problem, Minimum cost spanning trees

**UNIT-III**

**Dynamic Programming**- General Method, Applications-Optimal Binary Search Tree, 0/1 Knapsack Problem, All pair shortest path problem, Travelling Salesman Problem.
**Backtracking:**N-queen problem, Graph Coloring Problem and Hamiltonian Cycle.

**UNIT-IV**

**Branch and Bound**: Travelling Salesman Problem, 0/1 Knapsack Problem, FIFO Branch and Bound Search and LIFO Branch and Bound.
**Complexity Theory**: Introduction to NP Hard and NP Complete Problems.

**Text Books:**

1. Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
2. Design and analysis of algorithms, I.Chandra Mohan, 2nd Edition,PHI.
3. Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press.

**Reference Books:**

1. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.
2. Alfred V.Aho, John E Hopcroft and Jeffrey D.Ullman, The Design and Analysis of Computer Algorithms, Pearson Education, 1999.

**Course Outcomes :** After completion of the course student able to

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | Analyze the performance of a given algorithm by using Asymptotic Notations. | K1 |
| CO2 | Solve problems by using Divide-and-Conquer and Greedy Method. | K2 |
| CO3 | Apply dynamic programming and backtracking techniques for solving optimization problems. | K4 |
| CO4 | Design algorithms by using Branch and Bound Techniques. Also classify computational problems into P, NP, NP Hard and NP Complete. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO2 | 3 | 3 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | 3 | - |
| CO4 | 3 | 3 | 3 | 3 | - | 3 | 3 | - | - | 2 | 3 | 3 | 3 |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

# KRISHNA CHAITNAYA DEGREE COLLEGE

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## MSCS 203 A: DATA MINING AND DATA WAREHOUSING

| Programme | MSC(CS With AI) | Semester | **Secound** | | |
|---|---|---|---|---|---|
| Course Code | 203 | Course Name | **DATA MINING AND DATA WAREHOUSING** | | |
| Course category | CORE COURSE(CC)-6 A (Elective) | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**Course Objectives:**

- To conceptualize data mining and the need for pre-processing and to analyze the mining techniques for realistic data.
- To characterize the kinds of patterns that can be discovered by association rule mining.
- To implement classification and clustering techniques on large datasets.
- To identify business applications and trends of data mining.
- To get exposed to the concepts of data warehousing architecture and implementation**.**

**Unit-1**

**Introduction to data mining and Data Preprocessing**: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Major issues in Data Mining.
**Data Preprocessing:** Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction.
**Association Rule Mining**: Introduction, Frequent Item Set Generation, Association Rule Mining, Association Rule Generation; APRIOIRI Algorithm, the Partition Algorithms, FP-Growth Algorithm, Closed Frequent Item Set.

**Unit-2**
**Data Warehousing:** Definition of data warehouse, Operational Database Systems versus Data Warehouses, A Multidimensional Data Model, Data warehouse architecture, ETL Process, Difference between OLAP and OLTP.
**OLAP models:** ROLAP and MOLAP, OLAP operations, OLAP queries & Tools.
**Schemas for Multidimensional Databases:** Define Schemas - Star, snowflake and fact constellations, indexing.
**Unit-3**
**Classification and Prediction**
Classification versus Prediction, Classification by Decision Tree, Measures for Selecting the Best Split, Bayesian Classification, Rule Based Classification, Classification by Back Propagation, Support Vector Machines, KNN, Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor, Ensemble Methods.
**Unit-4**
Clustering: Cluster Analysis, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods: Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Outlier Analysis.
**TEXT BOOKS:**
1. DATA WAREHOUSING & DATA MINING- Dr. B. Shadaksharappa,Mr. P.Ramkumar ,Dr. T.N. Prabakar,2022

2. Data Mining-Concepts and Techniques -Jiawei Han & Michel Kamber. Morten Publisher 2nd

Edition, 2006.

**REFERENCE BOOKS:**

1. Data Mining Introductory and advanced topics -Margaret H Dunham. Pearson education.
2. Data Mining Techniques - Arun K Pujari. University Press.
3. Data Warehousing in the Real World- Sam Aanhory & Dennis Murray Pearson in Edn Asia. .
4. Data Warehousing Fundamentals-Paulraj Ponnaiah Wiley student Edition
5. The Data Warehouse Life cycle Tool kit-Ralph Kimball Wiley student edition

**Course Outcomes :** After completion of the course student able to

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | Students will be able to understand data mining and the need for pre-processing and to analyze the mining techniques for realistic data. | K1 |
| CO2 | Students will be able to apply the patterns that can be discovered by association rule mining. | K2 |
| CO3 | Students will be able to implement classification and clustering techniques on large datasets. | K4 |
| CO4 | Students will be able to identify business applications and trends of data mining. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 3 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO3 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO4 | - | 3 | 2 | - | - | - | - | - | - | - | 2 | - | - |

1-Low, 2-Medium, 3-High

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## MSCS 203 B: FULL STACK DEVELOPMENT

| Programme | MSC(CS With AI) | Semester | **Secound** | | |
|---|---|---|---|---|---|
| Course Code | 203 | Course Name | **FULL STACK DEVELOPMENT** | | |
| Course category | CORE COURSE(CC)-6 B (Elective) | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**Course Objectives:**

1. To become knowledgeable about the most recent web development technologies.
2. Idea for creating two tier and three tier architectural web applications.
3. Design and Analyze real time web applications.
4. Constructing suitable client and server side applications.
5. To learn core concept of both front end and back end programming.

**UNIT -1:**

**Introduction & Frontend Basics**
Meaning of Full Stack Development, Web application architecture, Client–Server model, Basics of Internet and HTTP **HTML:** Page structure, forms, tables, **CSS:** Styling, layouts, responsive design **Introduction to JavaScript:** Variables, functions, events.

**UNIT -2:**

**Frontend Development**
Advanced JavaScript basics, DOM manipulation, Introduction to React.js, Components, Props and State, Single Page Applications (SPA), Form handling and validation

**UNIT -3:**

**Backend Development**
Introduction to Backend and Server, Node.js basics, Express.js framework, Routing and middleware, Restful APIs, Handling GET and POST requests, Basic authentication concepts

**UNIT-4:**

**Database, Integration & Deployment**
Database fundamentals ,SQL concepts using MySQL ,CRUD operations ,Introduction to MongoDB, Connecting backend with database ,Connecting frontend with backend ,Git and GitHub basics, Introduction to deployment and hosting.

**TEXT BOOKS:**

1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett

ProfessionalJavaScript for Web Developers Book by Nicholas C. Zakas

**Reference Books:**

1. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-byStep Guide to CreatingDynamic Websites by Robin Nixon

2. Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB.

**Course Outcomes :** After completion of the course student able to

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | Develop a fully functioning website and deploy on a web server. | K1 |
| CO2 | Gain Knowledge about the front end and back end Tools | K2 |
| CO3 | Find and use code packages based on their documentation to produce working results in a project. | K4 |
| CO4 | Create web pages that function using external data. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 3 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO3 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO4 | - | 3 | 2 | - | - | - | - | - | - | - | 2 | - | - |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

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## MSCS 205 A: PRINCIPLES OF DATA SCIENCE

| Programme | MSC(CS With AI) | Semester | **Secound** | | |
|---|---|---|---|---|---|
| Course Code | 205 | Course Name | **PRINCIPLES OF DATA SCIENCE** | | |
| Course category | SKILL ORIENTED COURSE(SOC)-3 A (Elective) | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**Course Objective:**

- Students will develop relevant **programming** abilities.
- Students will demonstrate proficiency with statistical **analysis of data**.
- Students will develop the ability to build and assess data-based **models**.
- Students will execute statistical analyses with professional statistical **software**.
- Students will demonstrate skill in **data management**.
- Students will apply data science concepts and methods to **solve** problems in real-world contexts and will **communicate** these solutions effectively

**UNIT-I**

**Introduction to Data Science:** Definition, benefits and uses of data science and big data.

**Facets of Data:** Structured data, unstructured data, natural language, machine generated data, network data, audio, images and video streaming data.

**Data science process**: overview of data science process, defining the goal, Retrieving data, data preparation, data exploration, build the models, cleaning and transforming data, presentation and automation.

**UNIT-II**

**DATA:** Definition, characteristics of data, classification of digital data.

**The Data Science Fundamentals:** Distributed file system, data integration frame work, machine learning framework, system deployment, security.

**Data mining and Data Preprocessing**: Introduction data mining, Data Mining Functionalities, Classification of Data Mining systems, Need for Preprocessing the Data, Data Cleaning

**UNIT-III**

**BIG DATA:** Definition, Evolution of big data and its importance, four V's in big data, Big data analytics, Big data applications, big data designing data architecture, Big data Vs Little data.

**Machine Learning:** Definition, Applications of machine learning in data science, Types of Machine Learning (Degree) - supervised learning, semi supervised learning, un-supervised learning

**UNIT-IV**

**Data Visualization**: Definition, importance of data visualization in data science, Exploratory Data analysis -confronting new data set, visualization tools, proper scaling and labeling, effective use of color and shading, the power of repetition.

**Chart Types:** Tabular data, dot and line plots, scatter plots, bar plots and pie charts.

**Text Books:**


1. Introducing Data Science by Davy Cielen , Arno D.B.Meysman and Mohamed Ali, Published by Manning
2. Steven S.Skiena, The Data Science Design Manual, Published by Springer.Nature.

**Reference Books:**

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline.O'Reilly.
2. Jure Leskovek, AnandRajaraman and Jeffrey D.Ullman. Mining of Massive Datasets.v2.1, Cambridge University Press.

**Course Outcomes :** After completion of the course student able to

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | Explain various data types, and data formats , and identify and appropriately acknowledge sources of various types of data | K1 |
| CO2 | Gain an ability to apply mathematical and statistical methods in data science applications | K2 |
| CO3 | Demonstrate proficiency in using appropriate tools and technology to collect, process, transform, summarize, and visualize data. | K4 |
| CO4 | Apply various machine learning algorithms in data-based decision-making applications , and draw accurate and useful conclusions through data analysis | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 3 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO3 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO4 | - | 3 | 2 | - | - | - | - | - | - | - | 2 | - | - |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

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**MSCS 205 B: INTERNET OF THINGS**

| Programme | MSC(CS With AI) | Semester | **Secound** | | |
|---|---|---|---|---|---|
| Course Code | 205 | Course Name | **INTERNET OF THINGS** | | |
| Course category | SKILL ORIENTED COURSE(SOC)-3 B (Elective) | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**Course objectives:**

1. Understand the Fundamentals of IoT and Its Applications
2. Gain Proficiency in Sensors, Actuators, and IoT Development Tools
3. Master IoT Communication Protocols and Networkin.
4. Design and Implement IoT Solutions

**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.

**Domain Specific IoT:** Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.

**UNIT II**

**Sensors Networks** : Definition, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, RaspberriPi Development Kit, RFID Principles and components.

**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, LoRA

**UNIT IV**

**Arduino Simulation Environment**: Arduino Uno Architecture, Setting up the IDE, Writing Arduino Software, Arduino Libraries, Basics of Embedded C programming for Arduino, Interfacing LED.

**Sensor & Actuators with Arduino**: Overview of Sensors working, Analog and Digital Sensors, Interfacing of Temperature, Humidity, Motion.

***Text book:***


1. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. 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


**REFERENCE BOOK:**


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

**Course Outcomes :** After completion of the course student able to

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | To understand the various IOT protocols. | K1 |
| CO2 | To develop applications using Arduino/Raspberry Pi/ Equivalent boards. | K2 |
| CO3 | Test and experiment different sensors for application development. | K4 |
| CO4 | To develop applications that would read the sensor data and post it in Cloud | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 3 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO3 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO4 | - | 3 | 2 | - | - | - | - | - | - | - | 2 | - | - |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

# KRISHNA CHAITNAYA DEGREE COLLEGE

**(AUTONOMOUS)**

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## MSCS 206 A: SOFTWARE ENGINEERING

| Programme | MSC(CS With AI) | Semester | **Secound** | | |
|---|---|---|---|---|---|
| Course Code | 206 | Course Name | **SOFTWARE ENGINEERING** | | |
| Course category | SKILL ORIENTED COURSE(SOC)-4 A (Elective) | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**COURSE OBJECTIVES:**

- Discuss and Analyses how to develop software requirements specifications for a given problem.
- To understand Software development as a process
- To implement various software designs, data flow diagram models.
- various testing techniques including white box testing black box testing regression testing
- To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

**UNIT -1**

**SOFTWARE AND SOFTWARE Engineering:** The evolving role of software, changing nature of software, software application domain, unique nature of web application,
**SOFTWARE Process:** product and process, software engineering practice, software myths.
**PROCESS MODELS:** Generic process model, Prescriptive process model, specialized process model, Unified process model, Personal and team process models, product and process, Reverse Engineering.

**UNIT-2**

**SOFTWARE REQUIREMENTS:** Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.
**REQUIREMENTS ENGINEERING PROCESS:** Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.
**SYSTEM MODELS:** Context models, behavioral models, data models, object models, structured methods.

**UNIT -3**

**DESIGN ENGINEERING:** Design process and design quality, design concepts, the design model.
**CREATING AN ARCHITECTURAL DESIGN:** Software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modelling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

**UNIT – 4**

**PRODUCT METRICS:** Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

**RISK MANAGEMENT:** Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.
**QUALITY MANAGEMENT:** Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

**Text Books:**

1. Software Engineering- A practitioner's Approach by Roger pressman, Seventh Edition, Mc Graw Hill, 2014.
2. software Engineering by Ian Sommerville, 10th Edition, pearson Education2015
3. Agile Software Development by Jim Highsmith First Edition, Addison wesley

**Reference books:**

**Agile Modeling:** Effective practices for Extreme Programming and the Unified process by scott Amber, first Edition, John Wiley and Sons.

**Course Outcomes :** After completion of the course student able to

| | Course Outcome Description | Knowledge Level |
|---|---|---|
| CO1 | Ability to translate end-user requirements into system and software requirements | K1 |
| CO2 | Will have experience and/or awareness of testing problems and will be able to develop a simple testing report | K2 |
| CO3 | Understand and develop various structure and behavior UML diagrams. | K4 |
| CO4 | Explain the knowledge of project management tool Demonstrate how to manage file using Project Libre project management tool. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 3 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO3 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO4 | - | 3 | 2 | - | - | - | - | - | - | - | 2 | - | - |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

# KRISHNA CHAITNAYA DEGREE COLLEGE

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## MSCS 206 B: DEEP LEARNING

| Programme | MSC(CS With AI) | Semester | **Secound** | | |
|---|---|---|---|---|---|
| Course Code | 206 | Course Name | **DEEP LEARNING** | | |
| Course category | SKILL ORIENTED COURSE(SOC)-4 B (Elective) | Hour/Week | L | T | P |
| | | | 4 | 0 | 0 |
| | | Credits | 4 | | |

**Course Objectives**

1. Introduce students to the fundamentals and scope of Deep Learning.
2. Explain neural network concepts, activation functions, and training methods.
3. Teach advanced deep learning architectures like CNN, RNN, LSTM, and Auto encoders.
4. Familiarize students with practical tools, optimization techniques, and real-world applications.

UNIT – I

**Introduction to Deep Learning:**

Definition and scope of Deep Learning, Difference between AI, Machine Learning, and Deep Learning, History and evolution of Deep Learning, Applications of Deep Learning (Computer Vision, NLP, Speech Recognition, Healthcare)

UNIT – II

**Neural Networks Basics:**

Artificial Neuron model, Activation functions (Sigmoid, ReLU, Tanh), Feed forward neural networks (FNN),Training neural networks: Back propagation and Gradient Descent

UNIT – III

**Advanced Deep Learning Models:**

Convolution Neural Networks (CNN): Basics, architecture, applications, Recurrent Neural Networks (RNN): Basics, sequence modeling,Long Short-Term Memory Networks (LSTM): Concepts and uses,Autoencoders: Concept and applications

UNIT – IV

**Deep Learning Tools, Techniques & Applications:**

Deep Learning frameworks: Tensor Flow, PyTorch (overview),Optimization techniques: Learning rate, Dropout, Batch Normalization, Real-world applications: Image recognition, NLP, Chatbots, Recommendation Systems, Challenges and future trends in Deep Learning

**TEXT BOOKS:**


1. Ian Goodfellow, Yoshua Bengio, Aaron Courville – *Deep Learning*, MIT Press
2. Francois Chollet – *Deep Learning with Python*, Manning Publications


**REFERENCE BOOKS:**


1. Michael Nielsen – *Neural Networks and Deep Learning*, Determination Press
2. Charu Aggarwal – *Neural Networks and Deep Learning: A Textbook*, Springer
3. Sebastian Raschka – *Python Deep Learning*, Packt Publishing


**Course Outcomes :** After completion of the course student able to

| | **Course Outcome Description** | **Knowledge Level** |
|---|---|---|
| CO1 | Understand the basics and scope of Deep Learning and differentiate it from AI and Machine Learning. | K1 |

| | | |
|---|---|---|
| CO2 | Explain neural networks, activation functions, and network training methods. | K2 |
| CO3 | Apply advanced models (CNN, RNN, LSTM, Autoencoders) to practical problems. | K4 |
| CO4 | Utilize Deep Learning frameworks and optimization techniques for real-world AI applications. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 3 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO3 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |
| CO4 | - | 3 | 2 | - | - | - | - | - | - | - | 2 | - | - |

1-Low, 2-Medium, 3-High

# KRISHNA CHAITNAYA DEGREE COLLEGE

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| **Programme** | **M.Sc. Computer Science With AI** | **Semester** | **Secound** | |
|---|---|---|---|---|
| **Course Code** | **CC-202A P** | **Course Name** | **CLOUD COMPUTING LAB** | |
| Course Category | Practical | Hours/Week | L | P |
| | | | 0 | 4 |
| | | Credits | 2 | |

**List of Programmes**

1. Working and Implementation of Infrastructure as a service.
2. Implementation of Software as a Service.
3. Working and Implementation of Platform as a service
4. Implementation of Storage as a Service.
5. Implementation of Virtualization in Cloud Computing to Learn Virtualization Basics, Benefits of Virtualization in Cloud using Open-Source Operating
6. Installing OS on a Virtual Machine Monitor.
7. Offline/Online Migration of Virtual OS
8. Deployment and Configuration options in Amazon (AWS).
9. Deployment and Configuration options in Microsoft Azure.
10. Assignment to install and configure Google App Engine

**Course Outcomes :** After completion of the course student able to write programs

| | **Course Outcome Description** | **Knowledge Level** |
|---|---|---|
| CO1 | Describe various cloud computing platforms and service providers. | K2 |
| CO2 | Illustrate the significance of various types of virtualization. | K3 |
| CO3 | Identify the architecture, delivery models and industrial platforms for cloud computing based applications. | K4 |
| CO4 | Analyze the role of security aspects in cloud computing, Demonstrate cloud applications in various fields using suitable cloud platforms. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

**COURSE AND PROGRAMME OUTCOMES MAPPING**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PSO1 | PSO2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3 | 2 | - | - | - | - | - | - | - | - | 3 | 3 | 3 |
| CO 2 | 3 | - | - | - | 2 | - | - | - | - | - | 3 | 3 | 3 |
| CO 3 | 3 | - | 2 | - | - | - | - | - | - | - | 3 | 2 | 3 |
| CO 4 | 3 | - | - | 2 | - | - | - | - | - | - | 3 | 3 | 3 |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

# KRISHNA CHAITNAYA DEGREE COLLEGE

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| **Programme** | **M.Sc. Computer Science With AI** | **Semester** | **Secound** | |
|---|---|---|---|---|
| **Course Code** | **CC-202B P** | **Course Name** | **DESIGN AND ANALYSIS OF ALGORITHMS LAB** | |
| Course Category | Practical ( Elective Foundation) | Hours/Week | L | P |
| | | | 0 | 4 |
| | | Credits | 2 | |

**List of Programmes**

1. Write a program to perform Bubble sort for any given list of numbers.
2. Write a program to perform Quick Sort for the given list of integer values.
3. W rite a program to find Maximum and Minimum of the given set of integer values.
4. Write a Program to perform Merge Sort on the given two lists of integer values.
5. Write a program to find solution for knapsack problem using greedy method.
6. Write a program to find minimum cost spanning tree using Prim's Algorithm.
7. Write a program to find minimum cost spanning tree using Kruskal's Algorithm.
8. Write a program to perform Single source shortest path problem for a given graph.
9. Write a program to find solution for job sequencing with deadlines problem.
10. Write a program to solve N-QUEENS problem.

**Course Outcomes :** After completion of the course student able to write programs

| | **Course Outcome Description** | **Knowledge Level** |
|---|---|---|
| CO1 | Develop programs for sorting a given set of elements and analyze its time complexity | K2 |
| CO2 | Solve and analyze the problems using greedy methods using Dynamic programming . | K3 |
| CO3 | Apply backtracking method to solve various problems. | K4 |
| CO4 | Apply branch and bound method to solve 0/1 knapsack problem. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

**COURSE AND PROGRAMME OUTCOMES MAPPING**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| CO3 | 3 | 2 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| CO4 | 3 | 2 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

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| **Programme** | **M.Sc. Computer Science With AI** | **Semester** | **Secound** | |
|---|---|---|---|---|
| **Course Code** | **CC-203A P** | **Course Name** | **DATAMINING AND DATAWAREHOUSING LAB** | |
| Course Category | Practical | Hours/Week | L | P |
| | | | 0 | 4 |
| | | Credits | 2 | |

**List of Programmes**

1. Installation of WEKA Tool.
2. Creating new Arff File.
3. Demonstration of Association rule process on dataset using apriori algorithm.
4. Demonstration of Association rule process on dataset using FP- Growth algorithm.
5. Implementation of Decision Tree Induction.
6. Classification of data using Bayesian Classification.
7. Classification of data using Support Vector Machines.
8. Demonstration of clustering the data using Partitioning method.
9. Demonstration of clustering the data using Hierarchical method.
10. Demonstration of Outlier Detection using DBSCAN.

**Course Outcomes :** After completion of the course student able to write programs

| | **Course Outcome Description** | **Knowledge Level** |
|---|---|---|
| CO1 | Ability to add mining algorithms as a component to the existing tools | K2 |
| CO2 | Demonstrate the classification in large data sets | K3 |
| CO3 | Demonstrate the clustering in large data sets | K4 |
| CO4 | Ability to apply mining techniques for realistic data. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

**COURSE AND PROGRAMME OUTCOMES MAPPING**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PSO1 | PSO2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3 | 2 | - | - | - | - | - | - | - | - | 3 | 3 | 3 |
| CO 2 | 3 | - | - | - | 2 | - | - | - | - | - | 3 | 3 | 3 |
| CO 3 | 3 | - | 2 | - | - | - | - | - | - | - | 3 | 2 | 3 |
| CO 4 | 3 | - | - | 2 | - | - | - | - | - | - | 3 | 3 | 3 |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

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| **Programme** | **M.Sc. Computer Science With AI** | **Semester** | **Secound** | |
|---|---|---|---|---|
| **Course Code** | **S0C-203B P** | **Course Name** | **FULL STACK DEVELOPMENT LAB** | |
| Course Category | Practical ( Elective Foundation) | Hours/Week | L | P |
| | | | 0 | 4 |
| | | Credits | 2 | |

**List of Programmes**

1. **Personal Portfolio Website:**
   Build a responsive personal portfolio website using HTML, CSS, and JavaScript that showcases your bio, skills, and projects.
2. **To-Do List App:**
   Create a To-Do List application using JavaScript or React.js where users can add, edit, delete tasks, and save them in local storage or backend.
3. **Simple Calculator:**
   Develop a web-based calculator that performs addition, subtraction, multiplication, and division using JavaScript.
4. **Movie Review App (Full Stack):**
   Build a full stack application using React for frontend and Node.js/Express for backend that allows users to submit, view, and delete movie reviews.
5. **User Authentication System:**
   Implement a signup/login system with Node.js and Express, including basic authentication and password validation.
6. **Contact Form with Email Notification:**
   Create a contact form that sends submission details to an email using Node.js (Nodemailer) and validate the form inputs.
7. **Weather App Using API:**
   Build a weather application that fetches live weather data from OpenWeatherMap API and displays it on the frontend.
8. **Real-Time Chat Application:**
   Create a chat app using Node.js and Socket.io that allows multiple users to chat in real time.
9. **Blog Post Management System:**
   Build a blog application with Node.js/Express and MongoDB where users can create, read, update, and delete blog posts.
10. **Deploy Your Full Stack App Online:**
    Deploy any of your full stack applications on platforms like Netlify, Vercel, or Heroku and connect it to a GitHub repository for version control.

**Course Outcomes :** After completion of the course student able to write programs

| | **Course Outcome Description** | **Knowledge Level** |
|---|---|---|
| CO1 | Usage of various front and back end Tools. | K4 |
| CO2 | They can understand and create applications on their own. | K2 |
| CO3 | Demonstrate and Designing of Websites can be carried out. | K3,K6 |

| | | |
|---|---|---|
| CO4 | Develop web based application using suitable client side and server side code. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

**COURSE AND PROGRAMME OUTCOMES MAPPING**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| CO3 | 3 | 2 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| CO4 | 3 | 2 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |

-Low, 2-Medium, 3-High

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| **Programme** | **M.Sc. Computer Science With AI** | **Semester** | **Secound** | |
|---|---|---|---|---|
| **Course Code** | **SOC-205A P** | **Course Name** | **PRINCIPLES OF DATASCIENCE LAB** | |
| Course Category | Practical (Elective Foundation) | Hours/Week | L | P |
| | | | 0 | 4 |
| | | Credits | 2 | |

**List of Programmes**

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.

2. Working with Numpy arrays

3.Working with Pandas data frames

4. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.

5. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
b. Bivariate analysis: Linear and logistic regression modeling
c. Multiple Regression analysis
d. Also compare the results of the above analysis for the two data sets.

6. Apply and explore various plotting functions on UCI data sets.
a. Normal curves
b. Density and contour plots
c. Correlation and scatter plots
d. Histograms
e. Three dimensional plotting

7. Visualizing Geographic Data with Basemap

Course Outcomes : After completion of the course student able to write programs

| | **Course Outcome Description** | **Knowledge Level** |
|---|---|---|
| CO1 | Write, test, and debug simple Python programs. | K4 |
| CO2 | Develop different type of Arrays and Matrix Functions by importing NumPy. | K2 |
| CO3 | Visualize data using graphs by importing Matplotlib. | K3,K6 |
| CO4 | Handle and transform data by importing any CSV file to Pandas DataFrame. | K6 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

**COURSE AND PROGRAMME OUTCOMES MAPPING**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| CO3 | 3 | 2 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| CO4 | 3 | 2 | 3 | - | - | - | 2 | - | - | - | 3 | 3 | 3 |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

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| **Programme** | **M.Sc. Computer Science With AI** | **Semester** | **Secound** | |
|---|---|---|---|---|
| **Course Code** | **SOC-205B P** | **Course Name** | **INTERNET OF THINGS LAB** | |
| Course Category | Practical ( Elective Foundation) | Hours/Week | L | P |
| | | | 0 | 4 |
| | | Credits | 2 | |

**List of Programmes**

1. To study various IoT protocols – 6LowPAN, IPv4/IPv6, Wifi, Bluetooth, MQTT.
2. IoT Application Development Using sensors and actuators (temperature sensor, light sensor, infrared sensor)
3. To study Raspberry Pi development board and to implement LED blinking applications.
4. To develop an application to send and receive data with Arduino using HTTP request
5. To develop an application that measures the room temperature and posts the temperature value on the cloud platform.
6. To develop an application that measures the moisture of soil and post the sensed data over Google Firebase cloud platform.
7. To develop an application for measuring the distance using ultrasonic sensor and post distance value on Google Cloud IoT platform.

**Course Outcomes :** After completion of the course student able to write programs

| | **Course Outcome Description** | **Knowledge Level** |
|---|---|---|
| CO1 | Connect Arduino board with internet | K2 |
| CO2 | Demonstrate the working of simple IoT task of LED Control. | K1 |
| CO3 | Apply IoT concept in simple real life applications. | K3 |
| CO4 | Implement IoT based home automation system. | K4 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

**COURSE AND PROGRAMME OUTCOMES MAPPING**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 2 |
| CO2 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | - | 2 | 3 |
| CO3 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | 2 | - | - |
| CO4 | 3 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | 2 |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

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| | | | | |
|---|---|---|---|---|
| **Programme** | **M.Sc. Computer Science With AI** | **Semester** | **Secound** | |
| **Course Code** | **SOC-206A P** | **Course Name** | **SOFTWARE ENGINEERING LAB** | |
| Course Category | Practical ( Elective Foundation) | Hours/Week | L | P |
| | | | 0 | 4 |
| | | Credits | 2 | |

**List of Programmes**

1. Development of problem statements.
2. Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.
3. Preparation of Software Configuration Management and Risk Management related documents.
4. Study and usage of any Design phase CASE tool.
5. Performing the Design by using any Design phase CASE tools.
6. Develop test cases for unit testing and integration testing.
7. Develop test cases for various white box and black box testing techniques.

**Course Outcomes :** After completion of the course student able to write programs

| | **Course Outcome Description** | **Knowledge Level** |
|---|---|---|
| CO1 | Analyse and specify software requirements for a given problem | K2 |
| CO2 | Design software using UML and other modelling tools, adhering to software engineering principles | K1 |
| CO3 | Implement software components using modern development tools and practices. | K3 |
| CO4 | Develop and execute test cases to validate software functionality and performance. | K4 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

**COURSE AND PROGRAMME OUTCOMES MAPPING**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 2 |
| CO2 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | - | 2 | 3 |
| CO3 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | 2 | - | - |
| CO4 | 3 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | 2 |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |

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| **Programme** | **M.Sc. Computer Science With AI** | **Semester** | **Secound** | |
|---|---|---|---|---|
| **Course Code** | **SOC-206B P** | **Course Name** | **DEEPLEARNING LAB** | |
| Course Category | Practical ( Elective Foundation) | Hours/Week | L | P |
| | | | 0 | 4 |
| | | Credits | 2 | |

**List of Programmes**

1. Build a deep neural network model start with linear regression using multiple variables.
2. Write a program to convert speech into text.
3. Write a program to convert text into speech.
4. Write a program to convert video into frames.
5. Write a program for Time-Series Forecasting with the LSTM Model.
6. Write a program for object detection using image labeling tools.
7. Write a program to predict a caption for a sample image using LSTM.
8. Write a program for character recognition using CNN.
9. Write a program to predict a caption for a sample image using CNN.
10. Write a program for character recognition using RNN and compare it with CNN.

**Course Outcomes :** After completion of the course student able to write programs

| | **Course Outcome Description** | **Knowledge Level** |
|---|---|---|
| CO1 | Understand the basic concepts and techniques of Deep Learning and the need of Deep Learning techniques in real-world problems | K2 |
| CO2 | Understand CNN algorithms and the way to evaluate performance of the CNN architectures. | K1 |
| CO3 | Understand, learn and design GANs for the selected problems. | K3 |
| CO4 | Understand the concept of Auto-encoders and enhancing GANs using auto-encoders. | K4 |

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

**COURSE AND PROGRAMME OUTCOMES MAPPING**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 2 |
| CO2 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | - | 2 | 3 |
| CO3 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | 2 | - | - |
| CO4 | 3 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | 2 |
| 1-Low, 2-Medium, 3-High | | | | | | | | | | | | | |