AMAL JYOTHI
COLLEGE OF ENGINEERING
AUTONOMOUS
KANJIRAPPALLY

# CURRICULUM

## MCA Regular (REG)

## SEMESTER III - 2023

**Master of Computer Applications**

**Amal Jyothi College of Engineering(Autonomous)**

Kanjirappally, Koovappally P.O

Affiliated to

**APJ Abdul Kalam Technological University**

# Table of Contents



## VISION

To promote an academic and research environment conducive for innovation centric technical education.

## MISSION

a) Provide foundations and advanced technical education in both theoretical and applied Computer Applications in-line with Industry demands.

b) Create highly skilled computer professionals capable of designing and innovating real life solutions.

c) Sustain an academic environment conducive to research and teaching focused to generate up-skilled professionals with ethical values.

d) Promote entrepreneurial initiatives and innovations capable of bridging and contributing with sustainable, socially relevant technology solutions.

## PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

**PEO1 :** Be successfully employed in computing profession as well as multidisciplinary domains in supportive and leadership roles.

**PEO2 :** Participate in life-long learning through the successful completion of advanced degrees, continuing education, certifications and/or other professional developments.

**PEO3 :** Promote design, research, product implementation and services in the field of Computer Science and Applications through strong technical, communication and entrepreneurial skills.

## PROGRAM OUTCOMES (POs)

Graduates will be able to:

**PO1 :** Computational Knowledge: Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

**PO2 :** Problem analysis: Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences and relevant domain disciplines.

**PO3 :** Design /Development of Solutions: Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

**PO4 :** Conduct investigations of complex Computing problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5 :** Modern Tool Usage: Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

**PO6 :** Professional Ethics: Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices.

**PO7 :** Life-long Learning: Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

**PO8 :** Project management and finance: Demonstrate knowledge and understanding of the computing and management principles and apply these to oneâ€™s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO9 :** Communication Efficacy: Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

**PO10 :** Societal and Environmental Concern: Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practices.

**PO11 :** Individual and Team Work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

**PO12 :** Innovation and Entrepreneurship: Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

## PROGRAMME SPECIFIC OUTCOME (PSOs)

Programme Specific Outcomes of the Programme (REG) are

**PSO1 :** Apply Engineering knowledge to analyze, design and develop computing solutions by employing modern computer languages, environments and platforms that can solve complex problems.

**PSO2 :** Anticipate the changing direction of computational technology, evaluate it and communicate the likely utility of that for building software systems that would perform tasks related to Industry, Research and Education.

**PSO3 :** Inculcate the knowledge of Engineering and Management principles to manage projects effectively and create innovative career path

## SCHEME OF THE PROGRAMME

**- MCA - REG - SEMESTER III - 2023**

| No | Course Code | Category | Course | Hours/week | | | | Hours | CIE Marks | ESE Marks | Total | ESE Pass | Total Pass | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | R | | | | | | | |
| 1 | 23MCA201 | GEN | Data Science & Machine Learning | 3 | 1 | 0 | 0 | 4 | 40 | 60 | 100 | 24 | 50 | 4 |
| 2 | 23MCA203 | GEN | Design & Analysis of Algorithms | 3 | 1 | 0 | 0 | 4 | 40 | 60 | 100 | 24 | 50 | 4 |
| 3 | -- | | Elective III | - | - | - | - | 0 | 40 | 60 | 100 | 24 | 50 | 4 |
| 4 | -- | | Elective IV | - | - | - | - | 0 | 40 | 60 | 100 | 24 | 50 | 4 |
| 5 | 23MCA241 | GEN | Data Science Lab | 0 | 1 | 3 | 0 | 4 | 50 | 50 | 100 | 20 | 50 | 2 |
| 6 | 23MCA243 | GEN | Mobile Application Development Lab | 0 | 1 | 3 | 0 | 4 | 50 | 50 | 100 | 20 | 50 | 2 |
| 7 | 23MCA245 | GEN | Mini Project | 0 | 0 | 4 | 0 | 4 | 50 | 50 | 100 | 20 | 50 | 2 |
| 8 | 23MCANC3 | GEN | Domain Expertise Workshops | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | | | | 700 | | | 22 |

| Elective III | |
|---|---|
| 23MCA261 | Operations Research |
| 23MCA263 | Cyber Security & Cryptography |
| 23MCA265 | Cloud Computing |
| 23MCA267 | Cyber Forensics |
| 23MCA269 | Compiler Design |
| | |
| **Elective IV** | |
| 23MCA281 | Internet of Things |
| 23MCA283 | Deep Learning |
| 23MCA285 | Digital Image Processing |
| 23MCA287 | Bioinformatics |
| 23MCA289 | Social Network Analysis |

AMAL JYOTHI
COLLEGE OF ENGINEERING
(AUTONOMOUS)

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | R | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|---|---|
| 23MCA201 | DATA SCIENCE & MACHINE LEARNING | GEN | 3 | 1 | 0 | 0 | 4 | 2023 |

**Preamble :**

This is an introductory course on data science and basic concepts behind various machine learning techniques. Machine learning is the study of adaptive computational systems that improve their performance with experience. At the end of the course the students should be able to design and implement machine learning solutions to classification, regression, and clustering problems and to evaluate and interpret the results of the algorithms.

**Course Outcomes(CO):** Upon successful completion of this course, students should be able to:

| | |
|---|---|
| CO1 | Learn the fundamental concepts of data science and data visualization techniques. |
| CO2 | Know the basics of machine learning and use lazy learning and probabilistic learning algorithms to solve data science problems. |
| CO3 | Describe decision trees, classification rules and regression methods and how these algorithms can be applied to solve data science problems. |
| CO4 | Solve data science problems using neural networks and support vector machines. |
| CO5 | Learn about clustering using k-means algorithm and evaluate and improve the performance of machine learning classification models. |

**Mapping of course outcomes with program outcomes**

| # | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 1 | - | - | - | - | 2 | - | - | - | - | - |
| **CO2** | 3 | 3 | 3 | 2 | - | - | 2 | - | - | - | - | - |
| **CO3** | 3 | 3 | 3 | 2 | - | - | 2 | - | - | - | - | - |
| **CO4** | 3 | 3 | 3 | 2 | 3 | - | 2 | - | - | - | - | - |
| **CO5** | 3 | 3 | 3 | 2 | - | - | 2 | - | - | - | - | - |
| **CO6** | - | - | - | - | - | - | - | - | - | - | - | - |

**Assessment Pattern :**

| Bloom's Category | Continuous Assessment Tests | | End Semester Examination |
|---|---|---|---|
| | 1 | 2 | |
| Remember | 15 | 10 | 10 |
| Understand | 25 | 20 | 30 |
| Apply | 10 | 20 | 20 |
| Analyse | | | |
| Evaluate | | | |
| Create | | | |

**Mark distribution :**

| Total Marks | CIE | ESE | ESE Duration |
|---|---|---|---|
| 100 | 40 | 60 | 3 Hours |

**Continuous Internal Evaluation Pattern :**

| | |
|---|---|
| Attendance | 8 marks |
| Continuous Assessment Test (2 numbers) | 20 marks |
| Assignment/Quiz/Course project | 12 marks |

**End Semester Examination Pattern (3 Hours)**

| Part | Total Qns | No. of Qns to be answered | Marks |
|---|---|---|---|
| Part A | 10 | 10 | 3 |
| Part B | 10 | 5 | 6 |
| Total Marks | | | 60 |

**Book of Study :**

1. Vijay Kotu, Bala Deshpande, Data Science Concepts and Practice, Morgan Kaufmann Publishers 2018 (Module 1)
2. Brett Lantz, Machine Learning with R, Second edition, PackT publishing 2015 (Modules 2 to 5)

**References :**


1. Michael Steinbach, Pang-Ning Tan, and Vipin Kumar, Introduction to Data Mining, Pearson 2016.
2. Jiawei Han, Micheline Kamber and Jian Pei, Data mining Concepts and techniques, Morgan Kaufmann Publishers 2012
3. Peter Harrington, Machine Learning in action, Dreamtech publishers 2012
4. Dr M Gopal, Applied Machine learning, McGraw Hill Education Private Limited
5. E. Alpayidin, Introduction to Machine Learning, Prentice Hall of India (2005)
6. T. Hastie, RT Ibrashiran and J. Friedman, The Elements of Statistical Learning, Springer 2001
7. Data Science from Scratch: First Principles with Python, Joel Grus, O'Reilly, First edition, 2015
8. Introducing Data Science, Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Manning Publications Co., 1st edition, 2016

**Industry, Innovation, and Emerging Technologies (Material)**
**:**

1. AWS Certified Machine Learning - Specialty

2. Python for Machine Learning(Great Learning)

**Syllabus**

**Module 1: Introduction to data science (9 Hours)**

Introduction to data science Data science classification Data science process - Prior knowledge, Data preparation, Modelling, Application Data exploration - Data sets,Descriptive statistics for univariate and multivariate data.Data visualisation – Histogram, Quartile plot, Distribution chart, Scatter plot, Bubble chart,Density chart.

**Module 2: Introduction to machine learning (9 Hours)**

How machines learn - Data storage, Abstraction,Generalisation, Evaluation Machine learning in practice - Types of machine learning algorithms.Lazy learning: Classification using K-Nearest Neighbour algorithm Measuring similarity with distance, Choice of k, Preparing data for use with k-NN.Probabilistic learning: Understanding Naive Bayes - Conditional probability and Bayes theorem, Naive Bayes algorithm for classification, The Laplace estimator, Using numeric features with Naive Bayes.

**Module 3: Decision tree learning (9 Hours)**

Concept of decision tree Divide and conquer approach C5.0 Decision tree algorithm Choosing the best split Pruning the decision tree.Classification rules learning: Concept of classification rules Separate and conquer approach The 1R algorithm, Rules from decision trees.Regression methods: Concept of regression Simple linear regression Ordinary least squares estimation Correlations Multiple linear regression.

**Module 4: Neural network learning (9 Hours)**

Neural network learning: Artificial neurons Activation functions Network topology Training neural networks with backpropagation.Support vector machines: Hyperplanes Classification using hyperplanes Maximum margin hyperplanes in linearly separable data Using kernels for non-linear spaces.

**Module 5: Clustering (9 Hours)**

Clustering: The k-means clustering algorithm Using distance to assign and update clusters Choosing number of clusters.Evaluating model performance: Confusion matrices Precision and recall Sensitivity and specificity Precision and recall F-measure ROC curves Cross validation - K-fold cross validation, Bootstrap sampling Improving model performance - Bagging, Boosting, Random forests.

**Course Contents and Lecture Schedule**

| Sl. No | Topic | No. of Lectures |
|---|---|---|
| **Module 1: Introduction to data science** | | (9 Hours) |
| 1.1 | Introduction to data science;Data science classification;Data science process - Prior knowledge, Data preparation, Modelling, Application;Data exploration - Data sets,Descriptive statistics for univariate and multivariate data | |

| | | |
|---|---|---|
| 1.2 | Data visualisation – Histogram, Quartile plot, Distribution chart, Scatter plot, Bubble chart,Density chart | |
| **Module 2: Introduction to machine learning** | | (9 Hours) |
| 2.1 | How machines learn - Data storage, Abstraction,Generalisation, Evaluation ;Machine learning in practice - Types of machine learning algorithms | |
| 2.2 | Lazy learning: Classification using K-Nearest Neighbour algorithm ;Measuring similarity with distance, Choice of k, Preparing data for use with k-NN | |
| 2.3 | Probabilistic learning: Understanding Naive Bayes - Conditional probability and Bayes theorem, Naive Bayes algorithm for classification, The Laplace estimator, Using numeric features with Naive Bayes | |
| **Module 3: Decision tree learning** | | (9 Hours) |
| 3.1 | Concept of decision tree ;Divide and conquer approach ;C5.0 Decision tree algorithm;Choosing the best split;Pruning the decision tree | |
| 3.2 | Classification rules learning: Concept of classification rules;Separate and conquer approach;The 1R algorithm, Rules from decision trees | |
| 3.3 | Regression methods: Concept of regression;Simple linear regression;Ordinary least squares estimation;Correlations;Multiple linear regression | |
| **Module 4: Neural network learning** | | (9 Hours) |
| 4.1 | Neural network learning: Artificial neurons;Activation functions;Network topology;Training neural networks with backpropagation | |
| 4.2 | Support vector machines: Hyperplanes;Classification using hyperplanes;Maximum margin hyperplanes in linearly separable data;Using kernels for non-linear spaces | |
| **Module 5: Clustering** | | (9 Hours) |
| 5.1 | Clustering: The k-means clustering algorithm;Using distance to assign and update clusters;Choosing number of clusters | |
| 5.2 | Evaluating model performance: Confusion matrices;Precision and recall;Sensitivity and specificity;Precision and recall;F-measure;ROC curves;Cross validation - K-fold cross validation, Bootstrap sampling;Improving model performance - Bagging, Boosting, Random forests | |
| Total Hours | | 45 |

AMAL JYOTHI
COLLEGE OF ENGINEERING
(AUTONOMOUS)

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | R | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|---|---|
| 23MCA203 | DESIGN & ANALYSIS OF ALGORITHMS | GEN | 3 | 1 | 0 | 0 | 4 | 2023 |

**Preamble :**

The syllabus is prepared with a view to provide a strong foundation to students in design and analysis of computer algorithms and to introduce them the advanced topics such as Network Flows, Approximation algorithms and Randomised algorithms.

**Prerequisite :**

Knowledge in Data Structures

**Course Outcomes(CO):** Upon successful completion of this course, students should be able to:

| | |
|---|---|
| CO1 | Understand and develop Ability to Analyze algorithm, its complexity and to representation using standard Notations. |
| CO2 | Understand optimization models using Knowing Greedy strategy and Dynamic Programming in algorithm design. |
| CO3 | Understand the Backtracking, Branch and Bound and Lower Bound method of an algorithm design . |
| CO4 | Understand the fundamental concepts of Computational complexity and Network flows. |
| CO5 | Understand the concepts of Approximation and Randomized class of Algorithms. |

**Mapping of course outcomes with program outcomes**

| # | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | - | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 1 |
| **CO2** | 3 | 3 | 3 | 2 | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 1 |
| **CO3** | 3 | 3 | 3 | 2 | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 1 |
| **CO4** | 3 | 3 | 3 | 3 | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 1 |
| **CO5** | 3 | 3 | 3 | - | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 1 |
| **CO6** | - | - | - | - | - | - | - | - | - | - | - | - |

**Assessment Pattern :**

| Bloom's Category | Continuous Assessment Tests | | End Semester Examination |
|---|---|---|---|
| | 1 | 2 | |
| Remember | 20 | 20 | 20 |
| Understand | 20 | 20 | 20 |
| Apply | 10 | 10 | 10 |
| Analyse | | | 10 |
| Evaluate | | | |
| Create | | | |

**Mark distribution :**

| Total Marks | CIE | ESE | ESE Duration |
|---|---|---|---|
| 100 | 40 | 60 | 3 hours |

**Continuous Internal Evaluation Pattern :**

Attendance : 8 marks
Continuous Assessment Test (2 numbers) : 20 marks
Assignment/Quiz/Course project : 12 marks

**End Semester Examination Pattern (3 Hours)**

| Part | Total Qns | No. of Qns to be answered | Marks |
|---|---|---|---|
| Part A | 10 | 10 | 3 |
| Part B | 10 | 5 | 6 |
| Total Marks | | | 60 |

**Book of Study :**

1. Thomas H. Cormen, et al., “Introduction to Algorithms”, Prentice Hall, 3rd Edition (2010)
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Orient Longman, Universities Press, 2nd Edition (2008)

**References :**

1. Richard Neapolitan, Kumarss Naimipour, “Foundations of Algorithms”, Jones and Bartlett Publishers, Inc, 4th Edition (2011).
2. Sara Baase, Allen Van Gelder, “Computer Algorithms: Introduction to Design and Analysis”, Pearson India, 3rd Edition (2002).
3. A. Levitin, “Introduction to the Design & Analysis of Algorithms”, Pearson Education, 3rd Edition (2008).

**Syllabus**

**Module 1: Review of Algorithm Analysis (8 Hours)**

Time and Space Complexity Asymptotic Notations Recurrence Equations Solving Recurrence Equations- Substitution method and Iteration method.Divide and Conquer: Control Abstraction Merge Sort Quick Sort Matrix Multiplication.

**Module 2: Greedy Strategy (9 Hours)**

Greedy Strategy: Control Abstraction Knapsack Problem Minimal Spanning Tree Algorithms- Prim's and Kruskal's Algorithm Job Scheduling with deadlines.Dynamic Programming: Control Abstraction Principle of Optimal Substructure All Pairs shortest path problem Travelling Salesman Problem Bellman-Ford Algorithm.

**Module 3: Backtracking (7 Hours)**

Backtracking: Control Abstraction N-Queens problem Sum of Subsets Problem.Branch and Bound: Control Abstraction 8- Puzzle problem.Lower Bounds: The Decision Tree method Lower Bounds for Comparison based Sort and Searching.

**Module 4: Complexity Theory (12 Hours)**

Complexity Theory: Class P and NP Polynomial time reductions Class NP Hard and NP Complete Example Problems- Vertex Cover problem, Clique Problem.Network Flows: Flow Networks and Network Flow Max- Flow Min Cut Theorem Ford Fulkerson method Bipartite matching.

**Module 5: Introduction to Approximation Algorithms (12 Hours)**

Introduction to Approximation Algorithms: Approximation Ratio 2-approximation algorithm for Vertex Cover problem Vertex Cover Approximation using Linear Programming and LP Rounding Algorithm.Introduction to Randomised Algorithms: Review of Basic Probability Schwartz-Zippel Lemma and Polynomial Identity Testing Randomized Quick Sort.

**Course Contents and Lecture Schedule**

| Sl. No | Topic | No. of Lectures |
|---|---|---|
| **Module 1: Review of Algorithm Analysis** | | (8 Hours) |
| 1.1 | Time and Space Complexity;Asymptotic Notations;Recurrence Equations;Solving Recurrence Equations- Substitution method and Iteration method | |
| 1.2 | Divide and Conquer: Control Abstraction;Merge Sort;Quick Sort;Matrix Multiplication | |
| **Module 2: Greedy Strategy** | | (9 Hours) |
| 2.1 | Greedy Strategy: Control Abstraction;Knapsack Problem;Minimal Spanning Tree Algorithms- Prim's and Kruskal's Algorithm;Job Scheduling with deadlines | |
| 2.2 | Dynamic Programming: Control Abstraction;Principle of Optimal Substructure;All Pairs shortest path problem;Travelling Salesman Problem;Bellman-Ford Algorithm | |
| **Module 3: Backtracking** | | (7 Hours) |
| 3.1 | Backtracking: Control Abstraction;N-Queens problem;Sum of Subsets Problem | |
| 3.2 | Branch and Bound: Control Abstraction;8- Puzzle problem | |
| 3.3 | Lower Bounds: The Decision Tree method;Lower Bounds for Comparison based Sort and Searching | |
| **Module 4: Complexity Theory** | | (12 Hours) |

| | | |
|---|---|---|
| 4.1 | Complexity Theory: Class P and NP;Polynomial time reductions;Class NP Hard and NP Complete;Example Problems- Vertex Cover problem, Clique Problem | |
| 4.2 | Network Flows: Flow Networks and Network Flow;Max- Flow Min Cut Theorem;Ford Fulkerson method;Bipartite matching | |
| **Module 5: Introduction to Approximation Algorithms** | | (12 Hours) |
| 5.1 | Introduction to Approximation Algorithms: Approximation Ratio;2-approximation algorithm for Vertex Cover problem;Vertex Cover Approximation using Linear Programming and LP Rounding Algorithm | |
| 5.2 | Introduction to Randomised Algorithms: Review of Basic Probability;Schwartz-Zippel Lemma and Polynomial Identity Testing;Randomized Quick Sort | |
| Total Hours | | 48 |

AMAL JYOTHI
COLLEGE OF ENGINEERING
(AUTONOMOUS)

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | R | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|---|---|
| 23MCA261 | OPERATIONS RESEARCH | GEN | 3 | 1 | 0 | 0 | 4 | 2023 |

**Course Outcomes(CO):** Upon successful completion of this course, students should be able to:

| | |
|---|---|
| CO1 | Formulate linear programming problems from real-world scenarios. Solve linear programming problem using graphical Method, Simplex method and Big M method |
| CO2 | Understand the concept of duality in linear programming and its importance. Formulate the dual of a given primal linear programming problem. Apply the simplex method to solve both the primal and the dual problems. |
| CO3 | Understand the formulation and significance of transportation problems in operations research. |
| CO4 | Use network analysis to solve real world problems |
| CO5 | Understand and extend queuing models to analyse real world systems |

**Mapping of course outcomes with program outcomes**

| # | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| **CO5** | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| **CO6** | - | - | - | - | - | - | - | - | - | - | - | - |

**Assessment Pattern :**

| Bloom's Category | Continuous Assessment Tests | | End Semester Examination |
|---|---|---|---|
| | 1 | 2 | |
| Remember(K1) | 15 | 15 | 15 |
| Understand(K2) | 20 | 20 | 30 |
| Apply(K3) | 15 | 15 | 15 |

**End Semester Examination Pattern (3 Hours)**

| Part | Total Qns | No. of Qns to be answered | Marks |
|---|---|---|---|
| Part A | 10 | 10 | 3 |
| Part B | 10 | 5 | 6 |
| Total Marks | | | 60 |

**Book of Study :**

1. Hamdy A.Taha, "Operations Research-An Introduction", Prentice Hall of India
2. Ravindran, Philips and Solberg, Wiley, "Operations Research", Second edition(2007),Wiley
3. Kanti Swarup, P.K.Gupta and Man Mohan "Operations Research", Sultan Chand (2010).
4. Prem Kumar Gupta and Dr. D.S. Hira "Operations Research", S Chand & Company pvt. Ltd

**References :**

1. G Hadley, Linear programming, Narosa Publishing House, New Delhi, 2002
2. R Panneerselvam, Operation Research. PHI, 2006
3. Hillier & Lieberman, Introduction to Operations Research, Holden Day Inc., 1996

**Internet Study Material :**

1. https://nptel.ac.in/courses/111/107/111107128/
2. https://faculty.psau.edu.sa/filedownload/doc-6-pdf-14b14198b6e26157b7eba06b390ab763-original.pdf
3. http://164.100.133.129:81/econtent/Uploads/Operations_Research.pdf
4. http://ebooks.lpude.in/commerce/bcom/term_5/DCOM303_DMGT504_OPERATION_RESEARCH.pdf

**Syllabus**

**Module 1: Linear programming problem (9 Hours)**

Linear programming problem Slack and surplus variable Standard form Solution of Linear programming problem Basic solution Basic feasible solution Degenerate and Nondegenerate solutions Optimal solution Solution by simplex method Artificial variables Big- M method.

**Module 2: Duality in Linear Programming Problem (9 Hours)**

Duality in Linear Programming Problem Statement of duality theorem Statement of complementary slackness theorem The primal Duality solutions using simplex method Revised simplex method.

**Module 3: Transportation problem (9 Hours)**

Solution of Transportation problem- Finding an initial basic feasible solution North West Corner method Matrix minima method Vogel's Approximation method Test for Optimality Modi method Unbalanced Transportation problem Maximisation in Transportation problem Assignment problem Optimal solution Hungarian method of assignment Maximization in assignment problem.

**Module 4: Network analysis (9 Hours)**

Network analysis Project scheduling Construction of project networks Critical path method (CPM) Identification of critical path using CPM Estimation of Floats- Total float- Independent float- Project Evaluation and Review Technique (PERT) Computation of expected completion times by PERT.

**Module 5: Queuing theory (9 Hours)**

Elements of Queuing System Kendall's notation Operating characteristics Poisson process Exponential distribution Mean and variance Birth and Death process Queuing models based on Poisson process Single server models with finite and infinite capacity Multi server model with finite and infinite capacity.

**Course Contents and Lecture Schedule**

| Sl. No | Topic | No. of Lectures |
|---|---|---|
| **Module 1: Linear programming problem** | | (9 Hours) |
| 1.1 | Linear programming problem;Slack and surplus variable;Standard form;Solution of Linear programming problem;Basic solution;Basic feasible solution;Degenerate and Nondegenerate solutions;Optimal solution;Solution by simplex method;Artificial variables;Big- M method | |
| **Module 2: Duality in Linear Programming Problem** | | (9 Hours) |
| 2.1 | Duality in Linear Programming Problem;Statement of duality theorem;Statement of complementary slackness theorem;The primal Duality solutions using simplex method;Revised simplex method | |
| **Module 3: Transportation problem** | | (9 Hours) |
| 3.1 | Solution of Transportation problem-;Finding an initial basic feasible solution;North West Corner method;Matrix minima method;Vogel's Approximation method;Test for Optimality;Modi method;Unbalanced Transportation problem;Maximisation in Transportation problem;Assignment problem;Optimal solution;Hungarian method of assignment;Maximization in assignment problem | |
| **Module 4: Network analysis** | | (9 Hours) |
| 4.1 | Network analysis;Project scheduling;Construction of project networks;Critical path method (CPM);Identification of critical path using CPM;Estimation of Floats- Total float-;Independent float- Project Evaluation and Review Technique (PERT);Computation of expected completion times by PERT | |

| | | |
|---|---|---|
| **Module 5: Queuing theory** | | (9 Hours) |
| 5.1 | Elements of Queuing System;Kendall's notation;Operating characteristics;Poisson process;Exponential distribution;Mean and variance;Birth and Death process;Queuing models based on Poisson process;Single server models with finite and infinite capacity;Multi server model with finite and infinite capacity | |
| Total Hours | | 45 |

AMAL JYOTHI
COLLEGE OF ENGINEERING
(AUTONOMOUS)

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | R | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|---|---|
| 23MCA263 | CYBER SECURITY & CRYPTOGRAPHY | GEN | 3 | 1 | 0 | 0 | 4 | 2023 |

**Preamble :**

This course is designed to provide theoretical concepts used in cryptography and to introduce the students to various cryptographic algorithms and techniques used for implementing data security and protection. This course also discusses common web application security vulnerabilities.

**Prerequisite :**

Student is expected to have studied mathematics courses that cover Elementary Number Theory, Finite Field, Discrete Logarithm and Euclidean Algorithm.

**Course Outcomes(CO):** Upon successful completion of this course, students should be able to:

| | |
|---|---|
| CO1 | Analyze fundamentals Cryptography and Classical Encryption techniques |
| CO2 | Analyze the Conventional Symmetric Key Encryption techniques |
| CO3 | Evaluate the authentication applications and hash algorithms |
| CO4 | Distinguish various protocols for network security to protect against the threats in the networks. |
| CO5 | Analyze common web application security vulnerabilities and prevention mechanisms |

**Mapping of course outcomes with program outcomes**

| # | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 3 | - | - | 2 | 1 | - | - | 2 | - |
| **CO2** | 3 | 3 | 1 | 1 | - | - | 2 | - | - | - | - | 1 |
| **CO3** | 3 | 3 | - | 2 | 2 | 1 | 2 | - | 1 | 1 | - | 1 |
| **CO4** | 3 | 2 | - | 1 | - | 1 | 2 | - | - | - | - | 1 |
| **CO5** | 3 | 2 | - | - | 1 | - | 2 | 1 | - | - | 2 | - |
| **CO6** | - | - | - | - | - | - | - | - | - | - | - | - |

**Assessment Pattern :**

| Bloom's Category | Continuous Assessment Tests | | End Semester Examination |
|---|---|---|---|
| | 1 | 2 | |
| Remember | 5 | 5 | 5 |
| Understand | 15 | 15 | 20 |
| Apply | 15 | 15 | 20 |
| Analyze | 15 | 15 | 15 |
| Evaluate | | | |
| Create | | | |

**Mark distribution :**

| Total Marks | CIE | ESE | ESE Duration |
|---|---|---|---|
| 100 | 40 | 60 | 3 hours |

**Continuous Internal Evaluation Pattern :**

Attendance : 8 marks

Continuous Assessment Test (2 numbers) : 20 marks

Assignment/Quiz/Course project : 12 marks

**End Semester Examination Pattern (3 Hours)**

| Part | Total Qns | No. of Qns to be answered | Marks |
|---|---|---|---|
| Part A | 10 | 10 | 3 |
| Part B | 10 | 5 | 6 |
| Total Marks | | | 60 |

**Book of Study :**

1. William Stallings, “Cryptography and Network Security,” 6th Edition, Pearson Education, March (2013).
2. Behrouz A. Forouzan, “Introduction to Cryptography and Network Security”, Tata McGraw-Hill Publishing 2nd Edition (2011).

**References :**

1. Charlie Kaufman, Radia Perlman and Mike Speciner, “Network Security”, Prentice Hall of India, 2002.
2. Manuel Mogollon, “Cryptography and Security Services – Mechanisms and Applications”, Cybertech Publishing, 2008
3. William R. Cheswick, Steven M. Bellovin, Aviel D. Rubin, “Firewalls and Internet Security” Addison-Wesley, 2003

**Massive Open Online Courses (MOOCs) :**

1.https://www.coursera.org/learn/crypto
2. https://www.coursera.org/learn/advanced-data-structures-rsa-and-quantum-algorithms

**Syllabus**

**Module 1: Introduction to Cryptography, OSI security architecture (7 Hours)**

Security Services Mechanisms and attacks Phishing Ransomware DoS attack Network security model Classical Encryption techniques Symmetric cipher model Substitution techniques Transposition techniques Steganography.

**Module 2: Conventional Symmetric Key Encryption (10 Hours)**

Block ciphers and Stream Ciphers Block Cipher Design Principles Modes of operation Data Encryption Standard Advanced Encryption Standard (AES) Multiple Encryption Triple DES.Public key cryptography: Principles of public key cryptosystems The RSA algorithm Key management Diffie Hellman Key exchange Elliptic curve arithmetic Elliptic curve cryptography.

**Module 3: Hash Functions and MAC (10 Hours)**

Properties of hash functions birthday attack hashcash Message Authentication Code Algorithms MAC protocols: HMAC, CMAC.Digital Signatures: Classification of signature schemes: RSA signature Digital Signature Standard Overview of ElGamal and Schnorr schemes One time signature schemes Attacks on Digital Signatures Blind Signatures.

**Module 4: Introduction to Cyber Security (10 Hours)**

Email Security: Security Services for email Attacks possible through email Establishing keys privacy Authentication of the source Message Integrity Non-repudiation Pretty Good Privacy S/MIME.IP Security: Overview of IPSec IPv4 and IPv6 Authentication Header Encapsulation Security Payload (ESP) Internet Key Exchange.Transport Level Security: SSL/TLS Basic Protocol computing the keys, client authentication PKI as deployed by SSL Attacks fixed in v3 Exportability Encoding Secure Electronic Transaction (SET).

**Module 5: Common web application security vulnerabilities (8 Hours)**

Injection flaws Broken authentication Sensitive data exposure XML External Entities (XXE) Broken access control Security misconfiguration Cross-Site Scripting (XSS) Insecure deserialization Using components with known vulnerabilities Insufficient logging & monitoring.Example attack scenarios of each of the vulnerabilities listed; how to prevent them.

**Course Contents and Lecture Schedule**

| Sl. No | Topic | No. of Lectures |
|---|---|---|
| **Module 1: Introduction to Cryptography, OSI security architecture** | | (7 Hours) |
| 1.1 | Security Services;Mechanisms and attacks;Phishing;Ransomware;DoS attack;Network security model;Classical Encryption techniques;Symmetric cipher model;Substitution techniques;Transposition techniques;Steganography | |
| **Module 2: Conventional Symmetric Key Encryption** | | (10 Hours) |
| 2.1 | Block ciphers and Stream Ciphers;Block Cipher Design Principles;Modes of operation;Data Encryption Standard;Advanced Encryption Standard (AES);Multiple Encryption;Triple DES | |
| 2.2 | Public key cryptography: Principles of public key cryptosystems;The RSA algorithm;Key management ;Diffie Hellman Key exchange ;Elliptic curve arithmetic ;Elliptic curve cryptography | |
| **Module 3: Hash Functions and MAC** | | (10 Hours) |
| 3.1 | Properties of hash functions;birthday attack;hashcash;Message Authentication Code Algorithms;MAC protocols: HMAC, CMAC | |

| | | |
|---|---|---|
| 3.2 | Digital Signatures: Classification of signature schemes: RSA signature;Digital Signature Standard;Overview of ElGamal and Schnorr schemes;One time signature schemes;Attacks on Digital Signatures;Blind Signatures | |
| **Module 4: Introduction to Cyber Security** | | (10 Hours) |
| 4.1 | Email Security: Security Services for email;Attacks possible through email;Establishing keys privacy;Authentication of the source;Message Integrity;Non-repudiation;Pretty Good Privacy;S/MIME | |
| 4.2 | IP Security: Overview of IPSec;IPv4 and IPv6;Authentication Header;Encapsulation Security Payload (ESP);Internet Key Exchange | |
| 4.3 | Transport Level Security: SSL/TLS Basic Protocol;computing the keys, client authentication;PKI as deployed by SSL;Attacks fixed in v3;Exportability;Encoding;Secure Electronic Transaction (SET) | |
| **Module 5: Common web application security vulnerabilities** | | (8 Hours) |
| 5.1 | Injection flaws;Broken authentication;Sensitive data exposure;XML External Entities (XXE);Broken access control;Security misconfiguration;Cross-Site Scripting (XSS);Insecure deserialization;Using components with known vulnerabilities;Insufficient logging & monitoring | |
| 5.2 | Example attack scenarios of each of the vulnerabilities listed; how to prevent them | |
| Total Hours | | 45 |

AMAL JYOTHI
COLLEGE OF ENGINEERING
(AUTONOMOUS)

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | R | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|---|---|
| 23MCA265 | CLOUD COMPUTING | GEN | 3 | 1 | 0 | 0 | 4 | 2023 |

**Preamble :**

The syllabus is prepared with a view to equip the students to learn basic concepts in cloud computing - compute, storage, networking. They should gain basic understanding of orchestration, HA and failover.

**Prerequisite :**

Awareness in Virtualisation and Containers is desirable.

**Course Outcomes(CO):** Upon successful completion of this course, students should be able to:

| | |
|---|---|
| CO1 | Understand the basic concepts in cloud computing and OpenStack logical architecture |
| CO2 | Analyze the OpenStack cloud controller and common services |
| CO3 | Evaluate different OpenStack compute service components and storage types |
| CO4 | Describe the OpenStack Networking- Connection types and networking services |
| CO5 | Discuss orchestration, HA and failover in OpenStack |

**Mapping of course outcomes with program outcomes**

| # | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | 3 | - | 3 | - | 2 | 1 | 1 | 1 | - | 1 |
| **CO2** | 3 | 2 | 2 | - | 3 | 2 | 2 | 1 | - | 1 | 1 | 2 |
| **CO3** | 2 | 3 | - | 2 | 3 | 1 | 2 | 2 | 1 | 1 | 1 | 1 |
| **CO4** | 2 | 1 | 1 | 2 | 3 | - | 2 | 1 | 1 | - | 2 | 1 |
| **CO5** | 2 | 1 | 2 | 1 | 3 | - | 2 | 1 | 1 | - | 1 | 1 |
| **CO6** | - | - | - | - | - | - | - | - | - | - | - | - |

**Assessment Pattern :**

| Bloom's Category Levels | Continuous Assessment Tests | | End Semester Examination |
|---|---|---|---|
| | 1 | 2 | |
| Level 1: Remember | 20 | 15 | 20 |
| Level 2: Understand | 20 | 35 | 30 |
| Level 3: Apply | 10 | | 10 |
| Level 4: Analyse | | | |
| Level 5: Evaluate | | | |
| Level 6: Create | | | |

**Mark distribution :**

| Total Marks | Continuous Internal Evaluation (CIE) | End Semester Examination (ESE) | ESE Duration |
|---|---|---|---|
| 100 | 40 | 60 | 3 hours |

**Continuous Internal Evaluation Pattern :**

Attendance : 8 marks
Continuous Assessment Test (2 numbers) : 20 marks
Assignment/Quiz/Course project : 12 marks

**End Semester Examination Pattern (3 Hours) :**

| Part | Total Qns | No. of Qns to be answered | Marks |
|---|---|---|---|
| Part A | 10 | 10 | 3 |
| Part B | 10 | 5 | 6 |
| Total Marks | | | 60 |

There will be two parts; Part A and Part B. Part A contains 10 compulsory short answer questions, 2 from each module. Each question carries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have a maximum 2 subdivisions and carry 6 marks.

**Book of Study :**

Omar Khedher, Chandan Datta Chowdhury, Mastering OpenStack, 2nd Edition, Packt Publishing, 2017

**References :**

1. Tom Fifield, Diane Fleming, Anne Gentle,Lorin Hochstein, Jonathan Proulx, Everett Toews, and Joe Topjian, OpenStack Operations Guide, O'REILY,1/e, 2014.
2. Uchit Vyas, Applied OpenStack Design Patterns, Apress, 1/e, 2016.
3. V. K. Cody Bumgardner, OpenStack in action, Manning, 2016.
4. Amar Kapadia, Sreedhar Varma, Kris Rajana, Implementing Cloud Storage with OpenStack Swift, Packt Publishing, 2014.

**Internet Study Material :**

https://docs.openstack.org/wallaby/?_ga=2.231002015.1428061357.1620834394-1139122985.1620834394

**Syllabus**

**Module 1: Overview of OpenStack (7 Hours)**

Introduction to cloud computing, private cloud, public cloud, hybrid cloud architecture Cloud Services - Infrastructure as a Service, Platform as a Service, Storage as a Service Designing OpenStack Cloud Architectural Consideration OpenStack The new data centre paradigm OpenStack logical architecture Nova Compute Service Neutron Networking services Gathering the pieces and building a picture A sample architecture setup.

**Module 2: OpenStack cluster - Controller and common services (6 Hours)**

OpenStack Cluster The Cloud Controller and Common Services Asymmetric clustering,Symmetric clustering The cloud controller The keystone service.The nova-conductor service The nova-scheduler service The API services Image management The network service The horizon dashboard The telemetry services.

**Module 3: OpenStack compute and Storage (12 Hours)**

OpenStack Compute The compute service components Deciding on the hypervisor OpenStack Magnum Project Segregating the compute cloud Overcommitment considerations Storing instances' alternatives - Understanding instance booting - Planning for service recovery.OpenStack Storage Block, Object, and File Share Understanding the storage types Ephemeral Storage Persistent storage A spotlight on Swift Deploying Swift service Using block storage service: Cinder.

**Module 4: OpenStack Networking (10 Hours)**

The architecture of Neutron Implementing virtual networks Connecting virtual networks with routers Implementing network security in OpenStack.OpenStack Networking The architecture of Neutron Implementing virtual networks VLAN, Tunnel based, Virtual Switches, The ML2 Plugin. Neutron Subnets Connecting virtual networks with routers Configuring the routing service connecting networks using a virtual router, connecting to the external world, connectivity from the external world,associating a floating IP Implementing network security in OpenStack.

**Module 5: OpenStack Orchestration, HA and failover (10 Hours)**

Orchestration in OpenStack Heat and its Components, stacking in OpenStack, OpenStack Orchestration with Terraform OpenStack HA and failover: Scope of HA in OpenStack, HA in the database, HA in the Queue, Implementing HA on RabbitMQ.

**Course Contents and Lecture Schedule**

| Sl. No | Topic | No. of Lectures |
|---|---|---|
| **Module 1: Overview of OpenStack** | | (7 Hours) |
| 1.1 | Introduction to cloud computing, private cloud, public cloud, hybrid cloud architecture;Cloud Services - Infrastructure as a Service, Platform as a Service, Storage as a Service;Designing OpenStack Cloud Architectural Consideration ;OpenStack ;The new data centre paradigm ;OpenStack logical architecture ;Nova ;Compute Service;Neutron ;Networking services ;Gathering the pieces and building a picture ;A sample architecture setup | |
| **Module 2: OpenStack cluster - Controller and common services** | | (6 Hours) |
| 2.1 | OpenStack Cluster ;The Cloud Controller and Common Services;Asymmetric clustering,Symmetric clustering;The cloud controller ;The keystone service | |
| 2.2 | The nova-conductor service;The nova-scheduler service;The API services;Image management;The network service;The horizon dashboard;The telemetry services | |

| | | |
|---|---|---|
| **Module 3: OpenStack compute and Storage** | | (12 Hours) |
| 3.1 | OpenStack Compute ;The compute service components ;Deciding on the hypervisor;OpenStack Magnum Project;Segregating the compute cloud ;Overcommitment considerations ;Storing instances' alternatives - Understanding instance booting - Planning;for service recovery | |
| 3.2 | OpenStack Storage ;Block, Object, and File Share;Understanding the storage types;Ephemeral Storage ;Persistent storage ;A spotlight on Swift ;Deploying Swift service ;Using block storage service: Cinder | |
| **Module 4: OpenStack Networking** | | (10 Hours) |
| 4.1 | The architecture of Neutron ;Implementing virtual networks ;Connecting virtual networks with routers ;Implementing network security in OpenStack | |
| 4.2 | OpenStack Networking ;The architecture of Neutron ;Implementing virtual networks VLAN, Tunnel based, Virtual Switches, The ML2 Plugin. Neutron Subnets ;Connecting virtual networks with routers ;Configuring the routing service ;connecting networks using a virtual router, connecting to the external world, connectivity from the external world,associating a floating IP ;Implementing network security in OpenStack | |
| **Module 5: OpenStack Orchestration, HA and failover** | | (10 Hours) |
| 5.1 | Orchestration in OpenStack ;Heat and its Components, stacking in OpenStack, OpenStack Orchestration with Terraform;OpenStack HA and failover: Scope of HA in OpenStack, HA in the database, HA in the Queue, Implementing HA on RabbitMQ | |
| Total Hours | | 45 |

AMAL JYOTHI
COLLEGE OF ENGINEERING
(AUTONOMOUS)

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | R | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|---|---|
| 23MCA267 | CYBER FORENSICS | GEN | 3 | 1 | 0 | 0 | 4 | 2023 |

**Preamble :**

This course helps the learner to understand the fundamentals of cyber forensics.Student will learn common approaches, practices and techniques used for collecting and preserving digital evidences in this course.

**Prerequisite :**

Basic knowledge in operating systems & computer networks.

**Course Outcomes(CO):** Upon successful completion of this course, students should be able to:

| | |
|---|---|
| CO1 | Explain a computer crime and the concept of rules or policy violations |
| CO2 | Gather evidences and preserve the collected evidence with the required knowledge on various storage format choices. |
| CO3 | Describe digital storage and file systems and extract data using Autopsy. |
| CO4 | Explain mobile device forensics and practice data acquisition procedures for network forensics using Wireshark. |
| CO5 | Prepare forensics reports both using tools and manually and explain ethics and code for expert witness. |

**Mapping of course outcomes with program outcomes**

| # | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 1 | - | 1 | - | 2 | 1 | - | 2 | - | - | - |
| **CO2** | 2 | 1 | - | 1 | 2 | - | 1 | - | - | - | - | - |
| **CO3** | 2 | 1 | - | 1 | 2 | - | 1 | - | - | - | - | - |
| **CO4** | 2 | 1 | - | 1 | 2 | - | 1 | - | - | - | - | - |
| **CO5** | 2 | 1 | - | 1 | 2 | 3 | 1 | - | 1 | - | - | - |
| **CO6** | - | - | - | - | - | - | - | - | - | - | - | - |

**Assessment Pattern :**

| Bloom's Category | Continuous Assessment Tests | | End Semester Examination |
|---|---|---|---|
| | 1 | 2 | |
| Remember | 10 | | 10 |
| Understand | 20 | 20 | 20 |
| Apply | 20 | 20 | 20 |
| Analyse | | 10 | 10 |
| Evaluate | | | |
| Create | | | |

**Mark distribution :**

| Total Marks | CIE | ESE | ESE Duration |
|---|---|---|---|
| 100 | 40 | 60 | 3 hrs |

**Continuous Internal Evaluation Pattern :**

| | |
|---|---|
| Attendance | 8 marks |
| Continuous Assessment Test (2 numbers) | 20 marks |
| Assignment/Quiz/Course project | 12 marks |

**End Semester Examination Pattern (3 Hours) :**

| **Part** | **Total Qns** | **No. of Qns to be answered** | **Marks** |
|---|---|---|---|
| Part A | 10 | 10 | 3 |
| Part B | 10 | 5 | 6 |
| Total Marks | | | 60 |

| Part | Total Qns | No. of Qns to be answered | Marks |
|---|---|---|---|
| Part A | 10 | 10 | 3 |
| Part B | 10 | 5 | 6 |
| | | | 60 |

There will be two parts; Part A and Part B. Part A contains 10 compulsory short answer questions, 2 from each module. Each question carries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 6 marks.

**Book of Study :**

Bill Nelson, Amelia Phillips, Christopher Steuart, “Guide to Computer Forensics and Investigations”, Cengage Learning, 6th Edition.

**References :**


1. Marjie T. Britz, “Computer Forensics and Cyber Crime”, Pearson Third Edition 2013.
2. Marie - Helen Maras “Computer Forensics: Cybercriminals, Laws, and Evidence”, Jones & Bartlett Learning, Second Edition 2015.

**Syllabus**

**Module 1: Overview of computer crime (8 Hours)**

Overview of computer crime Overview of company policy violation Preparing a case Planning an investigation Securing evidence Industrial espionage investigation Conducting an investigation: Gathering evidence Bit-stream copy of evidence. Storage formats for storing collected digital evidence Raw format, Proprietary formats Advanced Forensic Format (AFF) Acquisition tools and methods Digital evidence validation methods and tools Storing Digital evidence Evidence Retention Familiarizing Autopsy for Windows a free forensics tool.

**Module 2: Understanding Digital data and storage systems (10 Hours)**

Understanding boot sequence Understanding Disk Drives Solid-state Storage Devices (SSDs) Microsoft File Systems Disk partitions Understanding FAT Understanding NTFS, MFT file attributes file data NTFS compressed files NTFS encrypted file system Deleting NTFS file system, ReFS Whole disk encryption Microsoft BitLocker Understanding Windows Registry Microsoft Windows startup tasks.

**Module 3: Linux file structures (10 Hours)**

Linux file structures File structures in Ext4 Hard links and Symbolic links Macintosh (MacOS) file structures Forensic procedures in MacOS Setting up Sleuth Kit and Autopsy Examining a case with Sleuth Kit and Autopsy Importance of Write-blocker Acquiring data with a Linux boot CD Preparing a target drive for data acquisition Using dd and dcfldd commands Validating data acquisitions Linux validation methods Windows validation methods Following practical assignments may be given: i. Recover deleted files from pen drive ii. Extract camera information from recovered images iii. Extract deleted internet browsing history iv. Recover deleted files from unallocated space using Autopsy.

**Module 4: Understanding Mobile Device forensics (10 Hours)**

Mobile phone basics Understanding Mobile phone hardware Acquisition procedures for Mobile devices Mobile Forensic equipment SIM card readers Mobile phone Forensics tools and methods Network Forensics The Need for Established Procedures Securing a Network Developing Procedures for Network Forensics Wireshark packet analyser Practical assignments may be given: i. Identify students who use college lab facility to browse shopping websites ii. Identify the hacking attempt on a closed port using ping sweep iii. Using Wireshark retrieve the username and password of users who browse less secure website with Wi- Fi connection.

**Module 5: Understand the importance of Forensics Reports (10 Hours)**

Understand the importance of Forensics Reports Types of reports Guidelines for writing reports Layout and presentation of reports Generating reports with Autopsy Ethics and codes for Expert Witness Forensics Examiner’s role in testifying Considerations in disqualification Determining admissibility of evidence Ethical difficulties in Expert Testimony Ethical responsibilities.

**Course Contents and Lecture Schedule**

| Sl. No | Topic | No. of Lectures |
|---|---|---|
| **Module 1: Overview of computer crime** | | (8 Hours) |
| 1.1 | Overview of computer crime;Overview of company policy violation;Preparing a case Planning an investigation;Securing evidence;Industrial espionage investigation;Conducting an investigation: Gathering evidence;Bit-stream copy of evidence.;Storage formats for storing collected digital evidence;Raw format, Proprietary formats;Advanced Forensic Format (AFF);Acquisition tools and methods;Digital evidence validation methods and tools;Storing Digital evidence;Evidence Retention;Familiarizing Autopsy for Windows a free forensics tool | |

| | | |
|---|---|---|
| **Module 2: Understanding Digital data and storage systems** | | (10 Hours) |
| 2.1 | Understanding boot sequence;Understanding Disk Drives ;Solid-state Storage Devices (SSDs);Microsoft File Systems ;Disk partitions;Understanding FAT;Understanding NTFS, MFT file attributes;file data;NTFS compressed files;NTFS encrypted file system;Deleting NTFS file system, ReFS;Whole disk encryption;Microsoft BitLocker;Understanding Windows Registry;Microsoft Windows startup tasks | |
| **Module 3: Linux file structures** | | (10 Hours) |
| 3.1 | Linux file structures ;File structures in Ext4;Hard links and Symbolic links;Macintosh (MacOS) file structures ;Forensic procedures in MacOS;Setting up Sleuth Kit and Autopsy ;Examining a case with Sleuth Kit and Autopsy;Importance of Write-blocker;Acquiring data with a Linux boot CD ;Preparing a target drive for data acquisition;Using dd and dcfldd commands;Validating data acquisitions ;Linux validation methods;Windows validation methods;Following practical assignments may be given:;i. Recover deleted files from pen drive;ii. Extract camera information from recovered images;iii. Extract deleted internet browsing history;iv. Recover deleted files from unallocated space using Autopsy | |
| **Module 4: Understanding Mobile Device forensics** | | (10 Hours) |
| 4.1 | Mobile phone basics;Understanding Mobile phone hardware;Acquisition procedures for Mobile devices;Mobile Forensic equipment;SIM card readers;Mobile phone Forensics tools and methods;Network Forensics ;The Need for Established Procedures;Securing a Network;Developing Procedures for Network Forensics;Wireshark packet analyser;Practical assignments may be given:;i. Identify students who use college lab facility to browse shopping websites;ii. Identify the hacking attempt on a closed port using ping sweep;iii. Using Wireshark retrieve the username and password of users who browse less;secure website with Wi- Fi connection | |
| **Module 5: Understand the importance of Forensics Reports** | | (10 Hours) |
| 5.1 | Understand the importance of Forensics Reports;Types of reports;Guidelines for writing reports;Layout and presentation of reports;Generating reports with Autopsy;Ethics and codes for Expert Witness ;Forensics Examiner’s role in testifying;Considerations in disqualification;Determining admissibility of evidence;Ethical difficulties in Expert Testimony;Ethical responsibilities | |
| Total Hours | | 48 |

AMAL JYOTHI
COLLEGE OF ENGINEERING
(AUTONOMOUS)

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | R | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|---|---|
| 23MCA269 | COMPILER DESIGN | GEN | 3 | 1 | 0 | 0 | 4 | 2023 |

**Preamble :**

A compiler is a fundamental software necessary to translate computer programs to a form that can be executed on intended machines. Designing a compiler involves learning several aspects of computer science: logic, formalism, mathematics, data structures, algorithms, programming, and so on. This course is intended as a primer to the various stages typical in the design of standard compilers, starting with the front-end stages of compilation, and giving a peek into the back-end and some recent advancements in the area. At the end of the course, students should be able to appreciate the underlying concepts in compiler design, and be motivated to learn the art of analyzing and transforming programs for performance.

**Prerequisite :**

Basic understanding of at least one programming language such as C, Java etc.

**Course Outcomes(CO):** Upon successful completion of this course, students should be able to:

| | |
|---|---|
| CO1 | Understand the Phases of a Compiler and Grasp the Significance of Lexical Analysis. |
| CO2 | Understand the Role of Syntax Analysis in Compiler Design. |
| CO3 | Understand the role of semantic analysis phase in compiler construction. |
| CO4 | Understand the intermediate code generation techniques in compiler design. |
| CO5 | Understand the code optimization techniques in compiler design. |

**Mapping of course outcomes with program outcomes**

| # | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 1 | 1 | 1 | - | - | 1 | - | - | - | - | - |
| **CO2** | 2 | 1 | 1 | 1 | - | - | 1 | - | - | - | - | - |
| **CO3** | 1 | 1 | 1 | 1 | - | - | 1 | - | - | - | - | - |
| **CO4** | 2 | 1 | 1 | 1 | - | - | 1 | - | - | - | - | - |
| **CO5** | 2 | 2 | 1 | 1 | - | - | 1 | - | - | - | - | - |
| **CO6** | - | - | - | - | - | - | - | - | - | - | - | - |

**Assessment Pattern :**

| Bloom's Category | Continuous Assessment Tests | | End Semester Examination |
|---|---|---|---|
| | 1 | 2 | |
| Remember (K1) | 15 | 10 | 10 |
| Understand (K2) | 25 | 20 | 30 |
| Apply (K3) | 10 | 20 | 20 |
| Analyse (K4) | | | |
| Evaluate (K5) | | | |
| Create (K6) | | | |

**Mark distribution :**

| Total Marks | CIE | ESE | ESE Duration |
|---|---|---|---|
| 100 | 40 | 60 | 3 Hours |

**End Semester Examination Pattern (3 Hours)**

| Part | Total Qns | No. of Qns to be answered | Marks |
|---|---|---|---|
| Part A | 10 | 10 | 3 |
| Part B | 10 | 5 | 6 |
| Total Marks | | | 60 |

**Book of Study :**

Alfred V Aho , Jeffrey D. Ullman, "Principles of Compiler Design", Narosa.

**References :**


1. Aho, Ullman and Sethi, "Principles of Compiler Design", Addison Wesley
2. J. P. Trembley and P. G. Sorensen, "Theory and Practice of Compiler Writing", McGraw Hill.
3. Holub, "Compiler Design in C", PHI.


**Internet Study Material :**

1. https://www.geeksforgeeks.org/introduction-of-compiler-design/
2. https://web.stanford.edu/class/cs143/
3. https://onlinecourses.nptel.ac.in/noc21_cs07/preview

**Syllabus**

**Module 1: Introduction to compilers (8 Hours)**

Compilers and Translators. Analysis of the source program Phases of a compiler Grouping of phases Lexical analysis: role of lexical analyser input buffering specification of tokens recognition of tokens Deterministic and Non-Deterministic Finite automata Regular expression to NFA and DFA.

**Module 2: Syntax analysis (12 Hours)**

Syntax analysis: Role of parser Context free grammars Top down parsing: Recursive Descent parsing Predictive parsing LL(1) Grammars Bottom-up parsing: Shift Reduce Parsing Operator Precedence Parsing (concepts only) LR parsing – Constructing SLR parsing tables Constructing Canonical LR parsing tables and Constructing LALR parsing tables.

**Module 3: Syntax directed translation (12 Hours)**

Syntax directed translation: Syntax directed definitions Bottom-up evaluation of Sattributed definitions L- attributed definitions Top-down translation Bottom-up evaluation of inherited attributes Type Checking: Type systems Specification of a simple type checker Graphical representations.

**Module 4: Intermediate code generation (8 Hours)**

postfix notation syntax tree Three-address code Basic blocks and Flow graph DAG representation of basic blocks. .

**Module 5: Code Optimization (8 Hours)**

Principal sources of optimization Basic blocks and flow graphs Optimization of Basic blocks Loops in flow graphs. Peephole optimization.Code generation: - Issues in the design of a code generator. Simple code generator. .

**Course Contents and Lecture Schedule**

| Sl. No | Topic | No. of Lectures |
|---|---|---|
| **Module 1: Introduction to compilers** | | (8 Hours) |
| 1.1 | Compilers and Translators. ;Analysis of the source program;Phases of a compiler;Grouping of phases;Lexical analysis: role of lexical analyser;input buffering;specification of tokens;recognition of tokens;Deterministic and Non-Deterministic Finite automata;Regular expression to NFA and DFA | |
| **Module 2: Syntax analysis** | | (12 Hours) |
| 2.1 | Syntax analysis: Role of parser;Context free grammars;Top down parsing: Recursive Descent parsing;Predictive parsing;LL(1) Grammars;Bottom-up parsing: Shift Reduce Parsing;Operator Precedence Parsing (concepts only);LR parsing – Constructing SLR parsing tables;Constructing Canonical LR parsing tables and Constructing LALR parsing tables | |
| **Module 3: Syntax directed translation** | | (12 Hours) |
| 3.1 | Syntax directed translation: Syntax directed definitions;Bottom-up evaluation of Sattributed definitions;L-attributed definitions;Top-down translation;Bottom-up evaluation of inherited attributes;Type Checking: Type systems;Specification of a simple type checker;Graphical representations | |
| **Module 4: Intermediate code generation** | | (8 Hours) |
| 4.1 | postfix notation ;syntax tree ;Three-address code ;Basic blocks and Flow graph ;DAG representation of basic blocks. | |
| **Module 5: Code Optimization** | | (8 Hours) |

| | | |
|---|---|---|
| 5.1 | Principal sources of optimization;Basic blocks and flow graphs;Optimization of Basic blocks;Loops in flow graphs. ;Peephole optimization | |
| 5.2 | **Code generation:** Issues in the design of a code generator. ;Simple code generator. | |
| Total Hours | | 48 |

AMAL JYOTHI
COLLEGE OF ENGINEERING
(AUTONOMOUS)

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | R | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|---|---|
| 23MCA285 | DIGITAL IMAGE PROCESSING | GEN | 3 | 1 | 0 | 0 | 4 | 2023 |

**Preamble :**

This course introduces the techniques of simulating human vision into computer vision based on feature extraction to develop applications in different areas. The concept of enhancement, transforms, smoothing, restoration, compression, morphological image analysis, classification & segmentation in two-dimensional space are introduced. This course serves as a prerequisite for many advanced courses in computer vision areas.

**Prerequisite :**

A basic understanding of computer science fundamentals, including programming, is required for this course. Familiarity with essential mathematical concepts like calculus, linear algebra, and statistics is also necessary. While prior experience in signal processing is helpful, it is not mandatory, as the course will cover relevant concepts. An interest in visual data and a willingness to apply computational techniques to solve problems will help you engage effectively with the course material.

**Course Outcomes(CO):** Upon successful completion of this course, students should be able to:

| | |
|---|---|
| CO1 | Discuss the fundamental concepts of digital image processing, image formation and representation of images. |
| CO2 | Summarise image enhancement methods in the spatial domain |
| CO3 | Explain image transforms and image smoothing & sharpening using various kinds of filters in frequency domain. |
| CO4 | Describe various methods in image restoration and compression. |
| CO5 | Discuss morphological basics and image segmentation methods |

**Mapping of course outcomes with program outcomes**

| # | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | - | - | 1 | 2 | 1 | 1 | - | 1 | - |
| **CO2** | 3 | 2 | 3 | - | 2 | - | - | - | - | - | 1 | 1 |
| **CO3** | 3 | 3 | 3 | 2 | - | 1 | - | - | - | 1 | - | - |
| **CO4** | 3 | 3 | 3 | - | 2 | - | 2 | - | 1 | - | - | - |
| **CO5** | 3 | 3 | 3 | 3 | - | - | - | 1 | - | 1 | - | 1 |
| **CO6** | - | - | - | - | - | - | - | - | - | - | - | - |

**Assessment Pattern :**

| Bloom's Category | Continuous Assessment Test 1 | Continuous Assessment Test 2 | End Semester Examination |
|---|---|---|---|
| Remember | 15 | 15 | 20 |
| Understand | 20 | 20 | 30 |
| Apply | 10 | 10 | 10 |
| Analyse | - | - | - |
| Evaluate | - | - | - |
| Create | - | - | - |

**Mark distribution :**

| Total Marks | CIE | ESE | ESE Duration |
|---|---|---|---|
| 100 | 40 | 60 | 3 Hours |

**Continuous Internal Evaluation Pattern :**

Attendance : 8 marks
Continuous Assessment Test (2 Numbers) : 20 marks
Assignment/Quiz/Course project (3 Numbers) : 12 marks

**End Semester Examination Pattern (3 Hours)**

| Part | Total Qns | No. of Qns to be answered | Marks |
|---|---|---|---|
| Part A | 10 | 10 | 3 |
| Part B | 10 | 5 | 6 |
| Total Marks | | | 60 |

**Book of Study :**

1. Rafael C., Gonzalez & Woods R.E., "Digital Image Processing", Pearson Education.
2. Jain A.K, "Fundamentals of Digital Image Processing", Prentice Hall, Eaglewood Cliffs, NJ.

**References :**

1. Schalkoff R. J., "Digital Image Processing and Computer Vision", John Wiley 5. Pratt W.K., "Digital Image Processing", John Wiley
2. Al Bovick , "Handbook of Image and Video Processing" , Academic Press, 2000

**Massive Open Online Courses (MOOCs) :**

https://www.mygreatlearning.com/academy/learn-for-free/courses/digital-image-processing#fpc-section

**Industry, Innovation, and Emerging Technologies (Material) :**

Introduction to Image Processing Tools and Software: Overview of MATLAB, Python (OpenCV), and ImageJ- Basic operations (loading, displaying, saving images)- Simple image manipulations (cropping, resizing, rotating)- Introduction to image processing libraries (MATLAB Image- Processing Toolbox, OpenCV functions, ImageJ plugins).

Recent Advances in Image Processing- Machine Learning and Deep Learning for Image Processing, Convolutional Neural Networks (CNNs) - Architecture, training, applications, Image Processing Applications in Computer Vision - Object detection, face recognition, autonomous driving.

Case Studies and Real-world Applications - Medical Image Processing (Techniques for MRI, CT scan, X-ray analysis), Disease detection and diagnosis), Satellite Image Analysis (Preprocessing, land cover classification, change detection), Video Processing (Motion detection, activity recognition, video summarization).

**Syllabus**

**Module 1: Fundamentals of Digital Image Processing (10 Hours)**

Digital Image Processing: Basic concepts, Difference between image processing and computer vision, Components of an image processing system. Image processing applications. Mathematical preliminaries: Basic Vector and Matrix operations, Toeplitz, Circulant, Unitary & Orthogonal matrices. Elements of Visual Perception: Structure of the human eye and image formation, Brightness adaptation and discrimination. Types of Images: Binary, Gray scale and Color Images. Image Sampling and Quantization: Digital image as a 2D array, Spatial and Intensity resolution, 2D-sampling theorem. RGB and HSI color models..

**Module 2: Concept of Image enhancement & Spatial filtering (10 Hours)**

Concept of Image enhancement Basic grey level transformation functions: Image negative, Log transformation, Power-law transformation, Piecewise linear transformations. Histogram of an Image, Histogram equalization with illustration. Fundamentals of Spatial Filtering: Mechanics of Spatial filtering, 2D correlation and convolution. Smoothing spatial filters: Linear and Nonlinear types. Basics of Sharpening spatial filters: Laplacian operator, Unsharp masking and High-boost filtering, Gradient based operators for image sharpening..

**Module 3: Image Transform & Filtering in frequency domain (10 Hours)**

Image Transform-representation of an image in frequency domain Unitary transformation of an Image-transform pair equations in matrix form Properties of unitary transforms. 1D-DFT, 2D-DFT of an image- Properties of 2D-DFT. DCT and its properties Filtering an Image in the Frequency Domain– Steps of frequency domain filtering. Basic concept and illustration of frequency domain image smoothing and sharpening..

**Module 4: Image Restoration & Compression (8 Hours)**

Image Restoration: Concept of Image restoration A Model of the Image Degradation/Restoration Process Image Noise Models Point Spread Function Restoration using Inverse filtering Wiener filtering. Image compression: Need for compression, redundancy, classification of image compression schemes A general image compression system, Huffman coding, Transform based compression, JPEG standard, Digital image watermarking-basic concept..

**Module 5: Basics of morphological image processing & image segmentation (10 Hours)**

Morphological image processing basics: Erosion and dilation Opening and closing, Hit or Miss transformation. Image segmentation: Fundamental Point detection, Line detection, Basic steps of edge detection, Hough transform, Edge detectors - Marr-Hildreth edge detector & Canny edge detector. Thresholding: Basics of intensity thresholding, Global thresholding and Otsu’s method. Region-based segmentation: Region growing, Region Splitting and Merging..

**Course Contents and Lecture Schedule**

| Sl. No | Topic | No. of Lectures |
|---|---|---|
| **Module 1: Fundamentals of Digital Image Processing** | | (10 Hours) |
| 1.1 | Digital Image Processing: Basic concepts, ;Difference between image processing and computer vision, ;Components of an image processing system. ;Image processing applications. ;Mathematical preliminaries: Basic Vector and Matrix operations, Toeplitz, Circulant, Unitary & Orthogonal matrices. ;Elements of Visual Perception: Structure of the human eye and image formation, Brightness adaptation and discrimination. ;Types of Images: Binary, Gray scale and Color Images. ;Image Sampling and Quantization: Digital image as a 2D array, Spatial and Intensity resolution, 2D-sampling theorem. ;RGB and HSI color models. | |

| | | |
|---|---|---|
| **Module 2: Concept of Image enhancement & Spatial filtering** | | (10 Hours) |
| 2.1 | Concept of Image enhancement;Basic grey level transformation functions: Image negative, Log transformation, Power-law transformation, Piecewise linear transformations. ;Histogram of an Image, Histogram equalization with illustration.;Fundamentals of Spatial Filtering: Mechanics of Spatial filtering, 2D correlation and convolution. ;Smoothing spatial filters: Linear and Nonlinear types. ;Basics of Sharpening spatial filters: Laplacian operator, Unsharp masking and High-boost filtering, Gradient based operators for image sharpening. | |
| **Module 3: Image Transform & Filtering in frequency domain** | | (10 Hours) |
| 3.1 | Image Transform-representation of an image in frequency domain;Unitary transformation of an Image-transform pair equations in matrix form;Properties of unitary transforms. ;1D-DFT, 2D-DFT of an image-Properties of 2D-DFT. ;DCT and its properties;Filtering an Image in the Frequency Domain– Steps of frequency domain filtering. ;Basic concept and illustration of frequency domain image smoothing and sharpening. | |
| **Module 4: Image Restoration & Compression** | | (8 Hours) |
| 4.1 | Image Restoration: Concept of Image restoration;A Model of the Image Degradation/Restoration Process;Image Noise Models;Point Spread Function;Restoration using Inverse filtering;Wiener filtering.;Image compression: Need for compression, redundancy, classification of image compression schemes;A general image compression system, Huffman coding, Transform based compression, JPEG standard, Digital image watermarking-basic concept. | |
| **Module 5: Basics of morphological image processing & image segmentation** | | (10 Hours) |
| 5.1 | Morphological image processing basics: ;Erosion and dilation;Opening and closing, ;Hit or Miss transformation.;Image segmentation: Fundamental;Point detection, Line detection, ;Basic steps of edge detection, Hough transform, Edge detectors - Marr-Hildreth edge detector & Canny edge detector. ;Thresholding: Basics of intensity thresholding, Global thresholding and Otsu’s method. ;Region-based segmentation: Region growing, Region Splitting and Merging. | |
| Total Hours | | 48 |

AMAL JYOTHI
COLLEGE OF ENGINEERING
(AUTONOMOUS)

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | R | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|---|---|
| 23MCA283 | DEEP LEARNING | GEN | 3 | 1 | 0 | 0 | 4 | 2023 |

**Preamble :**

Studying deep learning involves delving into advanced computational techniques that enable machines to learn from and make decisions based on large volumes of data. This field builds on the foundational concepts of neural networks, leveraging multilayer architectures to model complex patterns and relationships. The knowledge gained is crucial for developing innovative solutions in fields like image and speech recognition, natural language processing, and autonomous systems, ultimately pushing the boundaries of artificial intelligence and machine learning.

**Prerequisite :**

Basic Understanding of Machine Learning Concepts

**Course Outcomes(CO):** Upon successful completion of this course, students should be able to:

| | |
|---|---|
| CO1 | Understand Core Concepts of Neural Networks: |
| CO2 | Apply Training Techniques and Optimization Methods |
| CO3 | Master Convolutional Neural Networks (CNNs) |
| CO4 | Explore Recurrent Neural Networks (RNNs) and their Variants |
| CO5 | Develop Proficiency in Generative Adversarial Networks (GANs) |

**Mapping of course outcomes with program outcomes**

| # | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 2 | 3 | 1 | 3 | 2 | 2 | 2 | 2 | 3 |
| **CO2** | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | - | - | 3 |
| **CO3** | 3 | 2 | 3 | 2 | 3 | 1 | 3 | 1 | 1 | 2 | 2 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 1 | 3 | 1 | - | 2 | - | 3 |
| **CO5** | 3 | 2 | 2 | 2 | 3 | 1 | 3 | 2 | - | - | 2 | 3 |
| **CO6** | - | - | - | - | - | - | - | - | - | - | - | - |

**Assessment Pattern :**

| Bloom's Category | Continuous Assessment Tests | | End Semester Examination |
|---|---|---|---|
| | 1 | 2 | |
| Remember | 5 | 5 | 15 |
| Understand | 15 | 15 | 20 |
| Apply | 15 | 15 | 15 |
| Analyze | 15 | 15 | 10 |
| Evaluate | | | |
| Create | | | |

**Mark distribution :**

| Total Marks | CIE | ESE | ESE Duration |
|---|---|---|---|
| 100 | 40 | 60 | 3 hours |

**Continuous Internal Evaluation Pattern :**

Attendance : 8 marks

Continuous Assessment Test (2 numbers) : 20 marks

Assignment/Quiz/Course project : 12 marks

**End Semester Examination Pattern (3 Hours) :**

| Part | Total Qns | No. of Qns to be answered | Marks |
|---|---|---|---|
| Part A | 10 | 10 | 3 |
| Part B | 10 | 5 | 6 |
| Total Marks | | | 60 |

There will be two parts; Part A and Part B. Part A contains 10 compulsory short answer questions, 2 from each module. Each question carries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 6 mark

**Book of Study :**

Deep Learning, Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT press (2016)
Hands on Machine Learning with Scikit Learn and TensorFlow, Aurélien Géron (2019)
Deep Learning Illustrated, Jon Krohn, Grant Beyleveld, Aglae Bassens, Pearson, 1st Edn., (2020)
Online book Dive Deep into Machine Learning at https://d2l.ai/

**References :**

Ian Goodfellow, Yoshua Bengio, and Aaron Courville, "Deep Learning", MIT Press, 1st Edition, 2016.
Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", O'Reilly Media, 2nd Edition, 2019.

**Internet Study Material :**

https://www.mygreatlearning.com/academy/learn-for-free/courses/neural-network-in-r
https://www.mygreatlearning.com/academy/learn-for-free/courses/introduction-to-tensorflow-and-keras
Hands on Machine Learning with Scikit Learn and TensorFlow, Aurélien Géron
Probabilistic Machine Learning: An Introduction, Kevin Murphy

**Syllabus**

**Module 1: Review of Neural Networks (8 Hours)**

Model of a biological neuron McCulloch Pitts Neuron Activation Functions Perceptron Perceptron Learning Algorithm and Convergence Multilayer Perceptron Back propagation Learning XOR Sigmoid Neurons Gradient Descent Feed forward Neural Networks.

**Module 2: Training Neural Networks (10 Hours)**

Initialization dropout batch normalization and dropout overfitting underfitting training and validation curves Data Visualization: Feature and weight visualization tSNE. Introduction to TensorFlow: graphs, nodes, Tensor data structures -rank, shape, type Building neural networks with TensorFlow Introduction to Keras.

**Module 3: Convolutional Neural Networks (10 Hours)**

Convolution operation Convolutional layers in neural network pooling, fully connected layers Case study: Architecture of Lenet Alexnet and VGG 16.

**Module 4: Recurrent Neural Networks (9 Hours)**

Back propagation vanishing gradients exploding gradients truncated backpropagation through time Gated Recurrent Units (GRUs) Long Short-Term Memory (LSTM) cells solving the vanishing gradient problem with LSTMs.

**Module 5: Generative Adversarial Networks (GAN) (9 Hours)**

Autoencoders, variational autoencoders.Discriminative and generative models GAN discriminator GAN generator upsampling GAN Training GAN challenges loss functions cross entropy minimax loss Wasserstein loss.

**Course Contents and Lecture Schedule**

| Sl. No | Topic | No. of Lectures |
|---|---|---|
| **Module 1: Review of Neural Networks** | | (8 Hours) |
| 1.1 | Model of a biological neuron;McCulloch Pitts Neuron;Activation Functions;Perceptron;Perceptron Learning Algorithm and Convergence;Multilayer Perceptron;Back propagation;Learning XOR;Sigmoid Neurons;Gradient Descent;Feed forward Neural Networks | |
| **Module 2: Training Neural Networks** | | (10 Hours) |
| 2.1 | Initialization;dropout;batch normalization and dropout;overfitting;underfitting;training and validation curves;Data Visualization: Feature and weight visualization;tSNE.;Introduction to TensorFlow: graphs, nodes, Tensor data structures -rank, shape, type;Building neural networks with TensorFlow;Introduction to Keras | |
| **Module 3: Convolutional Neural Networks** | | (10 Hours) |
| 3.1 | Convolution operation;Convolutional layers in neural network;pooling, fully connected layers;Case study: Architecture of Lenet;Alexnet and VGG 16 | |
| **Module 4: Recurrent Neural Networks** | | (9 Hours) |
| 4.1 | Back propagation;vanishing gradients;exploding gradients;truncated backpropagation through time;Gated Recurrent Units (GRUs);Long Short-Term Memory (LSTM) cells;solving the vanishing gradient problem with LSTMs | |
| **Module 5: Generative Adversarial Networks (GAN)** | | (9 Hours) |
| 5.1 | Autoencoders, variational autoencoders | |

| | | |
|---|---|---|
| 5.2 | Discriminative and generative models;GAN discriminator;GAN generator;upsampling;GAN Training;GAN challenges;loss functions;cross entropy;minimax loss;Wasserstein loss | |
| Total Hours | | 46 |

AMAL JYOTHI
COLLEGE OF ENGINEERING
(AUTONOMOUS)

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | R | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|---|---|
| 23MCA281 | INTERNET OF THINGS | GEN | 3 | 1 | 0 | 0 | 4 | 2023 |

**Preamble :**

This course intends to provide insight into new innovations that will build novel type of interactions among things and humans, and enables the realization of smart cities, infrastructures, and services for enhancing the quality of life and utilization of resources. An overview of IOT and its related concepts, different IOT architectures and their components, emerging paradigms such as Fog computing, Platforms and solutions supporting development and deployment of IOT applications, message passing mechanisms such as RPC, REST, and CoAP, data and knowledge management, data confidentiality, data integrity, and operation control issues faced by IOT are included in the course.

**Prerequisite :**

Basic concepts of Information Technology and Internet

**Course Outcomes(CO):** Upon successful completion of this course, students should be able to:

| | |
|---|---|
| CO1 | Understand the main concepts and features of the IOT paradigm. |
| CO2 | Know about Fog Computing, TinyOS - nesC and programming frameworks for IOT |
| CO3 | Describe the data management techniques applied to the IOT environment. |
| CO4 | Understand the security and privacy in IOT environments. |
| CO5 | Learn about the key enablers and solutions to enable practical IoT systems. |

**Mapping of course outcomes with program outcomes**

| # | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 2 | - | - | 1 | 1 | - | - | - | 1 |
| **CO2** | 3 | 1 | - | 2 | 2 | - | 1 | - | - | - | - | - |
| **CO3** | 3 | 1 | - | - | - | 1 | 1 | - | - | - | - | - |
| **CO4** | 3 | 1 | - | - | - | 1 | 1 | - | - | - | - | 1 |
| **CO5** | 3 | 1 | 1 | - | - | 1 | 1 | - | - | - | - | - |
| **CO6** | - | - | - | - | - | - | - | - | - | - | - | - |

**Assessment Pattern :**

| Bloom's Category | Continuous Assessment Tests | | End Semester Examination |
|---|---|---|---|
| | 1 | 2 | |
| Remember | *20* | *20* | *20* |
| Understand | *30* | *30* | *40* |
| Apply | | | |
| Analyze | | | |
| Evaluate | | | |
| Create | | | |

**Mark distribution :**

| Total Marks | CIE | ESE | ESE Duration |
|---|---|---|---|
| 100 | 40 | 60 | 3 hours |

**Continuous Internal Evaluation Pattern :**

Continuous Internal Evaluation Pattern:
Attendance : 8 marks
Continuous Assessment Test (2 numbers) : 20 marks
Assignment/Quiz/Course project : 12 marks

**End Semester Examination Pattern (3 Hours) :**

| Part | Total Qns | No. of Qns to be answered | Marks |
|---|---|---|---|
| Part A | 10 | 10 | 3 |
| Part B | 10 | 5 | 6 |
| Total Marks | | | 60 |

End Semester Examination Pattern: There will be two parts; Part A and Part B.
Part A contain 10 compulsory short answer questions, 2 from each module. Each question carries 3 marks.
Part B contains 2 questions from each module of which student should answer any one.
Each question can have a maximum of 2 subdivisions and carry 6 marks.

**Book of Study :**

Rajkumar Buyya; Amir Vahid Dastjerdi , "Internet of Things", Morgan Kaufmann, 2016

**References :**


1. Peter Waher, "Learning Internet of Things", Packt Publishing, 2015
2. S. Sitharamalyengar; Nandan Parameswaran; Vir V. Phoha; N. Balakrishnan; Chuka Okoye, "Fundamentals of Sensor Network Programming: Applications and Technology", Wiley, December 14, 2010
3. Robert Stackowiak, Art Licht, VenuMantha, Louis Nagode, "Big Data and The Internet of Things: Enterprise Information Architecture for A New Age", Apress, 2015


**Internet Study Material :**

1. https://www.coursera.org/specializations/internet-of-things
2. http://web.mit.edu/professional/digital-programs/courses/IoT

**Syllabus**

**Module 1: Overview of Internet of Things (9 Hours)**

Open-source semantic web infrastructure for managing IOT resources in the Cloud Device/Cloud Collaboration framework for intelligence applications.

**Module 2: Introduction to Fog Computing (11 Hours)**

Principles architecturesand applications TinyOS – NesC Programming frameworks for Internet of Things.

**Module 3: Stream processing in IoT (8 Hours)**

foundations state-of-the-art and future directions A framework for distributed data analysis for IoT.

**Module 4: Security and privacy in the Internet of Things (9 Hours)**

Internet of Things robustness and reliability TinyTO: two-way authentication for constrained devices in the Internet of Things Obfuscation and diversification for securing the Internet of Things.

**Module 5: Creating a simple IoT project (8 Hours)**

Preparing Raspberry Pi Interfacing the hardware Internal representation of sensor values Persisting data Creating the actuator project Creating a controller .

**Course Contents and Lecture Schedule**

| Sl. No | Topic | No. of Lectures |
|---|---|---|
| **Module 1: Overview of Internet of Things** | | (9 Hours) |
| 1.1 | Open-source semantic web infrastructure for managing IOT resources in the Cloud ;Device/Cloud Collaboration framework for intelligence applications | |
| **Module 2: Introduction to Fog Computing** | | (11 Hours) |
| 2.1 | Principles;architecturesand applications;TinyOS – NesC;Programming frameworks for Internet of Things | |
| **Module 3: Stream processing in IoT** | | (8 Hours) |
| 3.1 | foundations;state-of-the-art and future directions ;A framework for distributed data analysis for IoT | |
| **Module 4: Security and privacy in the Internet of Things** | | (9 Hours) |
| 4.1 | Internet of Things ;robustness and reliability;TinyTO: two-way authentication for constrained devices in the Internet of Things ;Obfuscation and diversification for securing the Internet of Things | |
| **Module 5: Creating a simple IoT project** | | (8 Hours) |
| 5.1 | Preparing Raspberry Pi ;Interfacing the hardware ;Internal representation of sensor values;Persisting data;Creating the actuator project ;Creating a controller | |
| Total Hours | | 45 |

AMAL JYOTHI
COLLEGE OF ENGINEERING
(AUTONOMOUS)

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | R | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|---|---|
| 23MCA289 | SOCIAL NETWORK ANALYSIS | GEN | 3 | 1 | 0 | 0 | 4 | 2023 |

**Preamble :**

Social Network Analysis (SNA) is a methodological approach used to study social structures through the use of network and graph theories. It focuses on the relationships and interactions between individuals, groups, organizations, or even entire societies. These relationships, often referred to as "ties" or "links," can represent various types of connections such as friendship, communication, collaboration, or financial exchanges.

**Prerequisite :**

Basic Understanding of Network Theory and Web Technologies, Basics of Mathematics and Statistics, Data Collection and Management, Computational Skills, Knowledge of Semantic Web Standards

**Course Outcomes(CO):** Upon successful completion of this course, students should be able to:

| | |
|---|---|
| CO1 | Understand and Apply Semantic Web and Social Network Analysis Concepts |
| CO2 | Master Knowledge Representation and Ontology Languages for the Semantic Web |
| CO3 | Represent and Reason with Network and Ontological Data |
| CO4 | Analyze Graph Structures and Algorithms in Social Networks |
| CO5 | Understand and Implement Search Engine Technologies |

**Mapping of course outcomes with program outcomes**

| # | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | - | - | - | 1 | - | - | - | - | - |
| **CO2** | 3 | 2 | 2 | - | 1 | - | 1 | - | - | - | - | - |
| **CO3** | 3 | 2 | 2 | - | - | - | 1 | - | - | - | - | - |
| **CO4** | 3 | 3 | 3 | 1 | 2 | - | 1 | 2 | - | - | - | 2 |
| **CO5** | 3 | 3 | 3 | 1 | 1 | - | 1 | 2 | - | - | - | 2 |
| **CO6** | - | - | - | - | - | - | - | - | - | - | - | - |

**Assessment Pattern :**

Assessment Pattern :

| Bloom's Category | Continuous Assessment Tests | | End Semester Examination |
|---|---|---|---|
| | 1 | 2 | |
| Remember | 10 | | 10 |
| Understand | 20 | 20 | 20 |
| Apply | 20 | 20 | 20 |
| Analyse | | 10 | 10 |
| Evaluate | | | |
| Create | | | |

**Mark distribution :**

Mark distribution:

| Total Marks | CIE | ESE | ESE Duration |
|---|---|---|---|
| 100 | 40 | 60 | 3 Hours |

**Continuous Internal Evaluation Pattern :**

Continuous Internal Evaluation Pattern :

| | |
|---|---|
| Attendance | 8 marks |
| Continuous Assessment Test (2 numbers) | 20 marks |
| Assignment/Quiz/Course project | 12 marks |

**End Semester Examination Pattern (3 Hours) :**

| Part | Total Qns | No. of Qns to be answered | Marks |
|---|---|---|---|
| Part A | 10 | 10 | 3 |
| Part B | 10 | 5 | 6 |
| Total Marks | | | 60 |

End Semester Examination Pattern ($duration Hours) : There will be two parts; Part A and Part B. Part A contains 10 compulsory short answer questions, 2 from each module. Each question carries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 6 marks

**Book of Study :**

1. Peter Mika, Social Networks and the Semantic Web, First Edition, Springer 2007.
2. Borko Furht, Handbook of Social Network Technologies and Applications, 1st Edition, Springer, 2010.

**References :**

1. Dion Goh and Schubert Foo, Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively, IGI Global Snippet, 2007.
2. Christakis, Nicholas A., and James H. Fowler, Connected: The Surprising Power of Our Social Networks and How They Shape Our Lives. New York: Little, Brown and Company, 2009.
3. Guandong Xu ,Yanchun Zhang and Lin Li, Web Mining and Social Networking – Techniques and applications, First Edition, Springer, 2011.
4. Kadushin, Charles, Understanding Social Networks: Theories, Concepts, and Findings. New York: Oxford University Press, 2012.
5. John G. Breslin, Alexander Passant and Stefan Decker, The Social Semantic Web, Springer, 2009.

**Internet Study Material :**

1. NPTEL Social Networks Course Notes by Dr. S. R. S. Iyengar (GitHub).
2. Social Network Analysis: Theory and Methods (GitHub).
3. Introduction to Social Network Methods (GitHub).

**Massive Open Online Courses (MOOCs) :**

1. Coursera - Social Network Analysis, https://www.coursera.org/learn/social-network-analysis
2. Udemy Social Network Analysis : https://www.udemy.com/course/social-network-analysis/
3. NPTEL Social Network Analysis : https://onlinecourses.nptel.ac.in/noc22_cs117/preview
4. Social Network Analysis: The Networks Connecting People
: https://www.futurelearn.com/courses/the-networks-connecting-people

**Syllabus**

**Module 1: Introduction to the Semantic Web and Social Networks (9 Hours)**

The Semantic Web Limitations of the current Web The semantic solution Development of the Semantic Web The emergence of the social web Social Network Analysis Development of Social Network Analysis The global structure of networks The macro-structure of social networks Personal networks.

**Module 2: Electronic sources for network analysis (8 Hours)**

Electronic discussion networks Blogs and online communities Web-based networks.Knowledge Representation on the Semantic Web: Ontologies and their role in the Semantic Web Ontology languages for the Semantic Web The Resource Description Framework (RDF) and RDF Schema The Web Ontology Language (OWL) Comparison of Ontology languages with the Unified Modelling Language (UML) Comparison to the Entity/Relationship (E/R) model and the Relational model Comparison to the Extensible Markup Language (XML) and XML Schema.

**Module 3: Modelling and aggregating social network data (8 Hours)**

Network data representation Ontological representation of social individuals Ontological representation of social relationships Aggregating and reasoning with social network data Representing identity On the notion of equality Determining equality Reasoning with instance equality Evaluating smushing.

**Module 4: Graph Structure of the Web (10 Hours)**

Breadth First Search (BFS) Algorithm Strongly Connected Components (SCC) Algorithm Weakly Connected Components (WCC) Algorithm In-degree and out- degree distributions Connected Components Zipf's Law Rank Exponent R Out-Degree Exponent O Hop Plot Exponent H Eigen Exponent E.Graph Structure of Facebook: Hyper ANF Algorithm Iterative Fringe Upper Bound (iFUB) Algorithm Spid Degree Distribution Path Length Component Size Clustering Coefficient and Degeneracy Friends-of-Friends Degree Assortativity Login Correlation Effects of Age Gender and Country of Origin.

**Module 5: Link Analysis (10 Hours)**

Search Engine – Search engine architecture Crawling Storage Indexing Ranking HITS Algorithm Page rank algorithm Random walk SALSA Algorithm Bayesian Algorithm; Google - Google architecture Data Structures Crawling Searching Web Spam Pages.

**Course Contents and Lecture Schedule**

| Sl. No | Topic | No. of Lectures |
|---|---|---|
| **Module 1: Introduction to the Semantic Web and Social Networks** | | (9 Hours) |
| 1.1 | The Semantic Web;Limitations of the current Web;The semantic solution;Development of the Semantic Web;The emergence of the social web;Social Network Analysis;Development of Social Network Analysis;The global structure of networks;The macro-structure of social networks;Personal networks | |
| **Module 2: Electronic sources for network analysis** | | (8 Hours) |
| 2.1 | Electronic discussion networks;Blogs and online communities;Web-based networks | |

| | | |
|---|---|---|
| 2.2 | Knowledge Representation on the Semantic Web: Ontologies and their role in the Semantic Web;Ontology languages for the Semantic Web;The Resource Description Framework (RDF) and RDF Schema;The Web Ontology Language (OWL);Comparison of Ontology languages with the Unified Modelling Language (UML);Comparison to the Entity/Relationship (E/R) model and the Relational model;Comparison to the Extensible Markup Language (XML) and XML Schema | |
| **Module 3: Modelling and aggregating social network data** | | (8 Hours) |
| 3.1 | Network data representation;Ontological representation of social individuals;Ontological representation of social relationships;Aggregating and reasoning with social network data;Representing identity;On the notion of equality;Determining equality;Reasoning with instance equality;Evaluating smushing | |
| **Module 4: Graph Structure of the Web** | | (10 Hours) |
| 4.1 | Breadth First Search (BFS) Algorithm;Strongly Connected Components (SCC) Algorithm;Weakly Connected Components (WCC) Algorithm;In-degree and out- degree distributions;Connected Components;Zipf's Law;Rank Exponent R;Out-Degree Exponent O;Hop Plot Exponent H;Eigen Exponent E | |
| 4.2 | Graph Structure of Facebook: Hyper ANF Algorithm;Iterative Fringe Upper Bound (iFUB) Algorithm;Spid;Degree Distribution;Path Length;Component Size;Clustering Coefficient and Degeneracy;Friends-of-Friends;Degree Assortativity;Login Correlation;Effects of Age;Gender and Country of Origin | |
| **Module 5: Link Analysis** | | (10 Hours) |
| 5.1 | Search Engine – Search engine architecture;Crawling;Storage;Indexing;Ranking;HITS Algorithm;Page rank algorithm;Random walk;SALSA Algorithm;Bayesian Algorithm; Google - Google architecture;Data Structures;Crawling;Searching;Web Spam Pages | |
| Total Hours | | 45 |

AMAL JYOTHI
COLLEGE OF ENGINEERING
(AUTONOMOUS)

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | R | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|---|---|
| 23MCA287 | BIOINFORMATICS | GEN | 3 | 1 | 0 | 0 | 4 | 2023 |

**Preamble :**

The rapidly evolving fields of Computational Biology and Bioinformatics are at the forefront of modern scientific research, offering revolutionary methods to analyze and interpret biological data. This course provides an in-depth introduction to these disciplines, emphasizing both theoretical understanding and practical applications. Students will learn how computational tools and models are employed to simulate biological systems, analyze genomic and proteomic data, and explore various bioinformatics databases. The curriculum covers essential topics such as the central dogma of molecular biology, the Human Genome Project, and advanced data mining techniques. Additionally, it introduces emerging technologies like next-generation sequencing and artificial intelligence, preparing students to tackle complex biological problems using computational approaches. By the end of this course, students will be well-equipped with the knowledge and skills necessary to contribute to cutting-edge research and applications in bioinformatics and computational biology.

**Prerequisite :**

To ensure students are well-prepared for this course, the following prerequisites are recommended:

1. Basic Biology:
   - Understanding of fundamental biological concepts, including cell biology, molecular biology, and genetics.
   - Knowledge of basic biological processes such as DNA replication, transcription, and translation.
2. Computer Science Basics:
   - Familiarity with basic computer operations and software usage.
   - Experience with a programming language (e.g., Python, R, or Java) is beneficial for understanding computational tools and performing data analysis.
3. Mathematics and Statistics:
   - Competence in basic mathematical concepts, including algebra and calculus.
   - Understanding of basic statistical principles and data analysis techniques.
4. Introductory Bioinformatics (Optional but Recommended):
   - Prior exposure to bioinformatics concepts, such as familiarity with common bioinformatics databases and tools, will be advantageous.

These prerequisites ensure that students have the foundational knowledge and skills necessary to fully engage with the course material and successfully apply computational methods to biological research.

**Course Outcomes(CO):** Upon successful completion of this course, students should be able to:

| | |
|---|---|
| CO1 | Identify the basics of Computational Biology and Bioinformatics |
| CO2 | Identify and assess different biological databases and tools. |
| CO3 | Study and describe the role of Data mining techniques and its use in the Human Genome Project |
| CO4 | Study and implement genomic analysis for protein sequence Prediction of protein structure |
| CO5 | Analyse the various Advanced Bioinformatics algorithms, models and its scope |

**Mapping of course outcomes with program outcomes**

| # | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 2 | 1 | 1 | - | - | - | - | 2 |
| **CO2** | 2 | 2 | - | 2 | 1 | - | 1 | 1 | - | - | - | 2 |
| **CO3** | 1 | 3 | - | 2 | 3 | - | - | - | - | - | - | - |
| **CO4** | 2 | - | 2 | 2 | - | - | - | - | - | 1 | 1 | - |
| **CO5** | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 |
| **CO6** | - | - | - | - | - | - | - | - | - | - | - | - |

**Continuous Internal Evaluation Pattern :**

| | | | |
|---|---|---|---|
| Series 1 | 50 Marks | Internals | 10 Marks |
| Series 2 | 50 Marks | Internals | 10 Marks |
| Assignment I | 6 Marks | Internals | 6 Marks |
| Assignment II | 6 Marks | Internals | 6 Marks |
| Attendance | | | 8 Marks |
| Total | | Internals | 40 Marks |

**End Semester Examination Pattern (3 Hours) :**

| Part | Total Qns | No. of Qns to be answered | Marks |
|---|---|---|---|
| Part A | 10 | 10 | 3 |
| Part B | 10 | 5 | 6 |
| Total Marks | | | 60 |

Part A

3 Marks x 10 Questions = 30 Marks [ From Each module 2 Questions ]

Part B

6 Marks x 5 Questions = 30 Marks [Each Module 2 Question Each, with Choice]

---

TOTAL 60 Marks

**Book of Study :**


1. Bioinformatics: A Primer, P. Narayanan, Publisher: New Age International Publishers
2. Introduction to Bioinformatics, T. K. Attwood & D. J. Parry-Smith, 2001, Pearson Education Ltd

**References :**


1. Understanding Bioinformatics, Marketa Zvelebil and Jeremy O. Baum, 2007, Garland Science
2. Bioinformatics: Methods and Applications, Rastogi et al., Prentice Hall of India
3. Fundamental Concepts of Bioinformatics, Dan E. Krane and Michael L. Raymer, 2002, Pearson Education
4. Bioinformatics: Sequence and Genome Analysis, David W. Mount, 2001, Cold Spring Harbor Laboratory Press
5. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, B. F. Francis Ouellette and Andreas D. Baxevanis, 2002, Wiley
6. Developing Bioinformatics Computer Skills, Cynthia Gibas and Per Jambeck, 2001, O'Reilly Media.
7. Bioinformatics Computing, Bryan Bergeron MD, 2003, Prentice Hall India
8. Bioinformatics: The Machine Learning Approach, Pierre Baldi and Soren Brunak, 2001, The MIT Press
9. Protein Bioinformatics, Eidhammer, Jonassen, Taylor, 2004, Wiley
10. Algorithms in Bioinformatics, Gary Benson and Roderic Page, 2009, Springer


**Internet Study Material :**

https://www.geeksforgeeks.org/bioinformatics-application/
https://omicstutorials.com/a-beginners-guide-to-bioinformatics-basics/
https://omicstutorials.com/bioinformatics-for-dummies-a-beginners-quick-guide/
https://bioinformaticsworkbook.org/#gsc.tab=0

**Syllabus**

**Module 1: Introduction+A2:D69 to Computational Biology and Bioinformatics (8 Hours)**

Computational biology: Introduction Scope Computational modelling of the biological Systems Computational analysis Tools Application of computational Biology. .Bioinformatics: Definitions, History of bioinformatics Applications Bioinformatics in business. .Overview of molecular biology: the cell as basic unit of Life-Prokaryotic cell and Eukaryotic cell Introduction to central dogma of molecular biology-DNA-RNA-Protein Secondary Structure Triplet Coding Introduction to Genome Protein Sequences (Concept definition Only) Protein Structure: Secondary, Tertiary, Quaternary Introduction to DNA and Protein sequencing (Concept definition Only) Human Genome Project, SNP Future and Scope of Bioinformatics..

**Module 2: Biological Databases (8 Hours)**

Nucleotide sequence databases.General purpose search engine: WWW, HTML, URLs Browsers: Netscape / Opera / Explorer, Search Engines Google, PUBMED Biological search engines: Entrez, SRS. .Types of Databases Biological databases: Primary nucleotide sequence databases – GenBank, DDBJ, EMBL. Secondary nucleotide sequence databases Protein sequence databases: Swissprot, Uniprot, Protein Data Bank, TrEMBL, PIR-PSD, PRINTS. Structural databases: PDB, NDB, PubChem, ChemBank, CCSD. Bibliographic databases: Pubmed, PMC, PloS. citeXplore..

**Module 3: Biological data mining and Human Genome Project (10 Hours)**

Introduction: Fundamentals of data Mining.Data mining process Data Mining Functionalities-Data collection, Data preprocessing, data mining, information interpretation, visualization, classification, clustering, association, summarization, text mining etc.. Data mining techniques Classification of Data Mining systems Data warehousing Statistics Applications of data mining. .The Human Genome Project Bioinformatics and Human diseases. Genomic analysis for DNA sequence Genomic analysis for protein sequence Strategy and options for similarity searches Structure prediction Illustration some problems and solution..

**Module 4: Problem Solving in Bioinformatics (10 Hours)**

**Module 5: Advanced Bioinformatics (12 Hours)**

Introduction (Definitions Only): Genomics, Proteomics, Transcriptomics, Metabolomics, Metagenomics, Nutrigenomics, Protein engineering, Comparative Genomics, Pharmacogenomics, Pharmacogenetics, Rational Drug Designing, CADD .Next Generation Sequencing (NGS) Methods NGS technologies/platforms NGS experiment types and applications Workflows for various NGS experiments. Biological data representation in digital form Various file formats such as SAM, VCF, BED, ChIP-seq Data Generating Technique-Microarray. .Introduction to Artificial Intelligence Introduction to search and Search algorithms, Heuristic and optimal search methods Machine learning approaches Principles Methods and Applications of: - Dynamic programming Hidden Markov Model, Neural networks Genetic algorithms Molecular Modelling: An overview. Introduction and challenges Molecular modelling methods Conformational searching Ramachandran maps Ab-initio methods Homology Modelling..

**Module i: Industry, Innovation, and Emerging Technologies (6 Hours)**

Use of different browsers, search engines for desired data retrieval - Study of major bioinformatics companies in India and overseas - Study of products produced by major bioinformatics firms using biological data analysis in Health (Diagnosis, Vaccines, Therapeutics) Agriculture, Environment etc - Explore the sitemap of NCBI. Study the resources available on NCBI. - Study format of Genbank entry data retrieval from Genbank - Retrieve the Genbank entry with Specific accession number - Retrieve and save only the coding sequence of the entry AF375082 in FASTA format. - Retrieving Protein sequences from protein database - Visit and report on bioinformatics research institute/ company -

**Course Contents and Lecture Schedule**

| Sl. No | Topic | No. of Lectures |
|---|---|---|
| **Module 1: Introduction+A2:D69 to Computational Biology and Bioinformatics** | | (8 Hours) |
| 1.1 | Computational biology: Introduction; Scope;Computational modelling of the biological Systems;Computational analysis Tools;Application of computational Biology. | |
| 1.2 | Bioinformatics: Definitions, History of bioinformatics;Applications;Bioinformatics in business. | |
| 1.3 | Overview of molecular biology: the cell as basic unit of Life-Prokaryotic cell and Eukaryotic cell ;Introduction to central dogma of molecular biology-DNA-RNA-Protein;Secondary Structure Triplet Coding;Introduction to Genome Protein Sequences (Concept definition Only);Protein Structure: Secondary, Tertiary, Quaternary ;Introduction to DNA and Protein sequencing (Concept definition Only);Human Genome Project, SNP;Future and Scope of Bioinformatics. | |
| **Module 2: Biological Databases** | | (8 Hours) |
| 2.1 | Nucleotide sequence databases | |
| 2.2 | General purpose search engine: WWW, HTML, URLs Browsers: Netscape / Opera / Explorer, Search Engines Google, PUBMED ;Biological search engines: Entrez, SRS. | |
| 2.3 | Types of Databases Biological databases: ;Primary nucleotide sequence databases – GenBank, DDBJ, EMBL. ;Secondary nucleotide sequence databases; Protein sequence databases: Swissprot, Uniprot, Protein Data Bank, TrEMBL, PIR-PSD, PRINTS. ;Structural databases: PDB, NDB, PubChem, ChemBank, CCSD. ;Bibliographic databases: Pubmed, PMC, PloS. citeXplore. | |
| **Module 3: Biological data mining and Human Genome Project** | | (10 Hours) |
| 3.1 | Introduction: Fundamentals of data Mining | |
| 3.2 | Data mining process ;Data Mining Functionalities-Data collection, Data preprocessing, data mining, information interpretation, visualization, classification, clustering, association, summarization, text mining etc. | |
| 3.3 | Data mining techniques;Classification of Data Mining systems;Data warehousing;Statistics;Applications of data mining. | |
| 3.4 | The Human Genome Project ;Bioinformatics and Human diseases.;Genomic analysis for DNA sequence;Genomic analysis for protein sequence;Strategy and options for similarity searches;Structure prediction;Illustration some problems and solution. | |
| **Module 4: Problem Solving in Bioinformatics** | | (10 Hours) |
| **Module 5: Advanced Bioinformatics** | | (12 Hours) |
| 5.1 | Introduction (Definitions Only): Genomics, Proteomics, Transcriptomics, Metabolomics, Metagenomics, Nutrigenomics, Protein engineering, Comparative Genomics, Pharmacogenomics, Pharmacogenetics, Rational Drug Designing, CADD | |
| 5.2 | Next Generation Sequencing (NGS) Methods;NGS technologies/platforms;NGS experiment types and applications;Workflows for various NGS experiments | |
| 5.3 | Biological data representation in digital form;Various file formats such as SAM, VCF, BED, ChIP-seq;Data Generating Technique-Microarray. | |
| 5.4 | Introduction to Artificial Intelligence;Introduction to search and Search algorithms, Heuristic and optimal search methods;Machine learning approaches ;Principles Methods and Applications of: - Dynamic programming;Hidden Markov Model, Neural networks;Genetic algorithms;Molecular Modelling: An overview. ;Introduction and challenges Molecular modelling methods ;Conformational searching;Ramachandran maps;Ab-initio methods;Homology Modelling. | |
| **Module I: Industry, Innovation, and Emerging Technologies (non-instructional hours)** | | (6 Hours) |
| I.1 | **Use of different browsers, search engines for desired data retrieval** | |
| I.2 | **Study of major bioinformatics companies in India and overseas** | |

| | | |
|---|---|---|
| I.3 | **Study of products produced by major bioinformatics firms using biological data analysis in Health (Diagnosis, Vaccines, Therapeutics) Agriculture, Environment etc** | |
| I.4 | **Explore the sitemap of NCBI. Study the resources available on NCBI.** | |
| I.5 | **Study format of Genbank entry data retrieval from Genbank** | |
| I.6 | **Retrieve the Genbank entry with Specific accession number** | |
| I.7 | **Retrieve and save only the coding sequence of the entry AF375082 in FASTA format.** | |
| I.8 | **Retrieving Protein sequences from protein database** | |
| I.9 | **Visit and report on bioinformatics research institute/ company** | |
| Total Hours | | 54 |

AMAL JYOTHI
COLLEGE OF ENGINEERING
(AUTONOMOUS)

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | R | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|---|---|
| 23MCA241 | DATA SCIENCE LAB | GEN | 0 | 1 | 3 | 0 | 2 | 2023 |

**Preamble :**

This is an introductory practical course on Data Science and student will learn how to use various scientific libraries in python to implement data mining techniques and machine learning algorithms.

**Course Outcomes(CO):** Upon successful completion of this course, students should be able to:

| | |
|---|---|
| CO1 | Use different python packages to perform numerical calculations, statistical computations and data visualization. |
| CO2 | Use different packages and frameworks to implement regression and classification algorithms. |
| CO3 | Use different packages and frameworks to implement text classification using SVM and clustering using K-means. |
| CO4 | Implement convolutional neural network algorithm using Keras framework. |
| CO5 | Implement programs for web data mining and natural language processing using NLTK. |

**Mapping of course outcomes with program outcomes**

| # | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 1 | 3 | 2 | 3 | - | 2 | - | - | - |
| **CO2** | 3 | 3 | 3 | 2 | 3 | 2 | 3 | - | 2 | - | - | - |
| **CO3** | 3 | 3 | 3 | 2 | 3 | 2 | 3 | - | 2 | - | - | - |
| **CO4** | 3 | 3 | 3 | 2 | 3 | 2 | 3 | - | 2 | - | - | - |
| **CO5** | 3 | 3 | 3 | 2 | 3 | 3 | 3 | - | 2 | - | - | - |
| **CO6** | - | - | - | - | - | - | - | - | - | - | - | - |

**Assessment Pattern :**

| Bloom's Category | Continuous Assessment Tests | | End Semester Examination |
|---|---|---|---|
| | 1 | 2 | |
| Remember | | | |
| Understand | | | |
| Apply | 50 | 50 | 50 |
| Analyse | | | |
| Evaluate | | | |
| Create | | | |

**Mark distribution :**

| Total Marks | CIE | ESE | ESE Duration |
|---|---|---|---|
| 100 | 50 | 50 | 3 hours |

**Continuous Internal Evaluation Pattern :**

| Maximum Marks: 50 | |
|---|---|
| Attendance | 7½ |
| Maintenance of daily lab record and GitHub management | 10 |
| Regular class viva voce | 7½ |
| Timely completion of day-to-day tasks | 10 |
| Tests/Evaluation | 15 |

**End Semester Examination Pattern (3 Hours) :**

| Part | Total Qns | No. of Qns to be answered | Marks |
|---|---|---|---|
| Part A | 10 | 10 | 2 |
| Part B | 10 | 5 | 6 |
| Total Marks | | | 50 |

| Maximum Marks: 50 | | | |
|---|---|---|---|
| Verification of Daily program record and Git Repository | | | 5 marks |
| Viva | | | 10 marks |
| Problem solving (Based on difficulty level, one or more questions may be given) | Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design | 15% | 35 marks |
| | Program correctness | 50% | |
| | Code efficiency | 15% | |
| | Formatted output | 20% | |

**References :**


1. Christopher M Bishop, “Pattern Learning and Machine Learning”, Springer, 2006
2. E. Alpayidin, “Introduction to Machine Learning”, Prentice Hall of India (2005)
3. T. Hastie, RT Ibrashiran and J. Friedman, “The Elements of Statistical Learning”, Springer 2001
4. Toby Segaran, “Programming Collective Intelligence: Building Smart Web 2.0 Applications”, O' Reilly Media; 1 edition (16 August 2007).
5. Drew Conway, John Myles White, “Machine Learning for Hackers: Case Studies and Algorithms to Get You Started”, O' Reilly Media; 1 edition (13 February 2012)
6. Simon Rogers, Mark Girolami, “A First course in Machine Learning”, CRC Press, First Indian reprint, 2015.
7. Tom Mitchell, “Machine Learning”, McGraw Hill, 1997.
8. Bing Liu, Web Data Mining - Exploring Hyperlinks, Contents and Usage Data, Second edition, Springer 2011

**Industry, Innovation, and Emerging Technologies (Material) :**

Cloud Computing for Data Science
Introduction to cloud platforms (AWS, Google Cloud, Azure), Setting up a data science environment on the cloud, Practical session: Running analyses on cloud-based datasets

Future Trends in Data Science: Emerging technologies (e.g., quantum computing, edge computing), Industry-specific innovations (e.g., healthcare, finance, retail), Exploring blockchain integration with data science workflows
Micro project: Proposal and presentation on a novel application or technology in data science

**Syllabus**

**Module 1: Module 1 (12 Hours)**

Review of python programming, Matrix operations, Data Visualisation using matplotlib / plotly / bokeh / seaborn, Data handling using pandas, .

**Module 2: Module 2 (9 Hours)**

Classification k-NN algorithm, Naïve Bayes algorithm, Implementation of linear and multiple regression techniques,.

**Module 3: Module 3 (9 Hours)**

Text classification using Support vector machine, Implementation of Decision Trees, Clustering using k-means algorithm.

**Module 4: Module 4 (9 Hours)**

Convolutional Neural Network to classify images using Keras framework, .

**Module 5: Module 5 (9 Hours)**

Web Crawler and Scrapping web pages, Implementation of NLP - Part of Speech tagging, N-gram & smoothening and Chunking using NLTK..

**Course Contents and Lecture Schedule**

| Sl. No | Topic | No. of Lectures |
|---|---|---|
| | **Module 1: Module 1** | (12 Hours) |
| 1.1 | Review of python programming, Matrix operations, Data Visualisation using matplotlib / plotly / bokeh / seaborn, Data handling using pandas, | |
| | **Module 2: Module 2** | (9 Hours) |
| 2.1 | Classification k-NN algorithm, Naïve Bayes algorithm, Implementation of linear and multiple regression techniques, | |
| | **Module 3: Module 3** | (9 Hours) |
| 3.1 | Text classification using Support vector machine, Implementation of Decision Trees, Clustering using k-means algorithm | |
| | **Module 4: Module 4** | (9 Hours) |
| 4.1 | Convolutional Neural Network to classify images using Keras framework, | |
| | **Module 5: Module 5** | (9 Hours) |
| 5.1 | Web Crawler and Scrapping web pages, Implementation of NLP - Part of Speech tagging, N-gram & smoothening and Chunking using NLTK. | |
| Total Hours | | 48 |

AMAL JYOTHI
COLLEGE OF ENGINEERING
(AUTONOMOUS)

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | R | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|---|---|
| 23MCA243 | MOBILE APPLICATION DEVELOPMENT LAB | GEN | 0 | 1 | 3 | 0 | 2 | 2023 |

**Preamble :**

This is a practical course on Mobile Application Development and student will learn how to program in Android Platform and develop applications using SQLite that run on Andriod Operating System

**Prerequisite :**

Basic knowledge on programming and database concepts.

**Course Outcomes(CO):** Upon successful completion of this course, students should be able to:

| | |
|---|---|
| CO1 | Design and develop user interfaces for mobile apps using basic building blocks, UI components and application structure using Emulator |
| CO2 | Write simple programs and develop small applications using the concepts of UI design, layouts and preferences |
| CO3 | Develop applications with multiple activities using intents, array adapter, exceptions and options menu. |
| CO4 | Implement activities with dialogs, spinner, fragments and navigation drawer by applying themes |
| CO5 | Develop mobile applications using SQLite. |

**Mapping of course outcomes with program outcomes**

| # | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 1 | 3 | 1 | 3 | 1 | 1 | - | 2 | - | - | 1 |
| **CO2** | 3 | 1 | 3 | 1 | 3 | 1 | 1 | - | 2 | - | - | - |
| **CO3** | 3 | 1 | 3 | 1 | 3 | 1 | 1 | - | 2 | - | 1 | - |
| **CO4** | 3 | 1 | 3 | 1 | 3 | 1 | 1 | - | 2 | - | - | - |
| **CO5** | 3 | 1 | 3 | 2 | 3 | 2 | 3 | - | 2 | 1 | 1 | 1 |
| **CO6** | - | - | - | - | - | - | - | - | - | - | - | - |

**Assessment Pattern :**

| Bloom's Category | Continuous Assessment Tests | | End Semester Examination |
|---|---|---|---|
| | 1 | 2 | |
| Remember | | | |
| Understand | | | |
| Apply | 50 | 50 | 50 |
| Analyse | | | |
| Evaluate | | | |
| Create | | | |

**Mark distribution :**

| Total Marks | CIE | ESE | ESE Duration |
|---|---|---|---|
| 100 | 50 | 50 | 3 hours |

**Continuous Internal Evaluation Pattern :**

| | |
|---|---|
| Maximum Marks | 50 |
| Attendance | 15% |
| Maintenance of daily lab record and GitHub management | 20% |
| Regular class viva | 15% |
| Timely completion of day to day tasks | 20% |
| Tests/Evaluation | 30% |

**End Semester Examination Pattern (3 Hours) :**

| Part | Total Qns | No. of Qns to be answered | Marks |
|---|---|---|---|
| Part A | 2 | 2 | 15 |
| Total Marks | | | 30 |

| | | | |
|---|---|---|---|
| Maximum Marks | | | 50 |
| Verification of Daily program record and Git Repository | | | 5 marks |
| Viva | | | 10 marks |
| Problem solving(Based on difficulty level, one or more questions may be given) | Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design | 15% | 35 marks |
| | Program correctness 35 marks | 50% | |
| | Code efficiency | 15% | |
| | Formatted output and Pushing to remote Git repository | 20% | |
| Total Marks | | | 50 marks |

**Book of Study :**

1. Joseph Annuzzi Jr, Lauren Darcey, Shane Condor, “Advanced Android Application Development, Developers Library”, Pearson Education, 4th Edition (2015)
2. Lauren Darcey, Shane Condor, “Android, Wireless Application Development”, Pearson Education, 3rd Edition.
3. Paul Deitel, Harvey Deitel, Alexander Wald, “Android 6 for programmers, An AppDriven Approach”, Pearson Education
4. Rap Payne, “Beginning App Development with Flutter: Create Cross-Platform Mobile Apps”, Apress (2019)

**Internet Study Material :**

https://www.tutorialspoint.com/android/index.htm
https://www.javatpoint.com/android-tutorial

**Massive Open Online Courses (MOOCs) :**

https://www.mygreatlearning.com/academy/learn-for-free/courses/android-application- development

**Syllabus**

**Module 1: Fundamentals (8 Hours)**

Basic Building blocks – Activities, Services, Broadcast Receivers and Content providers.UI Components - Views and notifications Components for communication.Intents and Intent Filters.

**Module 2: Application Structure (8 Hours)**

AndroidManifest.xml , user-permission - sdk , Resources and R.java.Assets, Layouts and Drawable Resources, Activities and Activity lifecycle..

**Module 3: Android Virtual Device (12 Hours)**

Emulator-Android Virtual Device:- Launching emulator, Editing emulator settings, Emulator shortcuts.Basic UI design:- Form widgets , Text Fields , Layouts Preferences:- Shared Preferences, Preferences from xml Menu : Option menu , Context menu, menu from xml, menu via code.Intents : Explicit Intents, Implicit intents.

**Module 4: UI design (10 Hours)**

Time and Date, Images and media , Composite , Alert Dialogs and Toast, Popup.Tabs and Tab Activity.Styles and Themes: styles.xml , drawable resources for shapes, gradients (selectors) , style attribute in layout file, Applying themes via code and manifest file.

**Module 5: Content Providers (10 Hours)**

SQLite Programming , SQLite Open Helper, SQLite Database,.Cursor, Reading and updating Contacts, Reading bookmarks.

**Course Contents and Lecture Schedule**

| Sl. No | Topic | No. of Lectures |
|---|---|---|
| **Module 1: Fundamentals** | | (8 Hours) |
| 1.1 | Basic Building blocks – Activities, Services, Broadcast Receivers and Content providers | |
| 1.2 | UI Components - Views and notifications Components for communication | |
| 1.3 | Intents and Intent Filters | |

| | | |
|---|---|---|
| **Module 2: Application Structure** | | (8 Hours) |
| 2.1 | AndroidManifest.xml , user-permission - sdk , Resources and R.java | |
| 2.2 | Assets, Layouts and Drawable Resources, Activities and Activity lifecycle. | |
| **Module 3: Android Virtual Device** | | (12 Hours) |
| 3.1 | Emulator-Android Virtual Device:- Launching emulator, Editing emulator settings, Emulator shortcuts | |
| 3.2 | Basic UI design:- Form widgets , Text Fields , Layouts;Preferences:- Shared Preferences, Preferences from xml;Menu : Option menu , Context menu, menu from xml, menu via code | |
| 3.3 | Intents : Explicit Intents, Implicit intents | |
| **Module 4: UI design** | | (10 Hours) |
| 4.1 | Time and Date, Images and media , Composite , Alert Dialogs and Toast, Popup | |
| 4.2 | Tabs and Tab Activity | |
| 4.3 | Styles and Themes: styles.xml , drawable resources for shapes, gradients (selectors) ,;style attribute in layout file, Applying themes via code and manifest file | |
| **Module 5: Content Providers** | | (10 Hours) |
| 5.1 | SQLite Programming , SQLite Open Helper, SQLite Database, | |
| 5.2 | Cursor, Reading and updating Contacts, Reading bookmarks | |
| Total Hours | | 48 |

AMAL JYOTHI
COLLEGE OF ENGINEERING
(AUTONOMOUS)

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | R | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|---|---|
| 23MCA245 | MINI PROJECT | GEN | 0 | 0 | 4 | 0 | 2 | 2023 |

**Preamble :**

This project work aims to enable the students to apply the software engineering principles on a real software project, to make the students familiar with the stages of a deployment pipeline and to develop a software product using the latest software development methodology

**Prerequisite :**

Knowledge in software engineering principles and programming skills.

**Course Outcomes(CO):** Upon successful completion of this course, students should be able to:

| | |
|---|---|
| CO1 | Identify a real-life project which is useful to society / industry |
| CO2 | Interact with people to identify the project requirements |
| CO3 | Apply suitable development methodology for the development of the product / project |
| CO4 | Analyse and design a software product / project |
| CO5 | Test the modules at various stages of project development, build and integrate different software modules |

**Mapping of course outcomes with program outcomes**

| # | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 1 | 3 | 2 | 3 | - |
| **CO3** | 3 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 1 | - | 2 | - |
| **CO4** | 3 | 3 | 3 | 3 | 3 | - | 3 | 3 | 1 | 1 | 2 | - |
| **CO5** | 3 | 3 | 3 | 3 | 3 | - | 2 | 3 | - | - | 1 | - |
| **CO6** | - | - | - | - | - | - | - | - | - | - | - | - |

**General Notes :**

●Students shall identify Real-Life Projects which are relevant and useful to the society or industry.

● The project shall be an individual project and must be done in-house. The student has to spend time in the lab for the project work.

● Attendance as per MCA regulations is applicable for submitting the project for final evaluation.

Students shall submit project synopsis and get prior approval from the Project (Faculty) Supervisor before the project work begins.

● If there is a customer for the project then he/she will be the Product Owner (External Guide) and a faculty from the department will be the Internal Guide. If there is no such customer then the Internal Guide himself/herself shall act as the Product Owner.

● A faculty / technical staff shall act as the Scrum Master to continuously monitor the project development. Periodic meetings, of less than 15 minutes, at the convenience of the Scrum Master are to be highly encouraged. Ensure such meetings occur once in three days.

● Set a sprint as two weeks, ensure biweekly reviews. A review shall not exceed 30 minutes. A demo to the Product Owner (Project Guide) is mandatory in every review.

● The student shall maintain a Scrum Book (Rough Record) which has to be divided into 4 parts – (i) Product Backlog (ii) Database & UI Design (iii) Testing & Validation and (iv) Details of Versions. Make dated entries in the corresponding part at regular intervals. The corrections and comments from Product Owner and Scrum Master should be clearly indicated with the Date.

● Test Driven Development methodology may be practiced for the project development. BugZilla, BackLog or any such tool may be used for Bug Tracking.

● Git shall be used for Version Control and Git commit history may be verified as part of project evaluation .

● LaTeX or an equivalent tool shall be used for preparing Presentations and Project Report.

**Assessment Pattern :**

| | |
|---|---|
| Class participation and attendance | 10% |
| Evaluation | 50% |
| Class work | 40% |

**Mark distribution :**

| Total Marks | CIE | ESE |
|---|---|---|
| 100 | 100 | - |

**Continuous Internal Evaluation Pattern :**

| | |
|---|---|
| Continuous evaluation by Supervisor, Scrum Master and Project Guide | 50 Marks |
| Interim evaluation by the Project Assessment Board | 25 Marks |
| Final evaluation by the Project Assessment Board | 25 Marks |
| Total | 100 Marks |

**References :**

1. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation (Addison-Wesley Signature Series (Fowler)) 1st Edition
2. Alistair Cockburn, Agile Software Development: The Cooperative Game, Addison Wesley, 2nd Edition (2006).
3. Andrew Hunt, David Thomas, The Pragmatic Programmer: From Journeyman to Master, Pearson India, 1st Edition (2008).
4. Ken Schwaber, Mike Beedle, Agile Software Development with Scrum, Pearson (2008).
5. Lisa Crispin, Janet Gregory, Agile Testing: A Practical Guide for Testers and Agile Teams, Addison Wesley Professional, 1st Edition (2008).
6. Mike Cohn, User Stories Applied: For Agile Software Development, Addison Wesley, 1 st Edition, (2004).
7. Pressman, R.S., Software Engineering: A Practitioner's Approach, McGraw Hill SE, 7th Edition, (2010).
8. Robert C. Martin, Agile Software Development, Principles, Patterns and Practices, Prentice Hall Imprint, Pearson Education, 2nd Edition (2002).
9. Rod Stephens, Beginning Software Engineering, Wrox Series, Wiley India Pvt Ltd (2015). 10. RyPress Ry's Git Tutorial (Free e-book)

**Internet Study Material :**

1. Introduction to DevOps (https://www.edx.org/course/introduction-devops-microsoftdev212x)

AMAL JYOTHI
COLLEGE OF ENGINEERING
(AUTONOMOUS)

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | R | CREDIT | YEAR OF INTRODUCTION |
|---|---|---|---|---|---|---|---|---|
| 23MCANC3 | DOMAIN EXPERTISE WORKSHOPS | GEN | 0 | 0 | 1 | 0 | 0 | 2023 |

**Preamble :**

*This course intends to give insight into various application domains and technology domains in the IT industry.*

**Prerequisite :**

Nil

**Course Outcomes(CO):** Upon successful completion of this course, students should be able to:

| | |
|---|---|
| CO1 | Associate real-life problems with IT solutions |
| CO2 | Describe latest developments in IT field |
| CO3 | Interact with technical experts |
| CO4 | Prepare technical documents |
| CO5 | Present a topic before an audience |

**Mapping of course outcomes with program outcomes**

| # | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 2 | - | - | - | 3 | 3 | - | 3 | 3 | 3 | 3 |
| **CO2** | 2 | 2 | - | - | - | 3 | 3 | - | 3 | 3 | 3 | 3 |
| **CO3** | - | 2 | - | - | - | 3 | 3 | - | 3 | - | - | 3 |
| **CO4** | - | - | - | - | - | 3 | - | - | 3 | - | - | 3 |
| **CO5** | - | - | - | - | - | 3 | - | - | 3 | - | - | 3 |
| **CO6** | - | - | - | - | - | - | - | - | - | - | - | - |

**General Notes :**

As part of this course following activities shall be done:
1. Expert talks shall be arranged to explain about various Application domains.
2. Instruct students to research and submit reports about any of these domains.
3. Instruct students to study about these domains and take seminars.

One hour in every week or two hours in alternate weeks shall be used for this course

Staff-in-charge shall maintain a file with the records, documents and reports as hard copies or e-copies of all the activities done on this course.

These documents shall be submitted for verification during the academic audit.

**Syllabus**

**Module 1: AI ML and Cybersecurity (6 Hours)**

Exploring AI techniques, neural networks, and deep learning.Applications in natural language processing, computer vision, and predictive analytics.Understanding threats, vulnerabilities, and risk management. Hands-on practice in ethical hacking, penetration testing, and cryptography.

**Module 2: Blockchain and Cryptocurrencies and IoT (6 Hours)**

Study of blockchain principles and decentralized systems.Hands-on experience in creating smart contracts and exploring cryptocurrency technologies.Learning about IoT devices, protocols, and sensor networks. Designing and developing IoT applications for real-world scenarios.

**Module 3: Cloud Computing and Data Science (6 Hours)**

Understanding cloud service models and deployment models..Hands-on experience with cloud platforms and virtualization technologies.Exploring data mining, data preprocessing, and data visualization. Analyzing large datasets and deriving meaningful insights.

**Module 4: Augmented Reality and Virtual Reality and E-commerce (6 Hours)**

Study of AR/VR technologies and applications in various industries. Creating interactive and immersive experiences using AR/VR tools.Study of e-commerce platforms, payment gateways, and online marketing strategies..Developing and optimizing digital marketing campaigns.

**Module 5: Gaming and Robotics (6 Hours)**

Understanding game design principles, graphics, and gameplay mechanics. Creating and developing interactive games using game engines.Study of robotic systems, control algorithms, and automation in manufacturing..Hands-on experience in designing and programming robots.

**Course Contents and Lecture Schedule**

| Sl. No | Topic | No. of Lectures |
|---|---|---|
| **Module 1: AI ML and Cybersecurity** | | (6 Hours) |
| 1.1 | Exploring AI techniques, neural networks, and deep learning | |
| 1.2 | Applications in natural language processing, computer vision, and predictive analytics | |
| 1.3 | Understanding threats, vulnerabilities, and risk management.;Hands-on practice in ethical hacking, penetration testing, and cryptography | |
| **Module 2: Blockchain and Cryptocurrencies and IoT** | | (6 Hours) |
| 2.1 | Study of blockchain principles and decentralized systems | |
| 2.2 | Hands-on experience in creating smart contracts and exploring cryptocurrency technologies | |
| 2.3 | Learning about IoT devices, protocols, and sensor networks.;Designing and developing IoT applications for real-world scenarios | |
| **Module 3: Cloud Computing and Data Science** | | (6 Hours) |
| 3.1 | Understanding cloud service models and deployment models. | |
| 3.2 | Hands-on experience with cloud platforms and virtualization technologies | |
| 3.3 | Exploring data mining, data preprocessing, and data visualization.;Analyzing large datasets and deriving meaningful insights | |
| **Module 4: Augmented Reality and Virtual Reality and E-commerce** | | (6 Hours) |
| 4.1 | Study of AR/VR technologies and applications in various industries.;Creating interactive and immersive experiences using AR/VR tools | |
| 4.2 | Study of e-commerce platforms, payment gateways, and online marketing strategies. | |

| | | |
|---|---|---|
| 4.3 | Developing and optimizing digital marketing campaigns | |
| **Module 5: Gaming and Robotics** | | (6 Hours) |
| 5.1 | Understanding game design principles, graphics, and gameplay mechanics.;Creating and developing interactive games using game engines | |
| 5.2 | Study of robotic systems, control algorithms, and automation in manufacturing. | |
| 5.3 | Hands-on experience in designing and programming robots | |
| Total Hours | | 30 |

**Model Question Paper**
**Course Code: 23MCA201**

**Course Name: DATA SCIENCE AND MACHINE LEARNING**

**Max. Marks :60** **Duration: 3 Hrs**

**Part A**

***Answer all questions. Each question carries 3 marks (10 * 3 = 30 Marks)***

1. What is data science?
2. Explain the different types of data.
3. Differentiate between supervised and unsupervised learning algorithms.
4. Explain how to choose the value of *k* in *k*-NN algorithm.
5. Explain entropy and information gain.
6. Explain the Ordinary Least Square method in regression.
7. Define activation function. Give two examples.
8. What is maximum margin hyperplane.
9. Define precision, recall and F-measure.
10. Explain bootstrap sampling

**Part B**

***Answer one full question from each module, each carries 6 marks.***

11. Explain the various methods for visualising multivariate data. (6 marks)

OR

12. Explain the various processes for preparing a dataset to perform a data science task. (6 marks)

13. Based on a survey conducted in an institution, students are classified based on the two attributes of academic excellence and other activities. Given the following data, identify the classification of a student with X = 5 and Y = 7 using *k*-NN algorithm (choose *k* as 3).

| X (Academic Excellence) | Y (Other Activities) | Z (Classification) |
|---|---|---|
| 8 | 6 | Outstanding |
| 5 | 6 | Good |
| 7 | 3 | Good |
| 6 | 9 | Outstanding |

(6 marks)

OR

14. Given the following data on a certain set of patients seen by a doctor. Can the doctor conclude that a person having chills, fever, mild headache and without running nose has flu? (Use Naive Bayes classification).

| **Chills** | **Running nose** | **Headache** | **Fever** | **Has flu** |
|---|---|---|---|---|
| Y | N | mild | Y | N |
| Y | Y | no | N | Y |
| Y | N | strong | Y | Y |
| N | Y | mild | Y | Y |
| N | N | no | N | N |
| N | Y | strong | Y | Y |
| N | Y | strong | N | N |
| Y | Y | mild | Y | Y |

(6 marks)

15. Obtain a linear regression for the data given in the table below assuming that *y* is the independent variable.

| *x* | 55 | 60 | 65 | 70 | 80 |
|---|---|---|---|---|---|
| *y* | 52 | 54 | 56 | 58 | 62 |

(6 marks)

OR

16. Given the following data, draw a decision tree to predict whether a person cheats. Give the corresponding set of classification rules also.

| **Sl. No.** | **Refund** | **Marital status** | **Income** | **Cheats?** |
|---|---|---|---|---|
| 1 | Yes | Single | High | No |
| 2 | No | Married | High | No |
| 3 | No | Single | Low | No |
| 4 | Yes | Married | High | No |

| | | | | |
|---|---|---|---|---|
| 5 | No | Divorced | High | Yes |
| 6 | No | Married | Low | No |
| 7 | Yes | Divorced | High | No |
| 8 | No | Single | High | Yes |
| 9 | No | Married | Low | No |
| 10 | No | Single | High | Yes |

(6 marks)

17. Define an artificial neuron. What are the characteristics of an artificial neural network (ANN)?

(6 marks)

OR

18. a) Define linearly separable dataset. Give an example each of a dataset that is linearly separable and of a dataset that is not linearly separable.

(3 marks)

b) Define kernel function. Explain the kernel trick to construct a classifier for a dataset that is not linearly separable.

(3 marks)

19. Suppose 10000 patients get tested for flu; out of them, 9000 are actually healthy and 1000 are actually sick. For the sick people, a test was positive for 620 and negative for 380. For the healthy people, the same test was positive for 180 and negative for 8820. Construct a confusion matrix for the data and compute the precision and recall for the data. (6 marks)

OR

20. Assume the following: A database contains 80 records on a particular topic of which 55 are relevant to a certain investigation. A search was conducted on that topic and 50 records were retrieved. Of the 50 records retrieved, 40 were relevant. Construct the confusion matrix for the search and calculate the precision and recall scores for the search. (6 marks)

< SEECODE > Reg no :_____

Name :_____

# AMAL JYOTHI COLLEGE OF ENGINEERING (AUTONOMOUS)

SEMESTER III MCA DEGREE EXAMINATION (Regular)

**23MCA203**

**Design & Analysis of Algorithms**

| Duration: **3 Hours** | Maximum Marks: **60** |
|---|---|

## PART A

***Answer all questions, each carries 3 Marks.***

| | | |
|---|---|---|
| 1 | Compare Iterative and Recurrence Tree method using an Example | ( 3 ) |
| 2 | Illustrate the Types of Algorithm Analysis | ( 3 ) |
| 3 | Describe the algorithm to find the maximum and minimum using an example | ( 3 ) |
| 4 | Illustrate knapsack problem using an example | ( 3 ) |
| 5 | Outline the working of Dynamic Programming | ( 3 ) |
| 6 | Compare Divide and Conquer Method and Dynamic Programming | ( 3 ) |
| 7 | Define Sum of Subsets Problem with suitable Example | ( 3 ) |
| 8 | Illustrate the Control Abstraction of Backtracking | ( 3 ) |
| 9 | Explain NP complexity class | ( 3 ) |
| 10 | What are Non-deterministic Algorithms | ( 3 ) |

## PART B

***Answer any 1 questions from each module, each carries 6 Marks.***

**Module 1**

| | | |
|---|---|---|
| 11 | Explain the various Asymptotic Notations with suitable examples | ( 6 ) |
| | **OR** | |
| 12 | State Master's Theorem. Formulate T(n) = 10T (n/2) + 2n2 using the Master's Theorem | ( 6 ) |

**Module 2**

| | | |
|---|---|---|
| 13 | Illustrate Quick Sort algorithm with proper code sequence | ( 6 ) |
| | **OR** | |
| 14 | Illustrate Kruskal’s Algorithm | ( 6 ) |

**Module 3**

| | | |
|---|---|---|
| 15 | Compose an algorithm to find the Shortest path in a weighted graph | ( 6 ) |
| | **OR** | |

| | | |
|---|---|---|
| 16 | Illustrate the Travelling Salesman Problem with suitable example | ( 6 ) |
| **Module 4** | | |
| 17 | Summarize the N-Queens problem with Suitable example | ( 6 ) |
| **OR** | | |
| 18 | Explain the 15 puzzle problem, with suitable example | ( 6 ) |
| **Module 5** | | |
| 19 | With the help of suitable code sequence convince Vertex cover is a Hard Problem | ( 6 ) |
| **OR** | | |
| 20 | Explain Clique Problem using the illustration of suitable example | ( 6 ) |

< SEECODE > Reg no :_____

Name :_____

# AMAL JYOTHI COLLEGE OF ENGINEERING (AUTONOMOUS)

SEMESTER IX MCA DEGREE EXAMINATION (Regular)

**23INMCA561**

**Operations Research**

| Duration: **3 Hours** | Maximum Marks: **60** |
|---|---|

## PART A

***Answer all questions, each carries 3 Marks.***

| | | |
|---|---|---|
| 1 | Define slack variable and surplus variable? | ( 3 ) |
| 2 | What do you mean by Big M method? | ( 3 ) |
| 3 | Write down the dual of the following problem.<br>$\text{Max } Z = 3x_1 + x_2 + 2x_3$<br>Subject to,<br>$x_1 + x_2 + x_3 \leq 5$<br>$2x_1 + x_3 \leq 10$<br>$x_2 + 3x_3 \leq 15$<br>$x_1 \geq 0, x_2 \geq 0$ | ( 3 ) |
| 4 | Explain in brief the Primal and Dual problems. | ( 3 ) |
| 5 | Find the optimum solution to the following assignment problem given the cost (Rs), for assigning workers.<br>X Y Z<br>A 18 17 16<br>B 15 13 14<br>C 19 20 21 | ( 3 ) |
| 6 | What are unbalanced transportation problem? How are they solved? | ( 3 ) |
| 7 | Define Critical Path. | ( 3 ) |
| 8 | What is float? How is it classified? | ( 3 ) |
| 9 | Explains customer's behaviours in a queue. | ( 3 ) |
| 10 | Explain the elements of queuing system. | ( 3 ) |

## PART B

***Answer any 1 questions from each module, each carries 6 Marks.***

**Module 1**

| | | |
|---|---|---|
| 11 | Solve the LPP using Graphical method.<br>Maximize $Z = 4x_1 + 3x_2$<br><br>Subject to,<br>$2x_1 + x_2 \leq 72$<br>$x_1 + 2x_2 \leq 48$<br>$x_1 \geq 0, x_2 \geq 0$ | ( 6 ) |
| | **OR** | |
| 12 | Solve using Simplex method<br>$\text{Max}\, Z = 3x_1 + 4x_2$<br><br>Subject to,<br>$2x_1 + 5x_2 \leq 120$<br>$4x_1 + 2x_2 \leq 80$<br>$x_1 \geq 0, x_2 \geq 0$ | ( 6 ) |
| | **Module 2** | |
| 13 | solve by using duality theory:<br>Max. $z = 2x_1 + x_2$<br>Subject to the constraints:<br>$x_1 + x_2 \leq 2$<br>$x_1 + 3x_2 \leq 3$<br>$x_1 \geq 0, x_2 \geq 0$ | ( 6 ) |
| | **OR** | |
| 14 | Solve the following LPP by using revised simplex method:<br>Max. . $z = x_1 + 2x_2$<br>Subject to<br>$x_1 + 2x_2 \leq 3$<br>$x_1 + 2x_2 \leq 1$<br>$x_1 \geq 0, x_2 \geq 0$ | ( 6 ) |
| | **Module 3** | |
| 15 | Obtain initial feasible solution for the transportation problem by Vogel's method | ( 6 ) |

| | W1 | W2 | W3 | W4 | Available |
|---|---|---|---|---|---|
| F1 | 11 | 20 | 7 | 8 | 50 |
| F2 | 21 | 16 | 10 | 12 | 40 |
| F3 | 8 | 12 | 18 | 9 | 70 |
| Required | 30 | 25 | 35 | 40 | |

| | | |
|---|---|---|
| | **OR** | |
| 16 | Given below is a matrix showing the profit for different jobs done through different machines. Find an assignment programme which will maximize the total profit. | ( 6 ) |

| | | | | |
|---|---|---|---|---|
| | M1 | M2 | M3 | M4 |
| J1 | 51 | 53 | 54 | 50 |
| J2 | 47 | 50 | 48 | 50 |
| J3 | 49 | 50 | 60 | 61 |
| J4 | 63 | 64 | 60 | 61 |

## Module 4

17 Listed in the table are the activities and sequencing requirements necessary for completing the research project. Find the critical path. ( 6 )

| Activity | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Duration | 4 | 2 | 1 | 12 | 14 | 2 | 3 | 2 | 4 | 3 | 4 | 2 | 2 |
| Immediate Predecessor | E | A | B | K | - | E | F | F | F | I,L | C,G,H | D | I,L |

**OR**

18 Calculate the earliest start, earliest finish, latest start and latest finish of each activity of the project given below: ( 6 )

| Activity | 1-2 | 1-3 | 1-5 | 2-3 | 2-4 | 3-4 | 3-5 | 3-6 | 4-6 | 5-6 |
|---|---|---|---|---|---|---|---|---|---|---|
| Duration | 8 | 7 | 12 | 4 | 10 | 3 | 5 | 10 | 7 | 4 |

## Module 5

19 The belt snapping for conveyers in open cast mine occur at the rate of 2 per shift. There is only one hot plate available for vulcanising and it can vulcanise on an average 5 belts snap per shift. ( 6 )

1. What is the probability that when a belt snaps, the hot plate is readily available?
2. What is the average number in the system
3. What is the waiting time of an arrival?
4. What is the average waiting time plus vulcanising time?

**OR**

20 A bank has two tellers working on savings accounts. The first teller handles withdrawals only. The second teller handles deposits only. It has been found that service time distributions for both deposits and withdrawals are exponential with mean service time 3 minutes per customer. Deposits are found to arrive in a Poisson fashion throughout the day with mean arrival rate 16 per hour. Withdrawals also arrive in a Poisson fashion with mean arrival rate 14 per hour. What would be the effect on the average waiting time for depositors and withdrawers? ( 6 )

< SEECODE > Reg no :_____

Name :_____

# AMAL JYOTHI COLLEGE OF ENGINEERING (AUTONOMOUS)

SEMESTER III MCA DEGREE EXAMINATION (Regular)

**23MCA263**

**Cyber Security & Cryptography**

| Duration: **3 Hours** | Maximum Marks: **60** |
|---|---|

## PART A

***Answer all questions, each carries 3 Marks.***

| | | |
|---|---|---|
| 1 | Explain about steganography | ( 3 ) |
| 2 | Explain Distributed Denial of Service (DDoS) attack on network security | ( 3 ) |
| 3 | What is Cipher Feed Back mode (CFB)? | ( 3 ) |
| 4 | Explain Triple Des | ( 3 ) |
| 5 | Illustrate blind signatures. | ( 3 ) |
| 6 | Define Attacks on Digital Signatures | ( 3 ) |
| 7 | Explain about S/MIME and its services | ( 3 ) |
| 8 | Describe security association of IPSEC. | ( 3 ) |
| 9 | Define XML External Entities (XXE) | ( 3 ) |
| 10 | Explain Security misconfiguration | ( 3 ) |

## PART B

***Answer any 1 questions from each module, each carries 6 Marks.***

**Module 1**

| | | |
|---|---|---|
| 11 | Given the key ‘MONARCHY’, apply the Playfair cipher to the plaintext ‘FACTIONAISM’. Decrypt the ciphertext also. | ( 6 ) |
| | **OR** | |
| 12 | Explain in detail about the Substitution ciphers with suitable examples. | ( 6 ) |

**Module 2**

| | | |
|---|---|---|
| 13 | Explain RSA algorithm with example. | ( 6 ) |
| | **OR** | |
| 14 | With a neat diagram explain AES algorithm. | ( 6 ) |

**Module 3**

| | | |
|---|---|---|
| 15 | With a neat diagram explain HMAC algorithm. | ( 6 ) |
| | **OR** | |

| | | |
|---|---|---|
| 16 | Explain the RSA digital signature scheme in cryptography. | ( 6 ) |
| | **Module 4** | |
| 17 | Explain in detail about the SSL architecture and SSL message format with suitable diagram | ( 6 ) |
| | **OR** | |
| 18 | Explain Exportability in SSLv2 and Exportability in SSLv3. | ( 6 ) |
| | **Module 5** | |
| 19 | Explain Cross-Site Scripting (XSS) | ( 6 ) |
| | **OR** | |
| 20 | Define Insufficient logging & monitoring | ( 6 ) |

**Course Code: 23MCA265**
**Course Name: Cloud Computing**

**Max. Marks :60** **Duration: 3 Hrs**

## Part A

***Answer all questions. Each question carries 3 marks (10 * 3 = 30 Marks)***

| | | |
|---|---|---|
| 1. | What are the different components in OpenStack logical architecture? | 3 |
| 2. | Differentiate between private cloud and public cloud. | 3 |
| 3. | Explain asymmetric clustering and symmetric clustering. | 3 |
| 4. | List out the functionalities handled by the cloud controller. | 3 |
| 5. | Briefly explain docker containers. | 3 |
| 6. | Compare object storage with NAS/SAN based storage. | 3 |
| 7. | Describe the steps in connecting two networks using a virtual router. | 3 |
| 8. | Write a short note on firewall as a service | 3 |
| 9. | List the HA levels in OpenStack. | 3 |
| 10. | Explain the purpose of HA proxy. | 3 |

## Part B

***Answer all questions. Each question carries 6 marks. (5 * 6 = 30 Marks)***

| | | |
|---|---|---|
| 11 | List and explain the different components in OpenStack Architecture. | 6 |
| | **OR** | |
| 12 | a. Explain the provisioning of VM in OpenStack using a diagram | 4 |
| | b. Describe the best practices used in Physical mode design | 2 |
| 13 | Explain the keystone architecture | 6 |
| | **OR** | |
| 14 | Explain the steps involved in running OpenStack playbooks | 6 |
| 15 | Explain in detail the multiple services involved in launching an instance | 6 |
| | **OR** | |
| 16 | Explain the steps in deploying swift service | 6 |
| 17 | Explain the architecture of neutron in detail | 6 |
| | **OR** | |
| 18 | Explain the categorization of neutron virtual networks in detail | 6 |
| 19 | Explain stacking in OpenStack | 6 |
| | **OR** | |
| 20 | Explain in detail steps involved in setting a database with high availability | 6 |

Reg no :_____

Name :_____

# AMAL JYOTHI COLLEGE OF ENGINEERING (AUTONOMOUS)

SEMESTER III MCA DEGREE EXAMINATION (Regular)

**23MCA267**

**Cyber Forensics**

| Duration: **3 Hours** | Maximum Marks: **60** |
|---|---|

## PART A

***Answer all questions, each carries 3 Marks.***

| | | |
|---|---|---|
| 1 | Categorize the formats used to store the collected digital evidences | ( 3 ) |
| 2 | What do you mean by a computer crime? Which activities are considered as company policy violations? | ( 3 ) |
| 3 | Enumerate the features of Resilient File System. | ( 3 ) |
| 4 | Write down the operations involved in boot sequence | ( 3 ) |
| 5 | Differentiate between soft link and hard link | ( 3 ) |
| 6 | Which are the data acquisition tools available in Linux that is forensically sound? | ( 3 ) |
| 7 | List the features of Wireshark tool. | ( 3 ) |
| 8 | List different types of mobile forensic acquisition procedures. | ( 3 ) |
| 9 | State the guidelines for writing a report which is admissible in a court of law | ( 3 ) |
| 10 | What are the different types of forensics reports? | ( 3 ) |

## PART B

***Answer any 1 questions from each module, each carries 6 Marks.***

### Module 1

| | | |
|---|---|---|
| 11 | What is evidence bag? Describe standard operating procedures for securing evidence before transporting it to forensic lab. | ( 6 ) |
| | **OR** | |
| 12 | How the retention policy of evidence related to evidence storage mediums? | ( 6 ) |

### Module 2

| | | |
|---|---|---|
| 13 | Explain the importance of Windows Registry in forensics analysis | ( 6 ) |
| | **OR** | |
| 14 | What is a solid-state storage device? Discuss the usage of Microsoft BitLocker tool. | ( 6 ) |

| | | |
|---|---|---|
| **Module 3** | | |
| 15 | Explain the file structures of Linux and MacOS | ( 6 ) |
| **OR** | | |
| 16 | Define write blocker? Explain the use of Sleuth Kit tool. | ( 6 ) |
| **Module 4** | | |
| 17 | Explain the standard operating procedures used for mobile forensics. | ( 6 ) |
| **OR** | | |
| 18 | Discuss the standard operating procedures used for network forensics. | ( 6 ) |
| **Module 5** | | |
| 19 | List and explain the steps involved in generating forensics report using Autopsy tool | ( 6 ) |
| **OR** | | |
| 20 | What are the responsibilities of a Computer Forensic Investigator? | ( 6 ) |

< SEECODE > Reg no :_____

Name :_____

# AMAL JYOTHI COLLEGE OF ENGINEERING (AUTONOMOUS)

SEMESTER III MCA DEGREE EXAMINATION (Regular)

**23MCA285**

**Digital Image Processing**

| Duration: **3 Hours** | Maximum Marks: **60** |
|---|---|

## PART A

***Answer all questions, each carries 3 Marks.***

| | | |
|---|---|---|
| 1 | List out various components of an Image Processing System. | ( 3 ) |
| 2 | Define Toeplitz & Circulant matrices | ( 3 ) |
| 3 | Explain histogram equalization in detail. | ( 3 ) |
| 4 | Differentiate linear spatial filter and non-linear spatial filter. | ( 3 ) |
| 5 | Explain the properties of 2D DFT. | ( 3 ) |
| 6 | List the steps involved in frequency domain filtering. | ( 3 ) |
| 7 | Write note on Point Spread Function. | ( 3 ) |
| 8 | List the components of a compression system. | ( 3 ) |
| 9 | Compare opening and closing in morphological processing of images. | ( 3 ) |
| 10 | Explain the merits and demerits of edge thresholding in segmentation. | ( 3 ) |

## PART B

***Answer any 1 questions from each module, each carries 6 Marks.***

**Module 1**

| | | |
|---|---|---|
| 11 | Explain fundamental steps in Digital Image Processing. | ( 6 ) |
| | **OR** | |
| 12 | Differentiate sampling and quantization in image processing. | ( 6 ) |

**Module 2**

| | | |
|---|---|---|
| 13 | Explain basic grey level transformation in spatial domain. | ( 6 ) |
| | **OR** | |
| 14 | Compare Unsharp masking and High-boost filtering in Spatial filtering | ( 6 ) |

**Module 3**

| | | |
|---|---|---|
| 15 | Explain Discrete Cosine Transform and its properties. | ( 6 ) |
| | **OR** | |
| 16 | Explain the working of Homomorphic filtering with an example. | ( 6 ) |
| | **Module 4** | |
| 17 | Explain image restoration process in detail. | ( 6 ) |
| | **OR** | |
| 18 | Differentiate lossy and lossless image compression methods | ( 6 ) |
| | **Module 5** | |
| 19 | Compare erosion and dilation in Morphological image analysis | ( 6 ) |
| | **OR** | |
| 20 | Explain canny edge detector in detail | ( 6 ) |

< SEECODE > Reg no :_____

Name :_____

# AMAL JYOTHI COLLEGE OF ENGINEERING (AUTONOMOUS)

SEMESTER III MCA DEGREE EXAMINATION (Regular)

**23MCA283**

**Deep Learning**

| Duration: **3 Hours** | Maximum Marks: **60** |
|---|---|

**PART A**

***Answer all questions, each carries 3 Marks.***

| | | |
|---|---|---|
| 1 | Describe sigmoid activation functions. | ( 3 ) |
| 2 | Write the gradient descent algorithm. | ( 3 ) |
| 3 | Explain with an example how graphs are stored and represented in TensorFlow. | ( 3 ) |
| 4 | Discuss how graph representation can accelerate computing models. | ( 3 ) |
| 5 | Describe the VGG 16 architecture. | ( 3 ) |
| 6 | What is max pooling in the context of CNN? | ( 3 ) |
| 7 | Explain ReLU. | ( 3 ) |
| 8 | Explain the problem of vanishing gradients. | ( 3 ) |
| 9 | Write a note on auto encoders. | ( 3 ) |
| 10 | Explain the idea behind cross entropy. | ( 3 ) |

**PART B**

***Answer any 1 questions from each module, each carries 6 Marks.***

**Module 1**

| | | |
|---|---|---|
| 11 | a) Describe the model of a biological neuron.<br>b) Explain perceptron learning algorithm. | ( 3 )<br>( 3 ) |
| | **OR** | |
| 12 | With a suitable example explain how backpropagation works | ( 6 ) |
| | **Module 2** | |
| 13 | Explain the role of batch normalization in training a neural network and describe how to find out overfitting from training and validation curves | ( 6 ) |
| | **OR** | |
| 14 | Explain the ideas of Rank, Shape and Type with an example in the context of a Tensor Data Structure | ( 6 ) |

| | | |
|---|---|---|
| **Module 3** | | |
| 15 | With a suitable numerical example illustrate convolution operation. | ( 6 ) |
| **OR** | | |
| 16 | Explain the architecture of AlexNet. | ( 6 ) |
| **Module 4** | | |
| 17 | Explain the idea of Truncated backpropagation through time. | ( 6 ) |
| **OR** | | |
| 18 | Describe how LSTM works. | ( 6 ) |
| **Module 5** | | |
| 19 | Distinguish between generative and discriminative models | ( 6 ) |
| **OR** | | |
| 20 | Explain how a GAN is trained. | ( 6 ) |

< SEECODE > Reg no :_____

Name :_____

# AMAL JYOTHI COLLEGE OF ENGINEERING (AUTONOMOUS)

SEMESTER III MCA DEGREE EXAMINATION (Regular)

**23MCA281**

**Internet of Things**

| Duration: **3 Hours** | Maximum Marks: **60** |
|---|---|

## PART A

***Answer all questions, each carries 3 Marks.***

| | | |
|---|---|---|
| 1 | What do you mean by computation offloading? | ( 3 ) |
| 2 | Explain the framework that enables collaboration between smart mobile devices and cloud. | ( 3 ) |
| 3 | Outline the major challenges faced in the Fog paradigm. | ( 3 ) |
| 4 | Explain Polyglot Programming. | ( 3 ) |
| 5 | Which are the challenges faced by stream-processing systems? | ( 3 ) |
| 6 | Explain anomaly detection and categorize anomalies in the data. | ( 3 ) |
| 7 | List the different ways that an IOT gateway can extend connectivity to nodes. | ( 3 ) |
| 8 | Write the advantages of obfuscation and diversification techniques. | ( 3 ) |
| 9 | Explain Inter-Integrated Circuit ($I^2C$) or Two Wire Interface (TWI). | ( 3 ) |
| 10 | Write a short note on Zigbee. | ( 3 ) |

## PART B

***Answer any 1 questions from each module, each carries 6 Marks.***

### Module 1

| | | |
|---|---|---|
| 11 | Explain the taxonomy of Resource Management in IOT. | ( 6 ) |
| | **OR** | |
| 12 | Draw and explain the state diagram of the open IOT services life cycle. | ( 6 ) |

### Module 2

| | | |
|---|---|---|
| 13 | a. Comment on the four broad requirements that motivate the design of TinyOS.<br>b. Describe the design decisions for nesC. | ( 6 ) |
| | **OR** | |
| 14 | List the features in coordination languages - Linda, eLinda, Orc, and Jolie. | ( 6 ) |

### Module 3

| | | |
|---|---|---|
| 15 | Compare Stream Management System (DSMS) and Complex Event Processing (CEP). | ( 6 ) |
| | **OR** | |
| 16 | Describe hyper ellipsoidal model for anomaly detection. | ( 6 ) |
| | **Module 4** | |
| 17 | Describe the error detection techniques which are applicable in the context of an IOT. | ( 6 ) |
| | **OR** | |
| 18 | Explain the Station-to-Station protocol (STS) and the two main shortcomings of STS. | ( 6 ) |
| | **Module 5** | |
| 19 | Discuss the sensors required to build the environmental-sensing IoT gateway device for weather monitoring. | ( 6 ) |
| | **OR** | |
| 20 | List and explain the six steps for the development of a sensor project. | ( 6 ) |

< SEECODE > Reg no :_____

Name :_____

# AMAL JYOTHI COLLEGE OF ENGINEERING (AUTONOMOUS)

SEMESTER III MCA DEGREE EXAMINATION (Regular)

**23MCA289**

**Social Network Analysis**

| Duration: **3 Hours** | Maximum Marks: **60** |
|---|---|

## PART A

***Answer all questions, each carries 3 Marks.***

| | | |
|---|---|---|
| 1 | Discuss two major limitations of the current Web that the Semantic Web aims to address. | ( 3 ) |
| 2 | How do personal networks differ from macro-structures of social networks, and why is it important to study them? | ( 3 ) |
| 3 | Compare the Web Ontology Language (OWL) to the Unified Modeling Language (UML) | ( 3 ) |
| 4 | Describe the significance of blogs and online communities as electronic sources for network analysis. | ( 3 ) |
| 5 | Explain the concept of "smushing" in the context of the Semantic Web | ( 3 ) |
| 6 | Discuss the significance of ontological representation of social relationships in the context of aggregating and reasoning with social network data. How does this approach enhance the analysis of social networks? | ( 3 ) |
| 7 | Explain the Breadth First Search (BFS) algorithm and its application in identifying connected components in a web graph | ( 3 ) |
| 8 | Discuss the significance of the clustering coefficient and degree assortativity in the analysis of the Facebook social graph. | ( 3 ) |
| 9 | What is page rank algorithm? | ( 3 ) |
| 10 | How does Google's architecture support efficient crawling, indexing, and searching while combating web spam? | ( 3 ) |

## PART B

***Answer any 1 questions from each module, each carries 6 Marks.***

**Module 1**

| | | |
|---|---|---|
| 11 | Write the Evolution and Intersection of the Semantic Web and Social Network Analysis. | ( 6 ) |
| | **OR** | |
| 12 | Exploring Social Network Analysis and Its Implications | ( 6 ) |

**Module 2**

| | | |
|---|---|---|
| 13 | Explain Electronic Sources for Network Analysis | ( 6 ) |
| | **OR** | |
| 14 | Explain Ontology languages for the Semantic Web | ( 6 ) |
| | **Module 3** | |
| 15 | Write ontological representation of social relationships | ( 6 ) |
| | **OR** | |
| 16 | Explain Aggregating and reasoning with social network data | ( 6 ) |
| | **Module 4** | |
| 17 | Describe Strongly Connected Components (SCC) Algorithm | ( 6 ) |
| | **OR** | |
| 18 | Explain iterative Fringe Upper Bound (iFUB) Algorithm | ( 6 ) |
| | **Module 5** | |
| 19 | Which are the components of Search Engine Architecture? | ( 6 ) |
| | **OR** | |
| 20 | Explain SALSA Algorithm | ( 6 ) |

**20MCA241**
**DATA SCIENCE LAB**
**<Question Paper Code>**

**Time : 3 Hrs** **Marks: 50**

**Lab Exam**
**Question Paper**

1. Program to implement text classification using Support vector machine.
2. Program to implement decision trees using any standard dataset available in the public domain and find the accuracy of the algorithm

< SEECODE > Reg no :_____

Name :_____

# AMAL JYOTHI COLLEGE OF ENGINEERING (AUTONOMOUS)

SEMESTER III MCA DEGREE EXAMINATION (Regular)

**23MCA243**

**Mobile Application Development Lab**

| Duration: **3 Hours** | Maximum Marks: **50** |
|---|---|

## PART A

***Answer all questions, each carries 15 Marks.***

| | | |
|---|---|---|
| 1 | Design a simple toast application that will display the message ”Displaying a sample message…!” for 5 seconds | ( 15 ) |
| 2 | Develop a Simple Android Application to display different shapes like rectangle, square, line etc. | ( 15 ) |