MCA -301
Compiler design

Subject Code	Subject Name & Title	Total Marks	End Semester Exam Marks		Sessional Marks		Total Credits
			Max	Min	Max	Min	
MCA-301	Compiler design	100	60	21	40	14	3

COURSE OBJECTIVES:

1. To learn the various phases of compiler.
2. To learn the various parsing techniques.
3. To understand intermediate code generation and run-time environment.
4. To learn to implement front-end of the compiler.
5. To learn to implement code generator.

Syllabus :

UNIT - I Introduction of compilers

Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA.

UNIT - II Syntax analyzer

Role of Parser – Grammars – Error Handling – Context-free grammars – Writing a grammar –Top Down Parsing – General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR (0)Item Construction of SLR Parsing Table - Introduction to LALR Parser – Error Handling and Recovery in Syntax Analyzer-YACC.

UNIT - III Intermediate code generation

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking.

UNIT - IV Run time environment and code generation

Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, HeapvManagement – Issues in Code Generation – Design of a simple Code Generator.

UNIT - V Code optimization

Principal Sources of Optimization – Peep-hole optimization – DAG- Optimization of Basic BlocksGlobal Data Flow Analysis – Efficient Data Flow Algorithm.

REFERENCE BOOK:

1. Compiler Design" by Chattopadhyay
2. "Compiler Design" by O G Kakde
3. "Principles Of Compiler Design" by Alfred V Aho
4. "Express Learning – Principles of Compiler Design" by ITL ESL

COURSE OUTCOME:

1. Explore the principles, algorithms, and data structures involved in the design and construction of compilers.
2. Implement a compiler for a small programming language.

MCA -302
Analysis & Design of Algorithm

Subject Code	Subject Name & Title	Total Marks	End Semester Exam Marks		Sessional Marks		Total Credits
			Max	Min	Max	Min	
MCA-302	Analysis & Design of Algorithm	100	60	21	40	14	3

COURSE OBJECTIVE :

1. Obtaining efficient algorithms is very important in modern computer engineering as the world wants applications to be time and space and energy efficient.
2. Course enables to understand and analyze efficient algorithms for various applications.

Syllabus :

UNIT - I Analysis of Algorithm

The efficient algorithm, Average, Best and worst case analysis, Amortized analysis , Asymptotic Notations, Analyzing control statement, Loop invariant and the correctness of the algorithm, Sorting Algorithms and analysis: Bubble sort, Selection sort, Insertion sort, Shell sort Heap sort, Sorting in linear time : Bucket sort, Radix sort and Counting sort Divide and Conquer Algorithm: Introduction, Recurrence and different methods to solve recurrence, Multiplying large Integers Problem, Problem Solving using divide and conquer algorithm - Binary Search, Max-Min problem, Sorting (Merge Sort, Quick Sort), Matrix Multiplication, Exponential.

UNIT - II Dynamic Programming

Introduction, The Principle of Optimality, Problem Solving using Dynamic Programming – Calculating the Binomial Coefficient, Making Change Problem, Assembly Line-Scheduling, Knapsack problem, All Points Shortest path, Matrix chain multiplication, Longest Common Subsequence.

Greedy Algorithm General Characteristics of greedy algorithms, Problem solving usingGreedy Algorithm - Activity selection problem, Elements of Greedy Strategy, Minimum Spanning trees (Kruskal's algorithm, Prim's algorithm), Graphs: Shortest paths, The Knapsack Problem, Job Scheduling Problem, Huffman code.

UNIT - III Graphs

An introduction using graphs and games, Undirected Graph, Directed Graph, Traversing Graphs, Depth First Search, Breath First Search, Topological sort, Connected components.

UNIT - IV Backtracking and Branch and Bound

Introduction, The Eight queens problem , Knapsack problem, Travelling Salesman problem, Minimax principle String Matching: Introduction, The naive string matching algorithm, The Rabin-Karp algorithm, String Matching with finite automata, The Knuth-Morris-Pratt algorithm.

UNIT - V Introduction to NP-Completeness

The class P and NP, Polynomial reduction, NP- Completeness Problem, NP-Hard Problems. Travelling Salesman problem, Hamiltonian problem, Approximation algorithms

REFERENCE BOOKS:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson,Ronald L. Rivest and Clifford Stein, PHI.
2. Fundamental of Algorithms by Gills Brassard, Paul Bratley, PHI.
3. Introduction to Design and Analysis of Algorithms, Anany Levitin, Pearson.
4. Foundations of Algorithms, Shailesh R Sathe, Penram
5. Design and Analysis of Algorithms, Dave and Dave, Pearson.

COURSE OUTCOME:-

1. Analyze the asymptotic performance of algorithms.
2. Derive and solve recurrences describing the performance of divide - and - conquer algorithms.
3. Find optimal solution by applying various methods.
4. Apply pattern matching algorithms to find particular pattern.
5. Differentiate polynomial and non-polynomial problems.
6. Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate.

MCA -303
Elective I
1. Internet of Things

Subject Code	Subject Name & Title	Total Marks	End Semester Exam Marks		Sessional Marks		Total Credits
			Max	Min	Max	Min	
MCA-303	Elective I (Internet of Things)	100	60	21	40	14	3

COURSE OBJECTIVE:

1. To understand Smart Objects and IoT Architectures
2. To learn about various IOT-related protocols
3. To build simple IoT Systems using Arduino and Raspberry Pi.
4. To understand data analytics and cloud in the context of IoT
5. To develop IoT infrastructure for popular applications

Syllabus :

UNIT - I Evolution of Internet of Things

Enabling Technologies – IOT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IOT models – Simplified IOT Architecture and Core IOT Functional Stack -– Fog, Edge and Cloud in IOT – Functional blocks of an IOT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT - II IOT Access Technologies

Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks

UNIT - III Optimizing IP for IOT

From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT - IV Design Methodology

Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – Arduino – Board details, IDE programming, Structured Vs Unstructured Data and Data in Motion Vs Data in Rest –

UNIT - V Role of Machine Learning

No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics

REFERENCE BOOK:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ―IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017
2. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach, Universities Press, 2015
3. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Key applications and Protocols, Wiley, 2012
4. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Elsevier, 2014.
5. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting the Internet of Things, Springer, 2011.

COURSE OUTCOME :

1. Explain the concept of IoT.
2. Analyze various protocols for IoT.
3. Design a PoC of an IoT system using Rasperry Pi/Arduino
4. Apply data analytics and use cloud offerings related to IoT.
5. Analyze applications of IoT in real time scenario

MCA -303
Elective I
2. Microprocessor & Microcontroller

Subject Code	Subject Name & Title	Total Marks	End Semester Exam Marks		Sessional Marks		Total Credits
			Max	Min	Max	Min	
MCA-303	Elective I (Microprocessor & Microcontroller)	100	60	21	40	14	3

COURSE OBJECTIVE:

1. To equip students with the fundamental knowledge and basic technical competence in the field of Microprocessors.
2. To emphasize on instruction set and logic to build assembly language programs.
3. To prepare students for higher processor architectures and Embedded systems

Syllabus :

UNIT - I Introduction to 8086

Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT - II 8086 Configuration

Basic configurations, System bus timing, System design using 8086, IO programming Introduction to Multiprogramming , Minimum & Maximum mode Operation, System Bus Structure, Multiprocessor configurations, Coprocessor, Closely coupled and loosely Coupled configurations ,Introduction to advanced processors.

UNIT - III Memory Interfacing and I/O interfacing

Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller

UNIT - IV 8051 microcontroller

Architecture, pin diagram, Internal RAM & ROM Architecture, Special Function Registers, External Memory Interfacing, Timers, I/O port, Interrupts, Serial Port

UNIT - V Programming 8051

Instruction Set, Addressing modes, assembly language programming, Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing

REFERENCE BOOKS:

1. "Microprocessor Architecture, Programming, and Applications with the 8085" by R Gaonkar
2. "Microprocessors: Principles and Applications" by A Pal
3. "Advanced Microprocessors and Peripherals" by A K Ray and K M Bhurchandi
4. "Fundamentals of Microprocessors and Microcontrollers" Ram B

COURSE OUTCOME :

1. Describe architecture of x86 processors.
2. Interpret the instructions of 8086 and write assembly and Mixed language programs.
3. Explain the concept of interrupts
4. Identify the specifications of peripheral chip
5. Design 8086 based system using memory and peripheral chips
6. Appraise the architecture of advanced processors

MCA -303
Elective I
3. Neural Networks & Fuzzy Logic

Subject Code	Subject Name & Title	Total Marks	End Semester Exam Marks		Sessional Marks		Total Credits
			Max	Min	Max	Min	
MCA-303	Elective I (Neural Networks & Fuzzy Logic)	100	60	21	40	14	3

COURSE OBJECTIVE:

1. To know the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks.
2. Deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components.

Syllabus :

UNIT - I Neuron and Neural network

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

UNIT - II Introduction to classical sets

Properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT - III Fuzzification

Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT - IV Neural network applications

Process identification, control, fault diagnosis and load forecasting. Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

UNIT - V Other networks

Multilayer Feed forward Neural Networks, Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP)

BOOKS:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
2. Introduction to Neural Networks using MATLAB 6.0 –
3. S.N.Sivanandam, S.Sumathi, S.N.Deepa, TMH
4. Neural Networks – James A Freeman and Davis Skapura, Pearson Education, 2002.
5. Neural Networks – Simon Hakins , Pearson Education
6. Neural Engineering by C.Eliasmith and CH.Anderson, PHI

COURSE OUTCOME :

1. Understand basic knowledge of fuzzy sets and fuzzy logic.
2. Apply basic fuzzy inference and approximate reasoning.
3. Understand principles of neural networks.
4. Apply basic fuzzy system modelling methods.