BRANCH-COMPUTER SCIENCE AND ENGINEERING

Specialization:COMPUTER ENGINEERING
COMPUTER SCIENCE AND ENGINEERING
COMPUTER SCIENCE
COMPUTER SCIENCE AND TECHNOLOGY

First Semester							
Theory					Practical		
Course Name	**Hours/Week L/T**	**Credit Theory**	**University Marks**	**Internal Evaluation**	**Hours/ Week L/T**	**Credit Practical**	**Marks**
Computational Methods and Techniques	4-0	4	100	50	-	-	-
Internet of Things	4-0	4	100	50	-	-	-
Advanced Computer Architecture	4-0	4	100	50	-	-	-
Adavanced Data Structure And Algorithm	4-0	4	100	50	-	-	-
Advanced Operating System	4-0	4	100	50	-	-	-
Lab-I					8	4	150
Total							
Total Marks: 900							
Total Credits: 22							

TENTATIVE
Likely to be modified

INTERNET OF THINGS (IoT)

MODULE I

Introduction to Internet of Things

Introduction-Definition & Characteristics of IoT, **Physical Design of IoT-** Things in IoT, IoT Protocols, **Logical Design of IoT-** IoT Functional Blocks, IoT Communication Models, IoT Communication APIs, **IoT Enabling Technologies-** Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, **IoT Levels & Deployment Templates.**

MODULE II

Domain Specific IoTs

Home Automation: Smart Lighting, Smart Appliances, Intrusion Detection, Smoke/Gas Detectors, **Cities-**Smart Parking, Smart Lighting, Smart Roads, Structural Health Monitoring, Surveillance, Emergency Response, **Environment-**Weather Monitoring, Air Pollution Monitoring, Noise Pollution Monitoring, Forest Fire Detection, River Floods Detection, **Energy-** Smart Grids, Renewable Energy Systems, Prognostics, **Retail-**Inventory Management, Smart Payments, Smart Vending Machines, **Logistics-**Route Generation & Scheduling, Fleet Tracking, Shipment Monitoring, Remote Vehicle Diagnostics, **Agriculture-**Smart Irrigation ,Green House Control ,**Industry -**Machine Diagnosis & Prognosis Indoor Air Quality Monitoring ,**Health & Lifestyle -**Health & Fitness Monitoring, Wearable Electronics

IoT and M2M Introduction, M2M-Difference between IoT and M2M, SDN and NFV for IoT-Software Defined Networking , Network Function Virtualization

MODULE III

IoT Platforms Design Methodology

IoT Design Methodology-Purpose & Requirements Specification ,Process Specification, Domain Model Specification, Information Model Specification , Service Specifications , IoT Level Specification, Functional View Specification , Operational View Specification , Device & Component Integration , Application Development, **Case Study on IoT System for Weather Monitoring, Motivation for Using Python**

IoT Physical Devices & Endpoints

What is an IoT Device-Basic building blocks of an IoT Device, **Exemplary Device: Raspberry Pi**, **About the Board, Linux on Raspberry Pi , Raspberry Pi Interfaces –** Serial, SPI , I2C , **Programming Raspberry Pi with Python-**Controlling LED with Raspberry Pi , Interfacing an LED and Switch with Raspberry Pi ,Interfacing a Light Sensor (LDR) with Raspberry Pi , **Other IoT Devices-** pcDuino, Beagle Bone Black , Cubieboard

MODULE IV

IoT & Beyond : Use of Big Data and Visualization in IoT, Industry 4.0 Concepts. Overview of RFID, Low-power design (Bluetooth Low Energy), range extension techniques (data mining and mesh networking), and data-intensive IoT for continuous recognition applications. Overview of Android / IOS App Development tools & Internet Of Everything

Text Books:

Internet of Things, A Hands on Approach, by Arshdeep Bahga & Vijay audisetti, University Press.

Reference Books:

The Internet of Things, by Michael Millen, Pearson

COMPUTATIONAL METHODS AND TECHNIQUES

MODULE-I:

Neural Networks: Artificial Neural Network and Introduction, Learning Rules, Knowledge Representation and Acquisition, Different Methods of Learning.
Algorithms of Neural Network: Feed-forward Error Back Propagation, Hopfield Model, Kohonen's Featrure Map, K-Means Clustering, ART Networks, RBFN, Application of Neural Network to the relevant field.

MODULE-II:

Fuzzy Logic: Basic Concepts of Fuzzy Logic, Fuzzy vs Crisp Set, Linguistic variables,Membership Functions, Operations of Fuzzy Sets, Fuzzy If-Then Rules, Variable Inference Techniques, Defuzzification, Basic Fuzzy Inference Algorithm, Fuzzy System Design, FKBC and PID Control, Antilock Breaking System(ABS), Industrial Applications.

MODULE-III:

Optimization Fundamentals: Definition, Classification of Optimization Problems, Unconstrained and Constrained Optimization, Optimality Conditions.
LINEAR Programming: Simplex Method, Duality, Sensitivity Methods
NON-LINEAR Programming: Newton's Method, GRG Method, Penalty Function Method, Augmented Langrange Multiplier Method, Dynamic Programming and Integer Programming, Interior Point Methods, Karmakar's Algorithm, Dual Affine, Primal Affine.

MODULE-IV:

Genetic Algorithm: GA and Genetic Engineering, Finite Element based Optimization, PSO,BFO, Hybridization of Optimization Technique, Application of Optimization Technique for Solving Projects(Project solutions). Implementation of Branch Relevant Industrial Applications by Matlab Code.
Books Recommended:

1. Neural Networks- by Simon Haykin
2. Fuzzy Logic with Engineering Application- by ROSS J.T (Tata Mc)
3. Neural Networks and Fuzzy Logic – by Bart Kosko
4. An introduction Fuzzy Control – by D.Driankor, H. Hellendorn, M.Reinfrank (Narosa Pub)
5. Fuzzy Neural Control – by Junhong NIE & Derek Linkers (PHI)
6. Related IEEE/IEE Publications
7. Fuzzy System Design Principles, Building Fuzzy IF-THEN Rule Bases – by Riza C. Berikiu and Trubatch, IEEE Press
8. Ashok D. Begundu & chandrapatla T.R "Optimization concept and application in engineering",Prentice Hall,1999
9. Rao S.S "Engineering Optimization"
10. Gill,Murray and Wright ,"Practical Optimization"
11. James A.Memoh. "Electric Power System Application Of Optimization".
12. Song Y.,"Modern Optimization Techniques In Power System"
13. Optimization Research;Prabhakar Pai,Oxford University Press.

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ADVANCED COMPUTER ARCHITECTURE

Module – I

Principles of Processor Performance, RISC and CISC Architectures, Pipelining fundamentals, Pipeline Hazards, Superscalar Architecture, Super Pipelined Architecture, VLIW Architecture.

Module – II

Basic Multiprocessor Architecture: Flynn's Classification, UMA, NUMA, Distributed Memory Architecture, Array Processor, Vector Processors, Associative Processor, Systolic architecture.
Interconnection Networks: Static Networks, Network Topologies, Dynamic Networks.

Module –III

Hierarchical Memory Technology: Data and Instruction caches, Multi-level caches, Cache memory mapping policies, Cache Coherence, Cache Performance, Virtual memory, Page replacement techniques, Memory Inter leaving, Memory Management hardware.

Module – IV

Data Flow Computer Architecture: Static Data flow computer, Dynamic Data flow computer, Cluster computers, Distributed computing, Cloud computing.

Reference Books:

1. David A. Patterson and John L. Hennessy, Computer Organization and Design, Elsevier.
2. John L. Hennessy and David A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann
3. Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability, Programmability, McGraw-Hill.
4. K. Hwang and F. A. Briggs, Computer Architecture and Parallel Processing, McGraw Hill.
5. Computer Architecture: Parhami, Oxford University Press

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ADAVANCED DATA STRUCTURE AND ALGORITHM

MODULE-I:

Heap Structure: Min-Max heap, Leftist heaps, Binomial heaps, Fibonacci heaps, Skew heaps, Lazy binomial heaps, Deap Data structure.

MODULE-II:

Search and Multimedia Structure: Binary Search Tree, AVL Tree, 2-3 Tree, B-Tree, B+ Tree, Red-Black Tree, Segment Tree, k-d Tree, Point Quad Trees, R-Tree, TV-Tree.

MODULE-III:

Asymptotic Notations, Dynamic Programming (LCS, Floyd-Warshall Algorithm, Matrix Chain Multiplication), Greedy Algorithm (Single Source Shortest Path, Knapsack problem, Minimum Cost Spanning Trees), Geometric Algorithm (Convex hulls, Segment Intersections, Closest Pair), Internet Algorithm (Tries, Ukonnen's Algorithm, Text pattern matching), Numerical Algorithm (Integer, Matrix and Polynomial multiplication, Extended Euclid's algorithm)

MODULE-IV:

Polynomial Time, Polynomial-Time Verification, NP Completeness & reducibility, NP Completeness proofs, Cook's theorem

Reference Books:

1. T. H. Cormen, C. E. Leiserson, and R. L. Rivest, "Introduction to Algorithms", PHI.
2. E. Horowitz, S. Sahani and Dinesh Mehta, Fundamentals of Data Structures in C++, 2nd Ed, University Press.
3. Mark Allen Weiss, "Data Structures & Algorithm Analysis in C/C++", Pearson Edu. India.
4. Adam Drozdex, Data Structures and algorithms in C++, Thomason learning.

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ADVANCED OPERATING SYSTEM

MODULE-I:

System Architecture Types, Distributed Operating Systems, Issues in Distributed operating Systems, Lamport's Logical Clocks, Vector Clocks, Causal Ordering of Messages, Global State, Chandy-Lamport's Global State Recording Algorithm,

MODULE-II:

Cuts of a Distributed Computation, Termination Detection, Mutual Exclusion Algorithms, Performance Measures, Non-Token-Based Algorithms, Ricart-Agrawala Algorithm, Maekawa Algorithm, Token-Based Algorithms, Suzuki-Kasami Algorithm, Raymond Tree based Algorithm, Comparative Performance Analysis.

MODULE-III:

Deadlock Handling Strategies, Centralized Deadlock-Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms, Agreement Protocols.

MODULE-IV:

Distributed File Systems, Distributed Shared Memory, Distributed Scheduling, Fault Tolerance, Multiprocessor Operating Systems.

Reference Books:

1. M. Singhal and N. G. Sivaratri, "Advanced concepts in Operating Systems", Tata McGraw Hill.
2. Coulouris, "Distributed Systems: Concepts and Design", Pearson Education.
3. P. K. Sinha "Distributed Operating Systems Concepts and Design" PHI.

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