Item 6

B.Tech. VI Semester (Electronics and Telecommunication Engineering)
Microcontroller Systems and Applications (3200616)

Course Objectives: To introduce the basic concepts of microcontroller and to develop assembly language programming skills along with the introduction of microcontroller applications.

Unit I: Introduction: Microcontroller architecture, classification, challenges and design issues, Von Neumann/Harvard architectures, CISC, RISC, microcontrollers types and their selection, Overview of the 8051 family, architecture, pin description, Flags, Register Banks, Internal Memory Organization, I/O configuration, Special Function Registers, addressing modes.

Unit II: **Assembly programming and instruction of 8051:** An Overview of 8051 instruction set, Introduction to 8051 assembly programming, Assembling and running an 8051 program, Data types and Assembler directives, Arithmetic, logic instructions and programs, Jump, loop and call instructions, IO port programming.

Unit III: Introduction to ARM Microcontroller: Introduction to pipelining based processors, applications of ARM, Architecture of ARM Cortex M3, Various Units in the architecture, General Purpose Registers, Special Registers, exceptions, interrupts, and stack operation.

Unit IV: Interfacing real world devices with 8051 microcontroller: Memory address decoding, 8051 interfacing with memory, 8051 interface with 8255 PPI and various interfacings like: LCD, Matrix Keyboard, ADC, DAC and Stepper motor interfacing.

Unit V: System Design With Arduino Board: Overview of Arduino, Configuration, Interfacing, Board layout, Atmega328 specifications, Interfacing of Arduino with LED, Switches, Light dependent resistor (LDR), PWM, 16*2 LCD, Serial, L293D for motor interfacing, ADC.

Course Outcomes:
After successful completion of the course, students will be able to:
CO1. Explain the architecture of embedded system and 8051 microcontroller.
CO2. Develop programming skill for 8051 microcontroller.
CO3. Understand the 32-bit pipelined architecture of ARM microcontroller.
CO4. Design Interfacing circuitry for memory and I/O devices using different interfacing with 8051.
CO5. Develop skill in programming for Arduino with different peripherals.

Text Books:

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. Mckinlay, “The 8051 Microcontroller and Embedded Systems using Assembly and C” Pearson Education India, 2nd Edition Modern
2. Shibu K V, —”Introduction to Embedded Systems”, Tata McGraw Hill Education Private Limited.

Reference Books:

1. Kenneth Ayal, “The 8051 Microcontroller”, Architecture, Programming and Applications.
2. Subrata Ghoshal, “Embedded Systems and Robots, Projects using the 8051Microcontroller”.
3. David A Patterson and John L. Hennessy, “Computer Organization and Design ARM edition”

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	2	2	1	2	1	2	2	2	-	-
CO2	3	2	3	2	3	3	-	1	1	1	2	1	2	1
CO3	2	2	2	2	3	2	1	-	1	1	1	1	1	1
CO4	1	2	2	1	2	2	-	2	1	1	1	1	1	1
CO5	3	3	3	2	3	3	1	1	1	1	2	1	2	2

1 - Slightly; 2 - Moderately; 3 – Substantially

B.Tech. VI Semester (Electronics and Telecommunication Engineering)
Artificial Intelligence & Machine Learning (3200617)

Course Objectives: To provide the fundamental knowledge of Artificial Intelligence, Neural Network and Machine Learning, to present the basic representation and reasoning paradigms used in AI & ML, to understand the working of techniques used in AI & ML.

Unit I: Introducing Artificial Intelligence: Definition, Goals of AI, Task of AI, Computation, Psychology and Cognitive Science. Perception, Understanding, and Action. Artificial intelligence vs machine learning vs deep learning and other related fields. Applications of Artificial intelligence and Machine Learning in the real world.

Unit II: Problem, Problem Space and Search: Production System, Blind Search: BFS & DFS, Heuristic Search, Hill Climbing, Best First Search. **Introduction to Neural Networks:** History, Biological Neuron, Artificial Neural Network, Neural Network Architectures, Classification, & Clustering

Unit III: Introduction to Machine Learning: Traditional Programming vs Machine learning. Key Elements of Machine Learning: Representation, process (Data Collection, Data Preparation, Model selection, Model Training, Model Evaluation and Prediction), Evaluation and Optimization. Types of Learning: Supervised, Unsupervised and reinforcement learning. Regression vs classification problems.

Unit IV: Supervised Machine Learning: Linear regression:implementation, applications & performance parameters. Decision tree classifier, terminology, classification vs regression trees, tree creation with Gini index and information gain, IDE3 algorithms, applications and performance parameters. Random forest classifier. Case study on regression and classification for solving real world problems.

Unit V: Unsupervised Machine Learning: Introduction, types: Partitioning, density based, DBSCAN, distribution model- based, hierarchical, Agglomerative and Divisive, Common Distance measures, K-means clustering algorithm. Case study on clustering for solving real world problems.

Text Books/:

1. Artificial Intelligence: A Modern Approach by Stuart J. Russell and Peter Norvig, Prentice Hall.
2. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
3. Introduction to AI & Expert System: Dan W. Patterson, PHI.

Reference Books:

1. Pattern Recognition and Machine Learning, Christopher M. Bishop
2. Introduction to Machine Learning using Python: Sarah Guido
3. Machine Learning in Action: Peter Harrington

Course Outcomes:

After successful completion of the course, students will be able to:
CO1. Explain basic concepts of Artificial Intelligence & Machine Learning.
CO2. Describe the techniques for search and processing.
CO3. Compare AI, ANN & Machine Learning techniques.
CO4. Apply AI and ML techniques to solve real world problems

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2	2	1	1	2	1	-	3	1	-	-
CO2	2	3	1	1	3	3	-	1	1	1	3	1	2	2
CO3	3	2	2	2	3	2	1	-	1	1	1	1	1	1
CO4	2	2	2	1	-	2	-	1	1	1	1	1	2	2
CO5	2	3	3	2	3	3	1	1	1	1	2	1	2	3

1 - Slightly; 2 - Moderately; 3 – Substantially

Item 8

B.Tech. VI Semester (Electronics and Telecommunication Engineering)
Intelligent Control (3900117)

Course Objectives: The main objective of this course is to develop the basic understanding of an Intelligent control i.e. control system with optimization and prediction using Artificial Neural Network to the students.

Unit I: Adaptive Control: Introduction, Close loop and open loop adaptive control. Self-tuning controller, Parameter estimation using least square and recursive least square techniques, Gain Scheduling, Model Reference Adaptive Control, Self Tuning Regulators, Adaptive Smith predictor control, Auto tuning and self tuning smith predictor.

Unit II: Artificial Neural Network (ANN) Based Control: Introduction to ANN, Different activation functions, Different architectures and different learning methods, Back Propagation and Radial Basis Function networks.

Unit III: Modeling of Control System: Representation and identification, Modeling the plant, Control structures – supervised control, Model reference control, Internal model control, Predictive control,Indirect and direct adaptive controller design using neural network.

Unit IV: Fuzzy Logic Based Control: Fuzzy Controllers: Preliminaries – Mamdani and Sugeno inference methods, Fuzzy sets in commercial products – basic construction of fuzzy controller – fuzzy PI, PD and PID control, Analysis of static properties of fuzzy controller, Analysis of dynamic properties of fuzzy controller , Simulation studies and case studies , Stability issues in fuzzy control.

Unit V: Hybrid Control: Introduction to Genetic Algorithm (GA), Neuro-Fuzzy and Fuzzy-GA based hybrid system design.

Text Books:

1. Astrom .K, Adaptive Control, Second Edition, Pearson Education Asia Pvt. Ltd, 2002.
2. Shivanandan**,** Introduction to Artificial Neural Network with MATLAB 6.0.1, Third Edition, Mcgraw Hill India Ltd, 2015.

Reference Books:

1. Klir G.J and Folger T.A, Fuzzy sets, Uncertainty and Information, Prentice Hall of India, New Delhi 1994.
2. Bose and Liang, Artificial Neural Networks, Tata Mcgraw Hill, 1996.
3. Kosco B, Neural Networks and Fuzzy Systems: A Dynamic Approach to Machine Intelligence, Prentice Hall of India, New Delhi, 1992.
4. Chang C. Hong, Tong H. Lee and Weng K. Ho, Adaptive Control, ISA press, Research Triangle Park, 1993.

Course Outcomes:

After successful completion of this course students will be able to:

CO 1. **Explain** adaptive control systems.
CO 2. **Describe** neural network architecture and learning algorithms.
CO 3. **Apply** the concept of artificial neural network to model the control system.
CO 4. **Design** fuzzy logic based control system**.**
CO 5. **Optimize** control system using Genetic algorithm.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	-	3	2	2	1	2	1	2	3	2	-	-
CO2	3	3	3	2	3	3	-	1	1	1	3	1	2	2
CO3	2	2	2	2	3	2	1	-	1	1	1	1	1	1
CO4	2	2	2	1	2	2	-	2	1	1	1	1	2	2
CO5	2	3	3	2	3	3	1	1	1	1	2	1	2	3

1 - Slightly; 2 - Moderately; 3 – Substantially