B.Tech. VI Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
2140616	DC	Microcontroller Systems and Applications	50	10	20	20	60	20	20	200	3	-	2	4

Microcontroller Systems and Applications (2140616)

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	3	-	-
CO2	3	2	3	2	3	3	-	1	1	1	2	3	2	1
CO3	2	2	2	2	3	2	1	-	1	1	1	2	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	3	2	2

B.Tech. VI Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency in Subject course	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
2140617	MC	Artificial Intelligence & Machine Learning	50	10	20	20	60	20	20	200	3	-	2	4

Artificial Intelligence & Machine Learning (2140617)

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/Reference 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.
4. Pattern Recognition and Machine Learning, Christopher M. Bishop
5. Introduction to Machine Learning using Python: Sarah Guido
6. 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	-	-	-
CO2	2	3	1	1	3	3	-	1	1	1	3	3	2	2
CO3	3	2	2	2	3	2	1	-	1	1	1	2	1	1
CO4	2	2	2	1	-	2	-	1	1	1	1	2	2	2
CO5	2	3	3	2	3	3	1	1	1	1	2	3	2	3

B.Tech. VI Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency in Subject course	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
900117	OC	Intelligent Control	50	10	20	20	-	-		100	3	-	-	3

Intelligent Control (900117)

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:

CO1. Explain adaptive control systems.

CO2. Describe neural network architecture and learning algorithms.

CO3. Apply the concept of artificial neural network to model the control system.

CO4. Design fuzzy logic based control system**.**

CO5. 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	3	-	-
CO2	3	3	3	2	3	3	-	1	1	1	3	3	2	2
CO3	2	2	2	2	3	2	1	-	1	1	1	2	1	1
CO4	2	2	2	1	2	2	-	2	1	1	1	2	2	2
CO5	2	3	3	2	3	3	1	1	1	1	2	3	2	3

B.Tech. VI Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency in Subject course	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
900116	OC	Embedded System	50	10	20	20	-	-		100	3	-	-	3

Embedded System (900116)

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: Embedded system architecture, classification, challenges and design issues, fundamentals of embedded processor and microcontrollers, Von Neumann/Harvard architectures, CISC vs. 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 8051 Timer, Serial port, interrupt Programming: Basics of Timers/Counters, Programming 8051 timers/Counter, basics of serial communication, 8051 connection to RS232, 8051 serial port programming, basics of 8051 Interrupts, 8051 interrupts programming: Timer interrupts, external hardware interrupts and serial communication interrupt, 8051 Interrupt priority.

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 and Matrix Keyboard interfacing with 8051 microcontroller, ADC, DAC and Temperature Sensor interfacing with 8051 microcontroller, Stepper motor interfacing.

Unit V Interfacing real world devices with Arduino : 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.

Text Book:

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

Reference Books:

2. Kenneth Ayal, —The 8051 Microcontroller‖, Architecture, Programming and Applications.
3. SubrataGhoshal, —Embedded Systems and Robots, Projects using the 8051Microcontroller.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1. Explain the architecture of embedded system and 8051.
CO2. Write assembly language programs for 8051.
CO3. Describe the interfacing of 8051 microcontroller with Timers/Counters, Serial communication and interrupt.
CO4. Design memory and I/O interfacing circuits with 8051.
CO5. Explain the interfacing of Arduino with I/O devices.

Course Articulation Matrix

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

Subject Name: AIML Lab
Subject Code: 2140617

1. Perform Creation, indexing, slicing, concatenation and repetition operations on Python built-in data types: Strings, List, Tuples, Dictionary, Set.
2. Solve problems using decision and looping statements.
3. Apply Python built-in data types: Strings, list, Tuples, Dictionary, Set and their methods to solve any given problem
4. Manipulation of NumPy arrays- Indexing, Slicing, Reshaping, Joining and Splitting.
5. Computation on NumPy arrays using Universal Functions and Mathematical methods.
6. Import a CSV file and perform various Statistical and Comparison operations on rows/columns
7. Create Pandas Series and DataFrame from various inputs
8. Import any CSV file to Pandas DataFrame and perform the following:
    1. Visualize the first and last 10 records
    2. Get the shape, index and column details
    3. Select/Delete the records(rows)/columns based on conditions.
    4. Perform ranking and sorting operations.
    5. Do required statistical operations on the given columns.
    6. Find the count and uniqueness of the given categorical values.
9. Import any CSV file to Pandas DataFrame and perform the following:
    1. Handle missing data by detecting and dropping/ filling missing values.
    2. Transform data using different me hods.
    3. Detect and filter outliers.
    4. Perform Vectorized String operations on Pandas Series.
    5. Visualize data using Line Plots, Bar Plots, Histograms, Density Plots and Scatter Plots.
10. Use scikit-learn package in python to implement following machine learning models to solve real world problems using open source datasets:
    1. Linear Regression model.
    2. Multi-linear regression model.
    3. Decision tree classification model.
    4. Random forest model.
    5. SVM model.
    6. K-means clustering model

Subject Name: AIML Lab
Subject Code: 2140617

Skill Based Mini Project

1. Write a program to Predicting Iris Flower Species [Dataset: Iris dataset (available in scikit-learn).]
2. Write a program for Handwritten Digits Recognition [Dataset: MNIST dataset of handwritten digits.]
3. Write a program for Sentiment Analysis on Movie Reviews [Dataset: IMDb movie reviews dataset.]
4. Write a program to Predict House Prices [Dataset: Housing price data from Kaggle.]
5. Write a program for Spam Email Detection [Dataset: Enron Email Dataset.]
6. Write a program for Image Classification on CIFAR-10 [Dataset: CIFAR-10 dataset.]
7. Write a program for Credit Card Fraud Detection [Dataset: Credit Card Fraud Detection dataset from Kaggle.]
8. Write a program for Predicting Stock Prices [Dataset: Yahoo Finance or Alpha Vantage API.]
9. Write a program for Customer Segmentation [Dataset: Online Retail Data from UCI Machine Learning Repository.]
10. Write a program to Digit Recognition in Sign Language [Dataset: ASL Alphabet dataset.]
11. Write a program for Predicting Diabetes Onset [Dataset: Diabetes dataset from UCI ML Repository.]
12. Write a program for Facial Recognition [Dataset: Labeled Faces in the Wild (LFW) dataset.]
13. Write a program for Movie Recommendation System [Dataset: MovieLens dataset.]
14. Write a program for Predicting Employee Churn [Dataset: Human Resources Analytics dataset from Kaggle.]
15. Write a program for Text Generation with LSTM [Dataset: Various books, articles, or Kaggle text datasets.]
16. Write a program for Fake News Detection [Dataset: Fake news dataset from Kaggle.]
17. Write a program for Predicting Wine Quality [Dataset: Wine Quality dataset from UCI ML Repository.]
18. Write a program for Object Detection with YOLO [Dataset: COCO (Common Objects in Context) dataset.]
19. Write a program for Customer Lifetime Value Prediction [Dataset: Online Retail Data from UCI ML Repository.]
20. Write a program for Predicting Cardiovascular Disease [Dataset: Framingham Heart Study dataset.]

Subject Name: Microcontroller Systems and Applications Lab
Subject Code: 2140616

Course Objectives: The objective of this course is to provide students with hands-on experience in designing, implementing, and testing embedded systems using microcontrollers.

List of Experiments

1. Write an assembly language program to transfer a block of data bytes from source memory to destination memory and demonstrate on 8051 microcontroller board.
2. Write an assembly language program to perform Addition/subtraction of a given number and demonstrate on 8051 microcontroller board.
3. Write an assembly language program to demonstrate conditional bit jump, conditional byte jump, unconditional jump, call and return instructions on 8051 microcontroller board.
4. Write an assembly language program to demonstrate the basic interface between an LCD display and 4 x 4matrix key board and demonstrate on 8051 microcontroller board.
5. Write an assembly language program to implement a basic temperature sensor using an ADC output is displayed on a 2x16 LCD and demonstrate on 8051 microcontroller board.
6. Write an assembly language program to implement the basic wave form generation using DAC, output is displayed on a CRO and demonstrate on 8051 microcontroller board.
7. Write an Arduino IDE program for Blinking an LED with a delay of 2 seconds and demonstrate on 8051 microcontroller Ardunio board.
8. Write an Arduino IDE program for to demonstrate automatic traffic light control using Ardunio board. Turn ON Red LED for 4 seconds, Green LED for 5 seconds, Yellow for 2seconds.
9. Write an Arduino IDE program for Blinking an 5 LEDs with a delay of 2 seconds in a sequence.
10. Write an Arduino IDE program for connecting a servo motor to Arduino board and rotate in clockwise and anti-clockwise direction using switches.

Course Outcomes:
After successful completion of the course, students will be able to:
CO1. Develop 8051 assembly language programming skills for the various arithmetic and logical operations.
CO2. Demonstrate interfacing of 8051 microcontroller board with various interfacing devices.
CO3. Design Arduino board based automated electronic systems.

Subject Name: Microcontroller Systems and Applications Lab

Subject Code: 2140616

Skill Based Mini Project

1. Design and simulate Arduino based Temperature and Humidity monitoring system with DHT22 sensor on Proteus.
2. Design and simulate Arduino Password Based Door Lock System on Proteus.
3. Design and simulate Digital voltmeter using Arduino UNO Range: 0-50 volt Using SIMULINO UNO on Proteus.
4. Design and simulate Automatic Door Open System with Visitor Counter using ARDUINO UNO R3 on Proteus.
5. Design and simulate Arduino based light sensor using LDR on Proteus.
6. Design and simulate Arduino based Temperature and Humidity monitoring system with DHT22 sensor on Proteus.
7. Simulate a system to measure temperature using an LM35 sensor and display it on an LCD.
8. Design and simulate a traffic light control system with a pedestrian crossing signal.
9. Simulate a digital clock with a 7-segment display.
10. Simulate a motion detection system with an alarm using a PIR sensor.