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	
3140616	DC	Microcontroller Systems and Applications	50	10	20	20	40	30	30	200	3	-	2	4

Microcontroller Systems and Applications (3140616)

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 GillispieMazidi, Rolin D. Mckinlay, “The 8051 Microcontroller and Embedded Systems using Assembly and C” Pearson Education India, 2nd EditionModern
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. SubrataGhoshal, “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

1 - Slightly; 2 - Moderately; 3 – Substantially

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	
3140617	MC	Artificial Intelligence & Machine Learning	50	10	20	20	40	30	30	200	3	-	2	4

Artificial Intelligence & Machine Learning (3140617)

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, IDE3algorithms, 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, PrenticeHall.
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 Supervised ML techniques to solve real world problems
CO5. Apply Unsupervised 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

1 - Slightly; 2 - Moderately; 3 – Substantially

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	
900119	OC	Optical Communication	50	10	20	20	-	-		100	3	-	-	3

Optical Communication (900119)

Course objectives: This course gives information to the students about the basics of signal propagation through optical fibers, fiber fabrication, fiber losses, components of optical fiber communication and optical networks.

Unit I - Overview of Optical Fiber Communications: Optical laws and definitions, Optical fiber modes and configurations, Mode theory, Step Index and Graded Index (GI) fibers ,Single mode and Multimode, Derivation for numerical aperture, V number and modes supported by step index fiber, Mode field diameter, Modes supported by GI fibers.

Unit II - Fabrication and Coupling of Optical Fiber: Fiber materials: Glass fiber, Active glass fiber, Plastic optical fiber, Fiber fabrication techniques: Outside vapour phase oxidation, Vapour phase axial deposition, Modified chemical vapour deposition, Plasma activated chemical vapour deposition, Fiber splicing techniques, Optical fiber connectors and couplers.

Unit III - Optical Sources and Detectors: Introduction to optical sources, LED'S, LASER diodes, Model reflection noise, Power launching and Coupling, Population inversion, Photo-detectors, PIN, Avalanche detector, Response time, Avalanche multiplication noise.

Unit IV - Signal Degradation in Optical Fibers: Signal degradation in optical fibers, Attenuation losses, Signal distortion in optical wave guides, Material dispersion, Wave guide dispersion, Chromatic dispersion, Inter-modal distortion, Pulse broadening in Graded index fibers, Mode coupling.

Unit V - Optical Communication and Networks: Coherent optical fiber communication, Modulation techniques for Homodyne and Heterodyne systems, Rise time budget and link power budget, eye pattern, optical network elements and topologies, SONET / SDH.

Text Books:

1. Optical Fiber Communication – By G. Keiser , Tata McGraw-Hill Education
2. Optical Fiber Communication- By John M. Senior, Prentice Hall

Reference Books:

1. Optical Communication Networks – By Biswanath Mukherjee , McGraw-Hill
2. Fiber- Optic communication systems - By Govind P. Agrawal, John Wiley & sons

Course Outcomes:

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

CO1: Explain the basic elements of optical fiber transmission.
CO2: Discuss fiber fabrication, splicing and optical connectors.
CO3: Describe the working of optical sources and optical detectors.
CO4: Calculate the channel impairments like losses and dispersion.
CO5: Analyze the Coherent optical transmission system and optical networks.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

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	
900118	OC	MEMS &Mechatronics	50	10	20	20	-	-		100	3	-	-	3

MEMS &Mechatronics (900118)

Course Objectives: To understand basics architecture of the mechatronics system; design and characteristics of different sensors, mechanical and electrical actuators and their selection for design of mechatronic systems

UNIT-I

Introduction to MEMS: basics of MEMS (Micro-Electro Mechanical Systems), need of miniaturization, micro fabrication, micromachining, material for MEMS, types of MEMS: RF-MEMS, Bio-MEMS, etc, Various applications.

UNIT-II
Introduction to Mechatronics systems: Basic building blocks of mechatronic systems. Mechatronics key elements, Mechatronics in home, office and industry automation, Scope of Mechatronics, advantages of Mechatronics, pre-requisites for Mechatronics.

UNIT-III
Sensors: Performance characteristics of sensors and transducers, position and speed measurement; proximity sensor, potentiometer, LVDT, digital optical encoder, stress and strain measurement; strain gauges, force measurement with load cells, temperature measurement; thermometer, thermocouple, vibration and acceleration measurement, pressure and flow measurement.

UNIT-IV
Actuators and Control unit: electromagnetic principles, solenoids and relays, electric motors, DC motors, stepper motors, Hydraulic and pneumatic actuators, micro actuators. Piezoelectric actuators. Selection criteria for sensors and actuators, interfacing of sensors and actuators, Control unit; Microcontroller, PLC.

UNIT-V
Mechatronics System: Manipulator/ Robotic arm, quad copter, mobile robots, Hexapod Robots, Humanoid and Biped Robots.

Text Books

1. Introduction to Mechatronics and Measurement Systems, Alciatore and Histand Tata McGraw-Hill

Reference Books

1. Mechatronics, Kenji Uchino and Jayne R. Giniewicz, publication: Marcel Dekker, Inc.
2. Applied Mechatronics- A. Smaili and F. Mrad, OXFORD university press.
3. Mechatronics System Design, Shetty and Kolk CENGAGE Learning, India Edition
4. Mechatronics, Necsulescu, Pearson education.

Course Outcome:

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

CO1. **Interpret** MEMS, their types and applications.

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	
3140617	DC	Artificial Intelligence and Machine Learning Lab					40	30	30	100	-	-	2	1

Artificial Intelligence & Machine Learning Lab (3140617)

Course Objectives: To enhance skills in model training, hyper parameter tuning, and validation, ensuring robust and optimized machine learning solutions.

List of Experiments

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. ImportaCSVfileandperformvariousStatisticalandComparisonoperations on rows/columns
7. Create Pandas Series and Data Frame from various inputs
8. Import any CSV file to Pandas Data Frame and perform the following:
    1. Visualizethefirstandlast10records
    2. Getthe shape, index and column details
    3. Select/Delete there cords(rows)/columns based on conditions.
    4. Perform ranking and sorting operations.
    5. Dore quired statistical operations on the given columns.
6. Find the count and uniqueness of the given categorical values.
9. Import any CSV file to Pandas Data Frame and perform the following:
    1. Handle missing data by detecting and dropping/filling missing values.
    2. Transform data using different methods.
    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

B. Tech. VI Semester (Electronics Engineering)

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			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	
3140617	DC	Artificial Intelligence and Machine Learning Lab					40	30	30	100	-	-	2	1

Artificial Intelligence and Machine Learning Lab (3140617)

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 hand written 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: Movie Lens 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.]

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			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	
3140616	DC	Microcontroller Systems and Applications Lab					40	30	30	100	-	-	2	1

Microcontroller Systems and Applications Lab (3140616)

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.

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	
3140616	DC	Microcontroller Systems and Applications Lab					40	30	30	100	-	-	2	1

Microcontroller Systems and Applications Lab (3140616)

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.