Scheme of Instruction & Examination
B. E. – MINOR –AI&ML
V SEMESTER
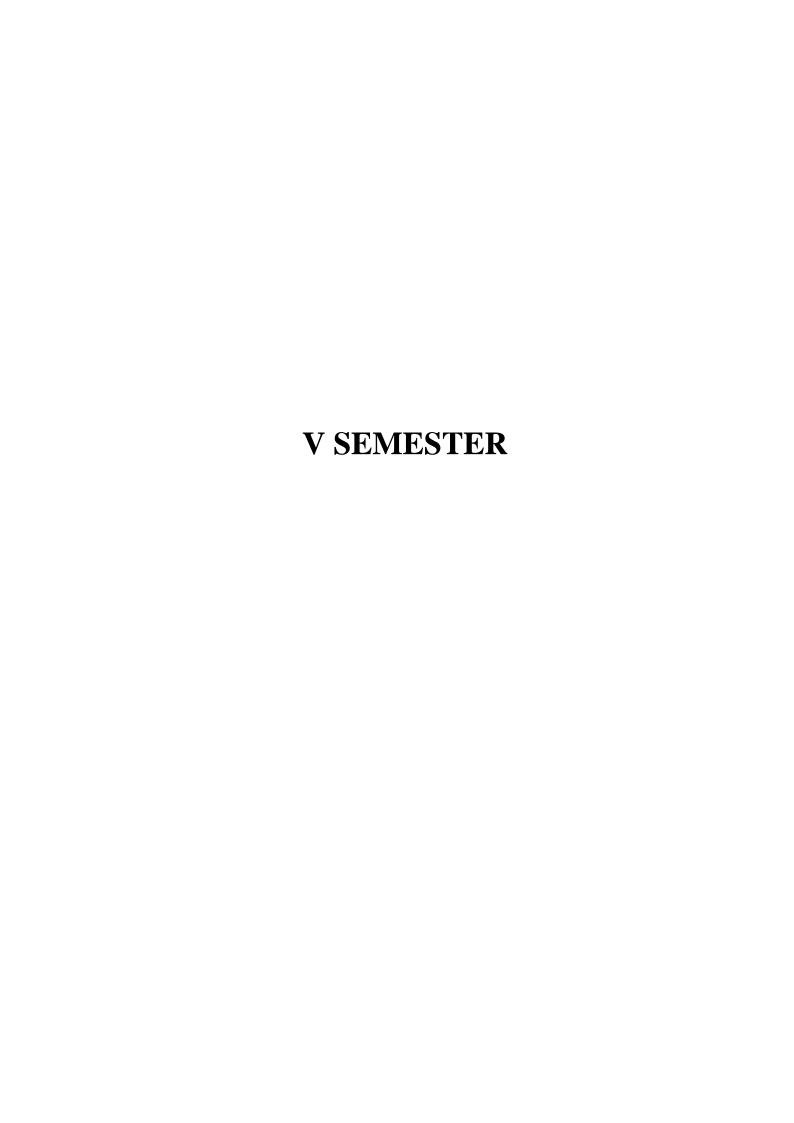
S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P / D	Contact Hours / week	CIE	SEE	
Theory Courses									
1	AML-01CS	Foundations of Data Mining and AI	3	0	0	3	40	60	3
2	AML-02CS	Statistical Analysis and Computing	3	0	0	3	40	60	3
Practical / Laboratory Courses									
3	AML-03CS	Statistical Analysis and Computing Lab	0	0	2	2	40	60	1
		Total Credits				08	120	180	07

VI SEMESTER

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P / D	Contact Hours / week	CIE	SEE	
Theory Courses									
1	AML-04CS	Machine Learning	3	0	0	3	40	60	3
	AML-05CS	Machine Learning Lab	0	0	2	2	40	60	1
OR									
2	AML-06CS	SWAYAM/NPTEL Course					40	60	4
		Total Credits				05	40	120	04

VII SEMESTER

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P / D	Contact Hours / week	CIE	SEE	
Theory Courses									
1	AML-07CS	Artificial Neural Networks	3	0	0	3	40	60	3
Practical / Laboratory Courses									
2	AML-08CS	Project Work	0	0	4	4	40	60	4
		Total Credits				07	80	120	07

V SEMESTER

Course Code	Course Title	Core / Elective
AML-01CS	**FOUNDATIONS OF DATA MINING AND AI**	**PE-1**

Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	**T**	**D**	**P**			
ATD	3	-	-	-	40	60	3

COURSE OBJECTIVES:

The objective of this course is to make the student to

1. Introduce current trends in data mining
2. Write association rules for a given data pattern.
3. Choose between classification and clustering solution.
4. Understand the importance of the field of AI.
5. Learn methods of expressing knowledge by a machine with appropriate reasoning and different statistics.

COURSE OUTCOMES: After the completion of course the students will be able to:

1. Organize and prepare the data needed for data mining using preprocessing techniques
2. Implement the appropriate data mining methods like classification, association and clustering on a given data set.
3. Understand the informed and uninformed problem types and apply search strategies to solve them.
4. Examine the issues involved in knowledge bases, reasoning systems and planning.
5. Design and evaluate intelligent expert models for perception and prediction from intelligent environment.

UNIT I

Introduction: What is data mining, Challenges, Data Mining Tasks, Major issues in data mining.
Data: Types of Data, Data Quality, Data Preprocessing, Measures of Similarity and Dissimilarity.
Association Analysis: Association Analysis: Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FP-Growth Algorithm.

UNITII

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Classification by Back propagation – Support Vector Machines. Accuracy and Error Measures – Evaluating the Accuracy of a Classifier.

UNITIII

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods –Outlier Analysis.

UNITIV

AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation

UNITV

Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

TEXT BOOKS

1. Data Mining -Concepts and Techniques, Jiawei Han, MichelineKamber, Jian Pei, III Edition, Morgan Kaufmann Publisher, 2012.
2. Artificial Intelligence – A Modern Approach, S. Russel and P. Norvig, II Edition, Pearson Education.

REFERENCE BOOKS

1. Data Warehousing in the Real World, Pearson,Sam Anahory, Dennis Murray, X Impression,2012.
2. Mastering Data Mining, Michael. J. Berry, Gordon. S.Linoff, Wiley Edition, II Edtion,2012.
3.Computational Intelligence: a logical approach, David Poole, Alan Mackworth, Randy Goebel, Oxford University Press.

Course Code	Course Title		Core / Elective
AML-02CS	STATISTICAL ANALYSIS AND COMPUTING		PE-1

Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ATD	3	-	-	-	40	60	3

COURSE OBJECTIVES:

The objective of this course is to make the student to

1. To understand Statistical parameters for data analytics
2. To use Numpy for organizing and analyzing data
3. To use pandas for summarizing and analysis of data
4. To use of statistical methods for cleaning and preparation of data

5. To performs aggregation of data and understand analysis of time series data

COURSE OUTCOMES: After the completion of course the students will be able to:
1. Understand and explore different aspects of python environment
2. Understand python Built-in Data Structures, Functions, and Files
3. Use Numpy for organizing and analyzing data
4. Use pandas for summarizing and analysis of data

5. Use of statistical methods for cleaning and preparation of data and performs aggregation of data

UNIT I
Python Language Basics, IPython, and Jupyter Notebooks: The Python Interpreter, IPython Basics, Python Language Basics
Built-in Data Structures, Functions, and Files: Data Structures and Sequences, Functions, Files

UNIT II
NumPy Basics: Arrays and Vectorized Computation: The NumPyndarray: A Multidimensional Array Object, Universal Functions, Array-Oriented Programming with Arrays, File Input and Output with Arrays, Linear Algebra.

UNIT III
PANDAS: Introduction to pandas Data Structures, Essential Functionality, Summarizing and Computing Descriptive Statistics, Reading and Writing Data in Text Format, Interacting with Databases

UNIT IV
Data Cleaning and Preparation: Handling Missing Data, Data Transformation, String Manipulations

UNIT V
Data Aggregation and Group Operations: GroupBy Mechanics, Data Aggregation, Apply: General split-apply-combine, Pivot Tables and Cross-Tabulation

TEXTBOOKS
1. Python for Data Analysis- DATA WRANGLING WITH PANDAS, NUMPY, AND IPYTHON, Wes McKinney, O-Reilly, 2018
2. Python Data Analytics, Fabio Nelli, Apress, 2015

REFERENCE BOOKS
1. Data Analysis from Scratch with Python Step By Step Guide, Peters Morgan , II Edition, AI Sciences
2. Python for Data Analysis: A Step-By-Step Guide to Master the Basics of Data Science and Analysis in Python Using Pandas, NumpyAndIpython, Volume 2, Andrew Park,

Course Code	Course Title						Core / Elective
AML-03CS	**STATISTICAL ANALYSIS AND COMPUTING USING PYTHON LAB**						**PE-1**

Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	**T**	**D**	**P**			
ATD	**-**	**-**	**-**	2	**40**	**60**	**1**

COURSE OBJECTIVES:

The objective of this course is to make the student to

1. Install Numpy and Pandas
2. Work with 1D and 2D arrays in Numpy
3. Explore multi-dimensional arrays in Numpy
4. Perform statistical analysis using Numpy
5. Perform statistical analysis using Pandas

COURSE OUTCOMES: After the completion of course the students will be able to:
1. Install Numpy and Pandas
2. Work with 1D and 2D arrays in Numpy and process data in arrays
3. Explore multi-dimensional arrays in Numpy and perform conversions
4. Perform statistical analysis using Numpy by calculating measures of central tendency, deviation, distances, and correlation
5. Perform statistical analysis using Pandas

List of Programs

1. Installing Numpy
2. Working with arrays
    a. Create a 1D array
    b. Create a boolean array
    c. Extract items that satisfy a given condition from 1D array
    d. Replace items that satisfy a condition with another value in numpy array
    e. Replace items that satisfy a condition without affecting the original array
    f. Reshape an array
    g. Extract all numbers between a given range from a numpy array
3. Multiple arrays
    a. Stack two arrays vertically
    b. Stack two arrays horizontally
    c. Get the common items between two python numpy arrays
    d. Remove from one array those items that exist in another
    e. Get the positions where elements of two arrays match

4. Multi-dimensional arrays
   a. Convert an array of arrays into a flat 1d array
   b. Swap two columns in a 2d numpy array
5. Statistical analysis
   a. Compute the mean, median, standard deviation of a numpy array
   b. Find the percentile scores of a numpy array
   c. compute the euclidean distance between two arrays
   d. Find the correlation between two columns of a numpy array
   e. Probabilistic sampling in numpy
   f. compute the moving average of a numpy array
6. Data Cleaning
   a. Find the position of missing values in numpy array
   b. Drop rows that contain a missing value from a numpy array
   c. Replace all missing values with 0 in a numpy array
   d. Drop all missing values from a numpy array
7. Data Transformation
   a. Normalize an array so the values range exactly between 0 and 1
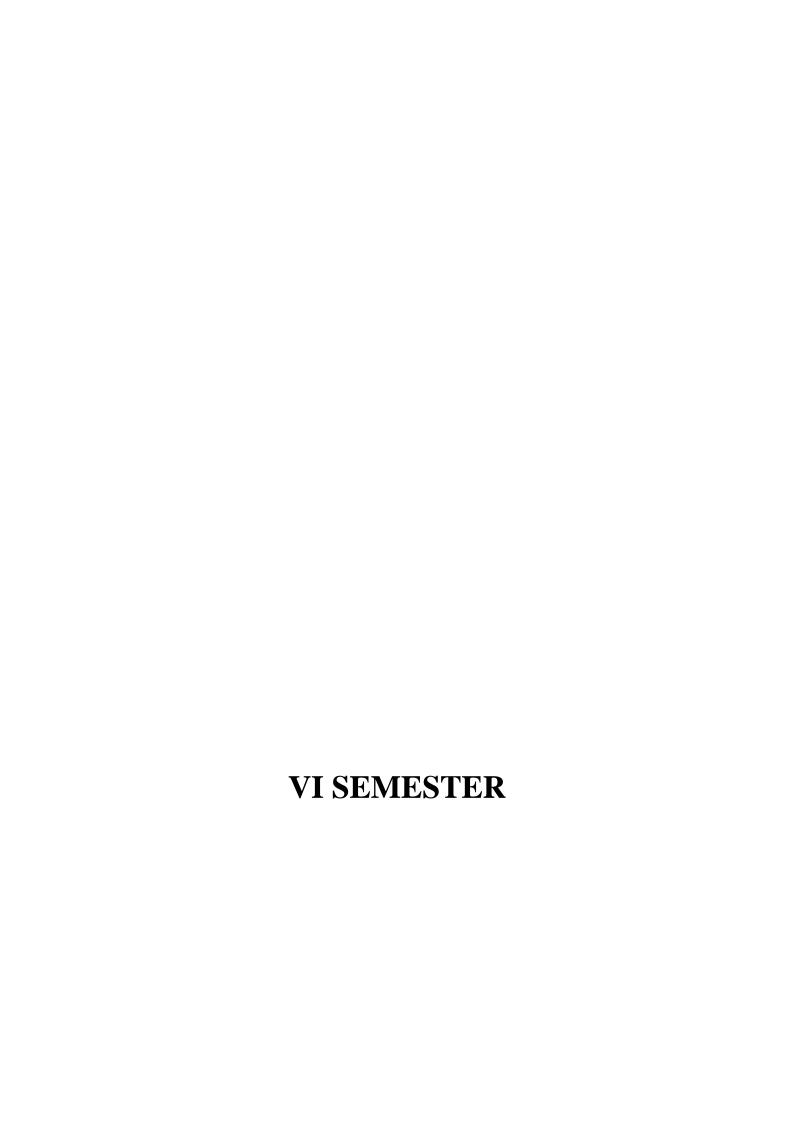   b. Compute the min-by-max for each row for a numpy array 2d

8. Pandas Basics
   a. Installing Pandas
   b. Import pandas and check the version
   c. Create a series from a list, numpy array and dict
   d. Convert the index of a series into a column of a dataframe
   e. Combine many series to form a data frame
9. Statistical analysis in pandas
   a. Get the minimum, 25th percentile, median, 75th, and max of a numeric series
   b. Get frequency counts of unique items of a series
   c. Bin a numeric series to 10 groups of equal size
   d. Compute the euclidean distance between two series
10. Data Preparation in pandas
   a. Normalize all columns in a dataframe
   b. Compute the correlation of each row with the suceeding row
   c. Compute the autocorrelations of a numeric series

VI SEMESTER

Course Code	Course Title		Core / Elective
AML-04CS	MACHINE LEARNING		PE-1

Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ATD	3	-	-	-	40	60	3

COURSE OBJECTIVES:

The objective of this course is to make the student to

1. Tolearntheconceptsofmachinelearningandtypesoflearning
2. Tostudyvarioussupervisedlearningalgorithms.
3. Tolearnensembletechniquesandvariousunsupervisedlearningalgorithms.
4. To understand assessment methods and evaluation parameters of machine learning algorithms

COURSE OUTCOMES: After the completion of course the students will be able to:

1. Describes types of data and their preprocessing methods
2. Describes supervised, unsupervised learning methods and their appropriate evaluation procedures and metrics
3. Applies different supervised and unsupervised machine learning algorithms to different datasets
4. Evaluates different machine learning approaches and infers the best learning model for a given scenario

UNIT I
Introduction: Types of Machine Learning Algorithms: Parametric and Non-parametric Machine Learning Algorithms, Supervised, Unsupervised, Semi-Supervised and Reinforced Learning.
Data Objects and Attribute Types: Nominal Attributes, Binary Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes.**Basic Statistical Descriptions of Data:** Measuring the Central Tendency: Mean, Median, and Mode. Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation.

UNIT II
Representation and Learning: Feature Vectors, Feature Spaces
Supervised Algorithms: Regression: Linear Regression, Logistic Regression. Evaluation Measures: SSE, RMSE, R2

UNIT III
Classification: Decision Tree, Naïve Bayes, K-Nearest Neighbors, Support Vector Machines.
Evaluation of classification: cross validation, hold out The Confusion Matrix, Accuracy, precision, recall, F-Score, Receiver Operator Characteristic (ROC) Curve

UNIT IV
Unsupervised Learning: Cluster Analysis: Similarity Measures.
Categories of clustering algorithms, k-means, Hierarchical Clustering.

UNIT V
Ensemble Algorithms: Bagging, Random Forest, Boosting

TEXTBOOKS

1. Machine Learning, Tom Mitchell, McGraw-Hill Science/Engineering/Math; (1997).
2. Data Mining -Concepts and Techniques,Jiawei Han, MichelineKamber, Jian Pei, III

Edition, Morgan Kauffmann Publisher, 2012.

REFERENCE BOOKS

1. MachineLearning:AnAlgorithmicPerspective,StephenMarsland,IIEdition ,Chapman&Hall/Crc
2. Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer. (2006)
3. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, VipinKumar,Pearson, 2014.

Course Code	Course Title							Core / Elective
AML-05CS	**MACHINE LEARNING LAB**							**PE-1**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**		**Credits**
	L	**T**	**D**	**P**				
ATD	-	-	-	2	**40**	**60**		**1**

COURSE OBJECTIVES:

The objective of this course is to make the student to

1. To Demonstrate different classifiers on different data.
2. To Apply different Clustering techniques
3. To use different machine learning techniques to real world data
4. To Evaluate different supervised models for different datasets

COURSE OUTCOMES: After the completion of course the students will be able to:
1. Demonstration of different classifiers on different data.
2. Application of different Clustering techniques
3. Analysis of different machine learning techniques to real world data
4. Evaluation of different supervised models for different datasets

List of Programs:

1. Build model using linear regression and apply it to classify anew instance
2. Build modelusing logistic regression and apply it to classify anew instance
3. Write a program to demonstrate Decision tree classifiers. Use an appropriate data setfor building the model.
4. Write a program to demonstrate K nearest neighbour classifier. Use an appropriate data setfor building the model.
5. Write a program to demonstrate Naïve bayes classifier. Use an appropriate data setfor building the model.
6. Write a program to demonstrate Support vector machine classifiers. Use an appropriate data setfor building the model.
7. Demonstrate Clustering using k-means Clustering algorithm
8. Demonstrate Clustering using Hierarchical Clustering algorithm

Semester -VI	L	T	P	Credits
Subject code – AML-06CS	**0**	**0**	**0**	**4**

Student can choose any one of the two courses

1. Computer Fundamentals   **Duration : 12 weeks**

Week 1   Introduction to Computer: Functional Block Diagram
Computer: History and Development
Evolution of Computer
An Introduction to Computer

Week 2   Overview of Computer: Input Devices, Part-1
Overview of Computer: Input Devices, Part-2
Overview of Computer: Input Devices, Pat-3
Overview of Computer: Output Devices, Part-1

Week 3   Overview of Computer: Output Devices, Part-2
Computer: Audio Input and Output Devices
Computer: An Introduction to Storage Device
Permanent Storage Devices - An Overview of Computer
An Overview of Computer Memory
Computer: Memory Management

Week 4   Computer: Working of CPU
Computer: Working of 8088 CPU
Evolution and Development of Microprocessors, Part-1
Evolution and Development of Microprocessors, Part-2
Cooling Mechanism of Computer Components
Computer: Components of Motherboard
Computer : Cabinet, Power Supply &UPS

Week 5   Micro-Programming, Part-1
Micro-Programming, Part-2
Central Processing Unit: Interrupt, Part-1
Central Processing Unit: Interrupt, Part-2
Device Driver, Part- 1
Device Driver, Part- 2

Week 6   Internet: An Introduction
An Introduction to Computer - Networking
Multimedia, Basic Elements
Multimedia System
Overview of Computer Hardware & Software

Week 7   Operating System Softwares
Computer Softwares - Application Software
An Introduction to Computer - Operating System

	Operating System: Utility Software Tools
	Disk Operating System, Part-1

Week 8   Disk Operating System, Part-2
            Disk Operating System, Part-3
            Flow Charts & Programs
            Basics of Linker & Loader
            Assembly Language & Assembler
            Introduction to Compilers
            Debugger Software
            Computer Software: Editor Part 1

Week 9   Computer Software: Editor Part 2
            Simulator
            Emulator
            Programming Languages
            Control Panel Settings

Week 10   Instruction Set of 8086/8088 Microprocessor Part 1
            Instruction Set of 8086/8088 Microprocessor Part 2
            Instruction Set of 8086/8088 Microprocessor Part 3
            Instruction Set of 8086/8088 Microprocessor Part 4
            Instruction Set of 8086/8088 Microprocessor Part 5

Week 11   Keyboard Controller
            Interrupt & DMA Controller
            Clock Generator & Bus Controller
            Math Co-processor
            Hard Disk Drive and Controller

Week 12   Display Controller
            Serial Interface Part-1
            Serial Interface, Part-2
            Parallel Interface & Printer Port
            Universal Serial Bus (USB)

TEXT BOOKS

1. Structured Computer Organization, Tanenbaum A.S, EEE, Prentice hall India, V Edition.
2. Computer Organization & Architecture, Stallings W,Prentice hall India, V Edition.
3. Fundamentals of Computers, RajaramanV,EEE, Prentice Hall India.
4. Computer Peripherals and Interfaces, Kamra A. and Bhambri P (2008),Technical Publication, Pune.
5. IBM PC and Clones- hardware Troubleshooting & Maintenance, B. Govindrajalu, Tata McGraw Hill.
6. The Complete PC Upgrade and Maintenance Guide, XVIEdition, Mark Minasi, Wiley India.
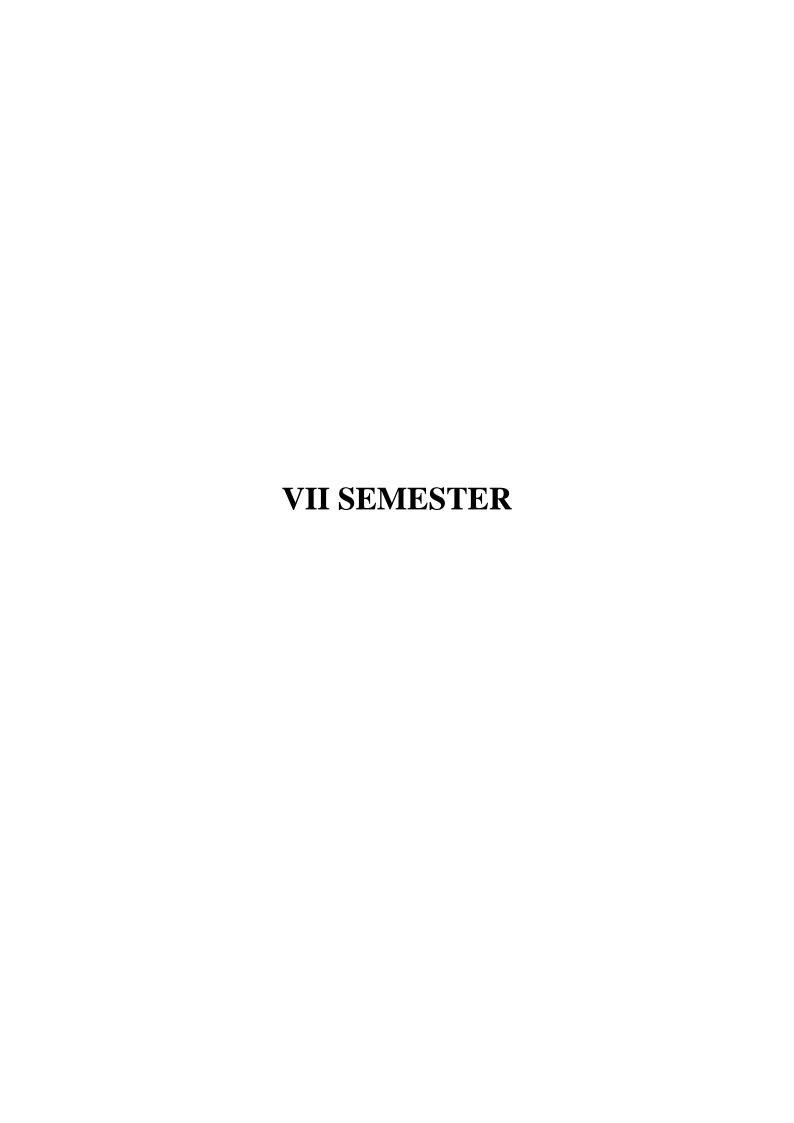7. Hardware Bible, Premier Edition, Winn L Rosch, Techmedia.

2. Ecommerce Technologies   **Duration : 12 weeks**

Week 1   Introduction to e-commerce
              Technical components and functions of e-commerce
              Advantages and disadvantages of e-commerce

Week 2   Scope and applications of e-commerce
               E-commerce and E-business

Week 3   Evolution of Internet, Domain names and Internet Organization
               Types of Network
               Role of internet in B2B application and Building own website

Week 4   Web Promotion
               Target email, Banner exchange and Shopping Bots
               Secure Transaction Over Internet

Week 5   Privacy issues
              Computer crime
              Threats and Attacks on Computer System

Week 6   Software Packages for Privacy
              Hacking and computer virus
              Security algorithms

Week 7   Authorization and Authentication, Digital Signature
              Firewall
              Basic Concepts of EDI

Week 8   Applications of EDI
              EDI Model and Disadvantages of EDI Model

Week 9   Introduction to electronic payment systems
              Electronic Payment types

Week 10   Planning E-commerce Initiates, Linking Objectives to Business Strategies
              Managing Costs, Strategies for Developing E-commerce Websites

Week 11   Pros and cons of online shopping
              Case Study - Cons of Online Shopping, E-cycle of Internet Marketing

Week 12   Internet Marketing Techniques
              Personalization of e-commerce

TEXTBOOKS
1. E-Commerce Concepts, Models, Strategies, G.S.V.Murthy, Himalaya Publishing House, 2011.
2. E- Commerce,Kamlesh K Bajaj and Debjani Nag, 2005.
3. Electronic commerce,Gray P. Schneider, International Student Edition, 2011,
4.https://www.kvimis.co.in/sites/...co.../Gary%20P.Schneider%20Electronic%20Commerce.pdf

VII SEMESTER

ARTIFICIAL NEURAL NETWORKS

Semester -VII   **L**   **T**   **P**   **Credits**

Subject code – AML-07CS   **3**   **0**   **0**   **3**

Prerequisites: Basic Knowledge about Data Mining

Course Objectives:	Course Outcomes:
➢ To understand the biological neural network and to model equivalent neuron models. ➢ To understand the architecture, learning algorithms ➢ To know the issues of various feed forward and feedback neural networks. ➢ To explore the Neuro dynamic models for various problems.	1.Interpret the importance of neural network and neural network architecture. 2. Understand the similarity of Biological networks and Neural networks. 3.Perform the training of neural networks using various learning rules. 4.Understanding the concepts of forward and backward propagations. 5.Understand and Construct the Hopfield models.

Course Code	Course Title							Core / Elective
AML-07CS	**ARTIFICIAL NEURAL NETWORKS**							**PE-1**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**	
	L	**T**	**D**	**P**				
ATD	**3**	-	-	-	**40**	**60**	**3**	

COURSE OBJECTIVES:

The objective of this course is to make the student to

1. To understand the biological neural network and to model equivalent neuron models.
2. To understand the architecture, learning algorithms
3. To know the issues of various feed forward and feedback neural networks.
4. To explore the Neuro dynamic models for various problems

COURSE OUTCOMES: After the completion of course the students will be able to:
1. Interpret the importance of neural network and neural network architecture.
2. Understand the similarity of Biological networks and Neural networks.
3. 3.Perform the training of neural networks using various learning rules.
4. 4.Understanding the concepts of forward and backward propagations.
5. Understand and Construct the Hopfield models.

UNIT I

Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence andNeuralNetworks
Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning.

UNIT II

Single Layer Perceptrons: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and BayesClassifier for a Gaussian Environment
Multilayer Perceptron: Back Propagation Algorithm XOR Problem.

UNIT III

Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning

UNIT IV

Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification

UNIT V

Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm Hopfield Models – Hopfield Models, restricted boltzmen machine.

TEXT BOOKS
1. Neural Networks a Comprehensive Foundations, Simon S Haykin, PHI Ed.,.
2. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

REFERENCE BOOKS
1. Neural Networks in Computer Inteligance, Li Min Fu TMH 2003.
2. Neural Networks -James A Freeman David M S Kapura Pearson Ed., 2004.
3. Artificial Neural Networks – B. Vegnanarayana Prentice Hall of India P Ltd 2005.

PROJECT WORK

Semester   VII   **L   T   P   Credits**

Subject code: AML-08   **0   0   4   4**

The Viva-Voce shall be conducted by a committee consisting of HOD, Project Supervisor and an External Examiner nominated by the University. The Internal Evaluation shall be made by the departmental committee, on the basis of two seminars given by each student on the topic of his/her project.

Project Proposal:

- Begin by developing a clear and well-defined project proposal. This should include a project title, objectives, scope, and a brief overview of the problem or area of interest.
- Specify the technologies, tools, and programming languages that will be used in the project.

2. Project Advisor:

- Assign a faculty member as a project advisor to guide and mentor the student throughout the project.

3. Project Selection:

- Choose a project that aligns with the program's objectives and your own interests. The project should be challenging and relevant to the field of computer science and engineering.
- Consider projects that involve software development, algorithm design, database management, data analysis, or other relevant areas.

4. Research and Literature Review:

- Conduct a thorough literature review to understand existing solutions and research related to your project.
- Identify gaps in the current knowledge and explain how your project will contribute to addressing these gaps.

5. Implementation:

- Begin the implementation phase by writing code, developing algorithms, or creating software as per your project's requirements.
- Ensure that your code adheres to coding standards and best practices.

6. Testing and Debugging:

- Rigorously test your project to identify and resolve bugs and errors.

- Perform unit testing, integration testing, and user acceptance testing as applicable.

7. Documentation:

- Maintain comprehensive documentation throughout the project. This includes code comments, user manuals, design documents, and technical reports.
- Properly cite and reference any external sources or libraries used in your project.

8. Presentation and Demo:

- Prepare a well-structured presentation and a live demonstration of your project's functionality.
- Highlight the problem statement, methodology, key features, and the impact of your project.

11. Final Report: - Submit a comprehensive final report that summarizes your project from start to finish. Include all documentation, code, and research findings.

12. Presentation: - Be prepared to present and defend your project in front of panel.

13. Future Work and Impact: - Discuss potential future work or enhancements that could be made to your project.