



# School of Computer Science & IT Devi Ahilya Vishwavidyalaya

## SYLLABUS

### M.Tech Executive (Computer Science) 2 years

#### Program Educational Objectives (PEOs)

- PEO 1:** Build strong theoretical and practical skills in Computer Science to accelerate career in industry or academia.
- PEO 2:** Demonstrate analytical, research, design, and implementation skills and deal with large- scale projects.
- PEO 3:** Imbibe lifelong learning, professional, and ethical attitude for embracing global challenges.

#### Program Specific Outcomes (PSOs)

- PSO 1:** Expose industry professionals in the areas of emerging technologies.
- PSO 2:** Implement projects that are industrial strength with a blend of theoretical knowledge gained in academia.

## II - SEMESTER

## CS-5319: AGILE SOFTWARE ENGINEERING

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### Course Outcomes (COs):

- CO1:** Interpret the concept of agile software engineering and its advantages in software development.
- CO2:** Analyze the core practices behind several specific agile methodologies.
- CO3:** Identify the roles and responsibilities in agile projects and their difference from projects following traditional methodologies.
- CO4:** Familiarizing the students with basic Agile Estimation & Planning.
- CO5:** Facilitate students in understanding the Tracking Agile Projects, differentiating tools and testing.
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### Course Contents

#### UNIT-I

**No. of Hours: 8**

Agile Software Development: The History and Value of Agile Software Development, The Agile Manifesto, Principles of Agile, Organizational Culture Considerations with Agile, What Is Organizational Culture, and Why Does It Matter? The Team Members' Viewpoint, A Manager's Viewpoint, An Executive's Viewpoint, Success and Failures.

#### UNIT-II

**No. of Hours: 8**

Understanding the Different Types of Agile: Introduction to Extreme Programming (XP), Pair Programming, Scrum, Feature-Driven Development, Dynamic Systems Development Method, Lean Software Development and Kanban. Describing the Different Roles: Deep Dive into Scrum Roles, Product Owner, Scrum Master, The Team, Extended Team Members, Roles in Other Methodologies: Project Sponsor, Requirements Gatherer, Agile Coach.

#### UNIT-III

**No. of Hours: 8**

The New Way to Collect and Document Requirements: Old Form of Requirements Gathering, Agile Requirements in Scrum, Enhancing Requirements, From User Stories to Deliverables, Case Study.

#### UNIT-IV

**No. of Hours: 8**

Grooming and Planning: Product Backlog (Scrum and XP), Prioritization of Stories, Estimating, Scrum: Sprint Planning, Extreme Programming: XP Planning Game, Triple Constraints.

#### UNIT-V

**No. of Hours: 8**

Testing, Quality, and Integration: Creating a Quality-Focused Culture, Test-Driven Development (Unit Testing), Refactoring. Tracking and Reporting: Kanban Board, Work in Progress (WIP) Limit, Burn Charts, Feature-Driven Development (FDD) Parking Lots. Meetings or Ceremonies: Daily Stand-Up Meeting, Sprint Review or Demo, Retrospectives.

**Text Books:**

1. Introduction to Agile Methods- Sondra Ashmore, Kristin Runyan, Addison Wesley, 2015.
2. Agile Software Engineering- Orit Hazzan, Yael Dubinsky, Springer, 2008

**Reference Books:**

1. Software Engineering: Concepts & Practices- Ugrasen Suman, Cengage Learning Publications, 2nd Ed., 2022.

**Online Resources:**

# CS-5319: AGILE SOFTWARE ENGINEERING - PRACTICAL

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## Course Outcomes (COs):

- CO1:** Understand the Agile Manifesto and its principles, and create and manage an Agile Product Backlog.
- CO2:** Able to write User Stories and Acceptance Criteria.
- CO3:** Implement Sprint Planning, Daily Stand-ups, and Retrospectives.
- CO4:** Able to use Tools for Agile Management.
- CO5:** Able to apply Test-Driven Development.
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## Course Contents

### UNIT-I

**No. of Hours: 4**

Agile Project Inception & Requirements Analysis

Topic: Project Charter Creation & User Story Development

Focus Areas: Introduction to Agile & Scrum, Project Charter (Scope, Goals, Stakeholders), User Roles & Personas, User Story Writing, Story Point Estimation.

Deliverable: Product Backlog document with user stories & story points.

### UNIT-II

**No. of Hours: 4**

Sprint Planning & Agile Tool Configuration

Topic: Sprint Planning and Kanban Board Setup

Focus Areas: Scrum roles & ceremonies, Sprint Planning, Product Backlog vs Sprint Backlog, Agile tools (Trello / Jira), Kanban workflow

Deliverable: Screenshot of configured board, Sprint Backlog with selected stories.

### UNIT-III

**No. of Hours: 4**

Iterative Development & Agile Communication

Topic: Daily Stand-ups & UI Prototyping

Focus Areas: Daily Stand-up meetings, Incremental development, Agile communication, UI/UX basics & wireframing

Deliverable: Stand-up log (3–5 days), UI mock-up screenshots, Updated Scrum board showing progress.

### UNIT-IV

**No. of Hours: 4**

Agile Testing & Test-Driven Development (TDD)

Topic: Implementing TDD for Checkout Functionality

Focus Areas: Agile testing principles, Test-Driven Development (Red–Green–Refactor), Unit testing, Code refactoring

Deliverable: TDD report including: Test cases, Code snippets, Test results (pass/fail).

**UNIT-V****No. of Hours: 4**

Sprint Review, Retrospective & Agile Metrics

Topic: Sprint Evaluation and Continuous Improvement

Focus Areas: Sprint Review, Sprint Retrospective, Agile metrics (Velocity, Burndown), Continuous improvement

Deliverable: Final Sprint Report including: Completed user stories, Velocity chart, Retrospective summary, Improvements planned for next sprint.

**Text Books:**

1. Introduction to Agile Methods- Sondra Ashmore, Kristin Runyan, Addison Wesley, 2015.
2. Agile Software Engineering- Orit Hazzan, Yael Dubinsky, Springer, 2008.

**Reference Books:**

1. Software Engineering: Concepts & Practices- Ugrasen Suman, Cengage Learning Publications, 2nd Ed., 2022.

**Online Resources:**

# CS-5715: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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## Course Outcomes (COs):

- CO1:** Understand the basic concepts of artificial intelligence and machine learning.  
**CO2:** Design and implement models based on supervised and unsupervised learning.  
**CO3:** Evaluate and compare modelling aspects of various machine learning approaches.  
**CO4:** Apply the ensemble methods for improving the learning algorithm.  
**CO5:** Apply the concepts of neural networks and deep learning methods.
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## Course Contents

### UNIT-I

**No. of Hours: 8**

Introduction: Past, Present, and Future, Definition, Applications, Types of the learning system, Concept learning, Concept learning as search through a hypothesis space, General-to-specific ordering of hypotheses, finding maximally specific hypotheses, Version spaces, Inductive bias. Evaluation of Learning Algorithms: Measuring the accuracy of learned hypotheses, cross-validation, learning curves, Overfitting, Bias-Variance Trade-off, Data Pre-processing, Feature Selection.

### UNIT-II

**No. of Hours: 8**

Supervised Learning: Linear Regression, Gradient Descent (GD), Multiple Regression, Logistic Regression, k-Nearest Neighbor (k-NN) classifier  
Decision Tree Learning: Picking the best splitting attribute: entropy and information gain, ID3, C4.5, CART Algorithm, Decision tree classifier, Stopping Criterion & Pruning loss functions.

### UNIT-III

**No. of Hours: 8**

Dimensionality Problem: Dimensionality Problem, Feature Extraction, Principal Component Analysis (PCA)  
Probabilistic Classifier: Probability and Bayes learning, Naïve Bayes classifier  
Non-probabilistic Classifiers: Support Vector Machine (SVM) classifier.  
Unit-IV:

### UNIT-IV

**No. of Hours: 8**

Unsupervised Learning: Clustering, k-means clustering, Hierarchical clustering  
Ensemble Methods: Ensemble Strategies, Boosting and Bagging, Random Forest, Ada-Boost algorithm.

### UNIT-V

**No. of Hours: 8**

Artificial Neural Network: Introduction, Early Models, Multilayer Perceptron, Gradient Descent, Multiclass Representation, Backpropagation algorithm.  
Deep Learning: Introduction, Convolutional Neural Networks (CNN), Recurrent Neural Networks  
Recent Trends in Deep Learning: Generative Adversarial Networks (GAN), Large Language Model (LLM), GenAI

**Text Books:**

1. Tom M. Mitchell, "Machine Learning", Tata McGraw-Hill Education, 2017.
2. Ethem Alpaydin, "Introduction to Machine Learning", PHI, Third Edition, 2015.
3. Russell and Norvig, "Artificial Intelligence: A Modern Approach" Third Edition, 2011

**Reference Books:**

1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", Oreily, Third Edition, 2022
2. Andreas Muller and Sarah Guido, "Introduction to Machine Learning with Python: A Guide for Data Scientists", Oreily, 2016.

**Online Resources:**

1. NPTEL Course Video Lectures on "Introduction to Machine Learning" - By Prof. Sudeshna Sarkar, IIT Kharagpur
2. Coursera Course Video Lectures on "Machine Learning" - By Prof. Andrew Ng, Stanford University

# CS-5715: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING - PRACTICAL

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## Course Outcomes (COs):

- CO1:** Implement models based on supervised and unsupervised learning.
- CO2:** Design and implement models based on supervised and unsupervised learning.
- CO3:** Evaluate and compare modelling aspects of various machine learning approaches using different evaluation measures.
- CO4:** Implement the ensemble methods for improving the learning algorithm.
- CO5:** Implement the concepts of neural networks and deep learning methods.
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## Course Contents

### UNIT-I

**No. of Hours: 6**

1. Write a Python program to implement a Linear Regression model. Compute and display RMSE, and R2 values for a data set.
2. Write a Python program to implement a logistic regression model.
3. Write a Python program to show the different pre-processing tasks such as Imputation, Standardization, Handling Categorical Variables, Outlier Management and Cross-Validation.

### UNIT-II

**No. of Hours: 6**

4. Write a Python program to implement the k-Nearest Neighbour algorithm to classify a data set.
5. Write a Python program to demonstrate how the decision tree algorithm works. Your program must consider an appropriate data set for building the decision tree and then apply the knowledge to classify a new sample.

### UNIT-III

**No. of Hours: 4**

6. Write a Python program to implement the naive Bayesian classifier for a sample training data set.
7. Write a Python program to perform classification using a Support Vector Machine (SVM).

### UNIT-IV

**No. of Hours: 4**

8. Write a Python program to perform K means clustering on a data set.
9. Write a Python program to implement the random forest algorithm.
10. Write a Python program to implement the ADA BOOST algorithm.

### UNIT-V

**No. of Hours: 4**

11. Write a Python program to build an Artificial Neural Network (ANN) by implementing the Backpropagation algorithm and test the same using appropriate data sets.
12. Explore and Understand a Python code of any Deep Learning Model (CNN).

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1. Tom M. Mitchell, "Machine Learning", Tata McGraw-Hill Education, 2017.

2. Ethem Alpaydin, "Introduction to Machine Learning", PHI, Third Edition, 2015.

**Reference Books:**

1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", Oreily, Third Edition, 2022
2. Andreas Muller and Sarah Guido, "Introduction to Machine Learning with Python: A Guide for Data Scientists", Oreily, 2016.

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2. Coursera Course Video Lectures on "Machine Learning" - By Prof. Andrew Ng, Stanford University