| QF01/0408-4.0E | **Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Artificial Intelligence Department** |
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| **Study plan No.** | **2024/2025** | | **University Specialization** | Data Science and Artificial Intelligence | |
| **Course No.** | 0135240 | | **Course Name** | Machine learning | |
| **Credit Hours** | **3** | | **Prerequisite Co-requisite** | Computing Systems for Data Science and Artificial Intelligence (0135203) AND Data Science and Artificial Intelligence Programming 1 (0135232) | |
| **Course Type** | ☐ Mandatory University Requirement | ☐ University Elective Requirements | ☐ Faculty Mandatory Requirement | ☐ Support Course Family Requirements | ✓Mandatory Requirements / ☐ Elective Requirements |
| **Teaching Style** | ☐ Full Online Learning | | Blended Learning | | ✓ Traditional Learning |
| **Teaching Model** | ☐ 2 Synchronous: 1Asynchronous | | 1 Face to Face: 1 Synchronous | | 3 Traditional |

**Faculty member and study divisions information (to be filled in each semester by the subject instructor)**

| **Name** | **Academic Rank** | **Office No.** | **Phone No.** | **E-mail** | |
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| | | | | | |
| **Division Number** | **Time** | **Place** | **Number of Students** | **Teaching Style** | **Approved Model** |
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**Brief Description**

This course offers an introduction to machine learning, focusing on supervised learning techniques. Students will explore foundational ML concepts, types of data, and key evaluation metrics. The course covers major supervised algorithms including K-Nearest Neighbors, Decision Trees, Ensemble Methods, Support Vector Machines, Naive Bayes, and Regression. Emphasis is placed on both theoretical understanding and hands-on implementation using Python. By the end, learners will be equipped to build, evaluate, and interpret supervised machine learning models effectively.

**Learning resources**

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| Course book information (Title, author, date of issue, publisher ... etc) | 1- A Hands-On Introduction to Machine Learning by Chirag Shah, 2023, Cambridge University |

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| Supportive learning resources (Books, databases, periodicals, software, applications, others) | 1- Machine Learning with Python Cookbook Practical Solutions from Preprocessing to Deep Learning, by Chris Albon, 2nd edition, O'Reilly Media, 2023.<br>2- Patterns, predictions, and actions: Foundations of machine learning. By Moritz Hardt, Benjamin Recht, Princeton University Press, 2022.<br>3- Machine learning foundations. Supervised, Unsupervised, and Advanced Learning. By Taeho Jo, Springer International Publishing | | | |
| Supporting websites | | | | |
| The physical environment for teaching | ✓ Class Room | ☐ Labs | ☐ Virtual Educational Platform | ☐ Others |
| Necessary equipment and software | | | | |
| Supporting people with special needs | | | | |
| For technical support | | | | |

**Course Learning Outcomes (S**= *Skills, C= Competences K= Knowledge,)*

| No. | Course Learning Outcomes | The Associated Program Learning Output Code |
|---|---|---|
| | **Knowledge** | |
| **K1** | Understand and explain fundamental concepts in machine learning, including supervised learning, unsupervised learning, overfitting, underfitting, model generalization, and model evaluations | **MK2** |
| **K2** | Understand the types of problems that machine learning algorithms can solve and understand various machine learning algorithms in a range of real-world applications. | **MK2** |
| | **Skills** | |
| **S1** | Analyze the theoretical underpinnings and assumptions of key supervised learning algorithms to determine their suitability for specific types of data and problems. | **MS2** |
| **S2** | To apply different machine learning algorithms and models to real-world problems, and use these machine learning methods in solving problems, and to evaluate and interpret the results of machine learning algorithms. | **MS2** |
| | **Competences** | |
| **C1** | To apply the main concepts of machine learning algorithms for problem-solving in real life. | **MC1** |

**Mechanisms for direct evaluation of learning outcomes**

| Type of Assessment / Learning Style | Fully Electronic Learning | Blended Learning | Traditional Learning (Theory Learning) | Traditional Learning (Practical Learning) |
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| Project | | | **10%** | |
| Second / midterm exam | | | **30%** | |
| Participation / practical applications | | | **20%** | |
| Asynchronous interactive activities | | | **0** | |
| final exam | | | **40%** | |

**Note:** Asynchronous interactive activities are activities, tasks, projects, assignments, research, studies, projects, work within student groups ... etc., which the student carries out on his own, through the virtual platform without a direct encounter with

the subject teacher.

**Schedule of simultaneous / face-to-face encounters and their topics**

| Week | Subject | learning style* | Reference ** |
|---|---|---|---|
| 1 | - Introduction to ML. | • Classroom lectures, discussions,and review of theoretical concepts<br>• Slides | Textbook 1 |
| 2 | - Why Use Machine Learning?<br>- Examples of Applications<br>- Types of Machine Learning Systems | • Classroom lectures, discussions,and review of theoretical concepts<br>• Slides | Textbook 1 |
| 3 | Main Challenges of Machine Learning<br>What Is Testing and Validating | • Classroom lectures, discussions,and review of theoretical concepts<br>• Slides | Textbook 1 |
| 4 | Evaluation Metrics for Classification | • Classroom lectures, discussions,and review of theoretical concepts<br>Slides | Textbook 1 |
| 5 | - K Nearest Neighbors | • Classroom lectures, discussions,and review of theoretical concepts<br>• Slides | Textbook 1 |
| 6 | - Practical Sessions | • Classroom lectures, discussions,and review of theoretical concepts<br>• Slides | Textbook 1 |
| 7 | Decision Trees | • Classroom lectures, discussions, and review of theoretical concepts | Textbook 1 |
| 8 | **Midterm Exam 30%** | | |
| 9 | Pruning, Random Forests<br>Ensemble Learning | • Classroom lectures, discussions,and review of theoretical concepts<br>• Slides | Textbook 1 |
| Practical Sessions | - Practical Sessions | • Classroom lectures, discussions,and review of theoretical concepts<br>• Slides | Textbook 1 |
| 11 | Support Vector Machines. (SVM) | • Classroom lectures, discussions,and review of theoretical concepts<br>• Slides | Textbook 1 |
| 12 | Naive Bayes Classifier | • Classroom lectures, discussions,and review of theoretical concepts<br>• Slides | Textbook 1 |
| 13 | - Regression | • Classroom lectures, discussions,and review of theoretical concepts<br>Slides | Textbook 1 |
| 14 | Evaluation Metrics for Regressions | • Classroom lectures, | Textbook 1 |

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| | | discussions,and review of theoretical concepts<br>• Slides | |
| 15 | Projects discussions | • Presentations | - |
| 16 | **Final Exam 40%** | | |

***** Learning styles: Lecture, flipped learning, learning through projects, learning through problem solving, participatory learning ... etc.

** Reference: Pages in a book, database, recorded lecture, content on the e-learning platform, video, website ... etc.