**Course Description Form**

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| 1. Course Name:
 |
| Pattern Recognition |
| 1. Course Code:
 |
| COM-326 |
| 1. Semester / Year:
 |
| 2023-2024 |
| 1. Description Preparation Date:
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| 1. Available Attendance Forms:
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|  |
| 1. Number of Credit Hours (Total) / Number of Units (Total)
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|  |
| 1. Course administrator's name (mention all, if more than one name)
 |
| Name: Dr.Adil Abdulwahhab Al-AzzawiEmail: adil\_alazzawi@updiyala.edu.iq |
| 1. Course Objectives
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| **Course Objectives** | * **Understand the basic concepts and principles of pattern recognition, including feature extraction, classification, and clustering.**
* **Apply various pattern recognition algorithms and techniques, including supervised and unsupervised learning methods, to solve real-world problems.**
* **Analyze and evaluate the performance of pattern recognition systems using appropriate metrics and evaluation methods.**
* **Gain practical experience in implementing pattern recognition algorithms using programming languages such as Python or MATLAB.**
* **Explore advanced topics in pattern recognition, such as deep learning, probabilistic graphical models, and ensemble methods.**
* **Apply pattern recognition techniques to different domains, including image processing, natural language processing, and bioinformatics.**
* **Develop critical thinking and problem-solving skills through hands-on projects, assignments, and case studies.**
* **Understand the ethical and societal implications of pattern recognition technologies, including privacy concerns and bias in decision-making systems.**
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| 1. Teaching and Learning Strategies
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| **Strategy** | **Pattern recognition theory and practice is concerned with the design, analysis, and development of methods for the classification or description of patterns, objects, signals, and processes. At the heart of this discipline is our ability to infer the statistical behavior of data from limited data sets, and to assign data to classes based on generalized notions of distances in a probabilistic space. Many commercial applications of pattern recognition exist today, including voice recognition (e.g., Amazon Alexa), fingerprint classification (e.g., MacBook Pro touch bar), and retinal scanners (e.g., your favorite cheesy sci-fi movie).** |
| 1. Course Structure
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| **Week**  | **Hours**  | **Required Learning Outcomes**  | **Unit or subject name**  | **Learning method**  | **Evaluation method**  |
| **1** | **2** | **Understands basic structure of pattern recognition systems.** | **Introduction: An Overview of Machine Learning** | **Lecture Base** |  |
| **2** | **2** |  | **Decision Theory: Bayes Rule** | **Lecture Base** |  |
| **3** | **2** |  | **Decision Theory: Gaussian Classifiers** | **Lecture Base** |  |
| **4** | **2** | **Expresses principal units within a pattern recognition system.** | **Decision Theory: Generalized Gaussian Classifiers** | **Lecture Base** |  |
| **5** | **2** | **Summarizes execution of a pattern recognition system.** | **Parameter Estimation: The Bayesian Approach** | **Lecture Base** |  |
| **6** | **2** |  | **Mid-term Exam**  | **Lecture Base** |  |
| **7** | **2** |  | **Decision Theory: Discriminant Analysis** | **Lecture Base** |  |
| **8** | **2** |  | **Parameter Estimation: The Expectation Maximization Theorem** | **Lecture Base** |  |
| **9** | **2** | **Defines the relationship between pattern and feature.** | **Parameter Estimation: Discriminative Training** | **Lecture Base** |  |
| **10** | **2** |  | **Experimental Design: Foundations of Machine Learning** | **Lecture Base** |  |
| **11** | **2** | **Explains supervised and unsupervised pattern recognition approaches.** | **Experimental Design: Evaluation** | **Lecture Base** |  |
| **12** | **2** |  | **Statistical Significance** | **Lecture Base** |  |
| **13** | **2** | **Analyzes the success of a feature recognition system.** | **Jackknifing, Bootstrapping and Combining Classifiers** | **Lecture Base** |  |
| **14** | **2** |  | **Introduction to Nonparametric Techniques** | **Lecture Base** |  |
| **15** | **2** |  | **Final Exam Review** | **Lecture Base** |  |
| 1. Course Evaluation
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| Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc  |
| 1. Learning and Teaching Resources
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| Required textbooks (curricular books, if any) | A. Lindholm, N. Wahlstrom, F. Lindsten and T. Schon, Machine Learning: A First Course for Engineering and Scientists, Cambridge University Press, New York, New York, USA, ISBN: 978-1-108-84360-7, pp. 338, 2022. URL: <http://smlbook.org/book/sml-book-draft-latest.pdf> |
| Main references (sources) |  C.M. Bishop, Pattern Recognition and Machine Learning, Springer, ISBN: 978-0387310732, 2003. |
| Recommended books and references (scientific journals, reports...) |  |
| Electronic References, Websites |  |