## Course Syllabus

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| **Code - Course Title** | **BVA222 - Artificial Neural Networks** |
| **Course Type** | IV. SEMESTER |
| **Laboratory + Practice** | 2+2 |
| **ECTS** | **5.0** |
| **Language of Instruction** | Türkçe |
| **Course Type** | Area Elective Courses |
| **Course Instructor(s)** | ÖĞR. GÖR. AHMET MÜCAHİD ARVASİ |

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| **Mode of Delivery** | Face to face |
| **Prerequisites** | There are no prerequisites or corequisites for this course. |

## Course Syllabus

| Weeks | Learning Outcomes | Topics | Teaching Methods |
|---|---|---|---|
| **Week - 1** | | Biological and Artificial Neurons, Perceptrons, and Introduction to Neural Networks | |
| **Week - 2** | | Multi-Layer Networks (MLP) and Feedforward Computation | |
| **Week - 3** | | Activation Functions (Sigmoid, ReLU, Tanh, Softmax) and Loss Functions | |
| **Week - 4** | | Backpropagation Algorithm and the Mathematics of Gradient Descent | |
| **Week - 5** | | Advanced Optimization Techniques: Adam, RMSprop, and Momentum | |
| **Week - 6** | | Preventing Overfitting: Regularization, Early Stopping, Dropout, and Batch Normalization | |
| **Week - 7** | | Introduction to Convolutional Neural Networks (CNN): Filtering, Pooling, and Feature Extraction | |
| **Week - 8** | | Midterm Exam | |
| **Week - 9** | | Advanced CNN Architectures (ResNet, VGG) and Image Classification Applications | |
| **Week - 10** | | Introduction to Recurrent Neural Networks (RNN) and Sequence Modeling | |
| **Week - 11** | | Advanced Recurrent Networks: LSTM (Long Short-Term Memory) and GRU (Gated Recurrent Unit) Architectures | |
| **Week - 12** | | Model Training on Large Datasets, Transfer Learning, and Fine-Tuning | |
| **Week - 13** | | Hyperparameter Optimization, Model Evaluation Metrics, and Cross-Validation | |
| **Week - 14** | | Real-World Big Data Analytics Projects and Student Presentations | |

## Learning Outcomes

| # | Learning Outcome |
|---|---|
| 1 | Upon successful completion of this course, students will gain the ability to model complex datasets by deeply understanding the fundamental working principles of artificial neural networks, perceptrons, and backpropagation algorithms; they will be able to successfully apply feedforward, convolutional (CNN), and recurrent (RNN) network architectures in classification, regression, and sequence prediction tasks; and they will achieve the competence to integrate model training on large datasets, hyperparameter optimization, and fine-tuning processes into real-world machine learning projects using modern deep learning libraries. |

## Sustainable Development Goals

*No content has been provided.*

## Course Theme

*No content has been provided.*

## AKTS Workload

| Activity | Duration (Hour) | Count | Workload |
|---|---|---|---|
| Teorik Derse Katılım | 0 | 0 | 0 |
| Sınıf Dışı Çalışma (Ön Hazırlık & Pekiştirme Amaçlı) | 0 | 0 | 0 |
| Ödevler | 0 | 0 | 0 |
| Proje - Rapor - Sunum Hazırlama | 0 | 0 | 0 |
| Ara Sınav Hazırlığı (sınav süresi dahil) | 0 | 0 | 0 |
| Final Sınavı Hazırlığı (sınav süresi dahil) | 0 | 0 | 0 |
| Uygulama (Laboratuvar, Müzik/Enstrüman Uygulaması, Atölye/Saha Çalışması vb.) | 0 | 0 | 0 |
| Staj Uygulaması | 0 | 0 | 0 |
| | | **Calculated ECTS** | **0** |

## Assessment Method and Passing Requirements

*No content has been provided.*