Course Syllabus for
Electrical and Information Engineering PhD
(years 2022-23 /2023-24)

Course title	Machine Learning
Scientific Discipline Sector	ING-INF/05
Hours of instruction	20 hours
CFU	2 CFU
Semester	Second semester
Goal	The course will provide a broad introduction to machine learning. The course will cover Supervised learning, Machine Learning systems design and evaluation, Unsupervised learning, including clustering and dimensionality reduction. By the end of the course, the course participants will be able to design and implement Machine Learning-based applications autonomously. The lessons alternate theoretical lectures and implementation examples.
Syllabus	Machine Learning classification Linear regression Logistic Regression Overfitting and Underfitting, Bias and Variance trade-off Regularization ML System Design, Machine learning diagnostics, Evaluation Neural Networks K-means, K-medoids, Gaussian Mixture Models Information criterion approaches, and Silhouette Coefficient Hierarchical Clustering Dimensionality Reduction
Bibliography	Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements Of Statistical Learning Second edition, Springer-Verlag ISBN 978-0-387-84858-7 https://web.stanford.edu/~hastie/ElemStatLearn/ Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach Fourth edition, Pearson Global Edition: ISBN 9781292401133 Rome: Pearson Italia, 2010. ISBN 9788871925936 http://aima.cs.berkeley.edu/index.html Kevin P. Murphy, Machine Learning A probabilistic Perspective, MIT Press, ISBN 10: 0262018020 ISBN 13: 9780262018029, https://mitpress.mit.edu/books/machine-learning-1 Slides and support material from lecturer.
Examination method	Final examination in class