

## Course descriptor F21DL

Course code	F21DL
Course title	Data Mining and Machine Learning
Credits	15
School	Mathematical and Computer Sciences
SCQF Level	11
Semester	1
Aims	<p>In this course, students will develop:</p> <ul style="list-style-type: none"> <li>• An understanding of the fundamental concepts and techniques used in data mining and machine learning.</li> <li>• An understanding of the mathematics underpinning data mining and machine learning.</li> <li>• A critical awareness of the appropriateness of different data mining and machine learning techniques and the relationships between them.</li> <li>• Familiarity with common applications of data mining and machine learning techniques.</li> </ul>
Syllabus	<p><b>Basic Concepts:</b> datasets, dealing with missing data, classification, supervised vs unsupervised learning.</p> <p><b>Generative Models:</b> naïve Bayes, probabilistic graphical models, cluster analysis (such as k-means clustering, EM algorithm).</p> <p><b>Discriminative Learning:</b> linear regression, decision tree learning, perceptron, advanced models such as multi-layer perceptron and deep learning architectures.</p>

Learning Outcomes	
Subject Mastery	<ul style="list-style-type: none"> <li>• Extensive understanding of the data mining process and machine learning algorithms.</li> <li>• Detailed understanding of the mathematics underpinning the data mining and machine learning methodologies.</li> <li>• Critical awareness of the appropriateness and performance of the different techniques, as well as the relationships between them.</li> <li>• Critical awareness of data quality and the appropriate use of data mining and machine learning for decision making.</li> <li>• Ability to apply this knowledge for practical data mining and machine learning purposes</li> </ul> <p>The students will develop their research abilities, and in particular:</p>

	<ul style="list-style-type: none"> <li>• Ability to conduct quantitative and qualitative research on real-life, complex data sets</li> <li>• Ability to ask own research questions about the hidden properties of data</li> <li>• Ability to ask own research questions about suitability of certain machine learning methods and algorithms for the given data</li> <li>• Demonstrate originality and creativity in the application of knowledge</li> </ul>
Personal Abilities	<p>The students will be expected to:</p> <ul style="list-style-type: none"> <li>• Show capacity for rational problem identification and definition.</li> <li>• Show capacity for critical analysis and solution selection, deal with complex issues and make informed judgements.</li> <li>• Use appropriate computer software to process data, and to support and enhance the research tasks.</li> <li>• Demonstrate the ability to learn independently and demonstrate leadership/initiative in tackling research problems.</li> <li>• Manage time, work to deadlines, and prioritise workloads.</li> <li>• Use a wide range of resources to present results in a way that demonstrates a good understanding of the technical and broader issues of data mining and machine learning.</li> <li>• Communicate with peers and more senior colleagues</li> </ul>

Assessment method	50% course work 50% examination
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