Module Title	**Data Mining and Analysis**
Level	7
Reference No. *(showing level)*	CSI_7_DMA
Credit Value	20
Student Study Hours	Total: 200 Contact hours: 52 Student managed learning hours: 148 Requirements for Self-Managed Learning Hours: • Read research papers and make notes for seminar presentations. • Undertake research work, complete and write up lab exercises and assessments. • Maintain a journal on contemporary research and technical work.
Pre-requisite learning	Statistical Analysis and Modelling
Co-requisites	None
Excluded combinations	None
Module co-ordinator	TBC
School/Division	Engineering/Computer Science and Informatics
Short Description	The module introduces you to the basic theory, concepts, and techniques of data mining, and its role in data science and business intelligence. It will cover the main topics in the area. The module also focuses on developing practical skills in solving real-world data mining problems by using appropriate software suites. Base SAS®, SAS® Enterprise Miner, SAS® Enterprise Guide and Tableau® may be taught and used for this purpose.
Aims	To develop an in-depth, critically evaluative knowledge of data mining concepts, methodologies, and tools, and to develop understandings about the need for data mining, the nature of data mining, benefits resulting from data mining, and its role in data science and business intelligence. The module also provides practical hands-on experience of using suitable data mining techniques and tools in real-world data mining case studies.
Learning Outcomes	**Knowledge and Understanding:** On successful completion of this module, you will have knowledge and understanding of: • Demonstrating a systematic understanding of the domain of Data Mining/Analytics/Data Science including the importance of research, methodologies, driving innovation and contribution; (covers course outcomes: a1, a2; BCS requirements: 7.1.1 - 7.1.4; 8.1.1 - 8.1.2; 8.2.1; 9.1.1, 9.1.2, 9.2.2; 10.1.1, 10.1.2, 10.2.1) • consistently producing and reviewing research informed work which applies and is at the forefront of the developments in the domain; (covers course outcomes: a3; BCS requirements: 7.1.1, 7.1.4, 7.1.6; 8.1.1 - 8.2.1; 9.1.1 - 9.1.3) • study and management of associated projects including timescales, risk identification/management, cost and quality constraints, as well as ethics working within professional frameworks and social/legal constraints (covers course outcomes: a4; BCS requirements: 7.1.5 - 7.1.9; 8.1.1 - 8.2.2 9.1.3 - 9.2.3; 10.1.1 - 10.2.3) **Intellectual Skills:** • Conduct a critically evaluative analysis of a case-based domain using appropriate analytic and quantitative methods; also developing the in-depth knowledge necessary to identify and apply suitable techniques to synthesize advanced theory/practical concepts. (covers course outcomes: b1, b2; BCS requirements: 8.1.1 - 8.2.1; 9.1.1 - 9.2.3; 10.1.1 - 10.1.3)

	• Specify/critically evaluate a project applying appropriate techniques, life-cycle/methodology; conducting effective independent research (covers course outcomes: b3, b4; BCS requirements: 8.1.1, 8.2.1, 8.2.2; 9.1.1, 9.1.2,10.1.1 - 10.1.3) **Practical Skills:** • Develop the in-depth knowledge necessary to identify Data Mining/Analytics/Data Science project domains and apply suitable techniques in order to synthesize advanced (theory/practical) concepts to design, develop, deploy, and maintain bespoke/innovative Data Mining/Analytics/Data Science/Big Data solutions using suitable tools e.g: SAS/Tableau; as well as being able to specify, manage, critically evaluate a project applying appropriate technology, techniques, life-cycle/methodology (covers course outcomes: c2, c4; BCS requirements: 8.2.1, 8.2.1; 9.2.1 - 9.2.3; 10.2.1 - 10.2.3;) • Be able to make concise, engaging and well-structured oral presentations, arguments and explanations; Communication /presentation of advanced Data Mining/Analytics/Data Science projects and concepts to a wide range of audiences. (covers course outcomes: c1, c3; BCS requirements: 8.2.1, 8.2.1; 9.1.1 - 9.2.3; 10.2.1 - 10.2.2;) **Transferable Skills:** • Critically evaluate existing/emerging Data Mining, Analytics, Data Science, Data Quality technology and techniques, carrying out independent research, recognize and contribute to opportunities for innovation, deal with uncertainty, evaluate and manage risks, synthesise ideas/theories/solutions and report back appropriately to your peers, also conducting effective peer reviews. (covers course outcomes: d2, d3; BCS requirements: 7.1.1 - 7.1.4) • Self-manage your study time and work effectively to meet deadlines, select and evaluate appropriate knowledge, skills, etc...; also select and evaluate supporting resources/tools for a particular purpose, as well as being able to make effective contributions as team member/leader when required. (covers course outcomes: d1, d4; BCS requirements: 7.1.5 - 7.1.9)
Employability skills	Data mining is the core of business intelligence analytics and is now becoming popular in various business sectors. Having sound knowledge of data mining techniques together with strong capability of using commercial software like SAS® system and Tableau® will potentially enhance your employability within the IT marketplace.
Teaching and learning pattern	The module will be delivered using a combination of lectures, tutorials and lab sessions. Teaching takes place over 15 weeks of the semester when there will be 4 hours of direct class contact. You will also be expected to undertake appropriate follow-up private study. The lab work is an important part of the module.
Supporting Tutorials	Each lecture will be followed by appropriate lab work to help the student understand and apply the principles and theories taught in order to resolve real-world problems.
Indicative content	The module syllabus includes: **Data Mining and business intelligence: the Basics** • Data mining tasks, methodologies, and models, the concept if business intelligence, and the role of data mining in business intelligence analytics. • Data mining tools and platforms: the main categories and vendors. • Data and data pre-processing for data mining, data quality issues. • Business reporting and pivot tables. • Visual analytics. **Data Mining: Modelling Approaches** • Descriptive and predictive modelling • Data discovery

	• Learning: supervised vs unsupervised; Eager vs Lazy • Pivot tables/charts, • Cluster and segmentation analysis • Association rules analysis/Basket analysis • Decision tree induction • Regression models • Artificial neural networks, rule-based classifiers • Statistical modelling: Naïve Bayesian classifiers **Data Mining: Applications in Businesses** • CRM, RFM models, and customer segmentation: analysis and construction • Database marketing: response models • Credit risk scoring models: analysis and construction • Social media analytics **Module Project** • Business intelligence reporting using Tableau®. • SAS® Enterprise Miner and SAS® Enterprise Guide: Essential skills • Data mining project using SAS® Enterprise Miner and SAS® Enterprise Guide with real-world data sets and case studies.
Assessment *Elements and weightings*	**60% Coursework (Summative Assessment)** The coursework is likely to be logbook based and demonstrate evidence of the weekly lab-based exercises in the areas of: applied design, development and implementation of practical software engineered solutions to BI problem domains. Practical work will focus on the application of industry standard tools using large real-world data sets where available, supported by appropriate narratives, ensuring that you can demonstrate achievement of the learning outcomes. **Final logbook length approx. 2500-3000 words**. (covers module outcomes: c1-c2, d1-d2; BCS requirements: 8.2.1, 8.2.1; 9.1.1 - 9.2.3; 10.2.1 - 10.2.2) **40% examination** The examination is a two-hour paper consisting of four questions from which you will answer three. The questions will assess both theory and practical elements from the indicative content ensuring that you can demonstrate achievement of the learning outcomes. (covers module outcomes: a1-a3, b1-b2; BCS requirements: 7.1.1 - 7.1.9; 8.2.1, 8.2.1; 9.1.1 - 9.2.3; 10.2.1 - 10.2.2) (**Formative Assessments:** The students will usually be given a range of weekly tutorial-based tasks (both individual/group work) comprised of formative exercises imparting the knowledge and skills required to satisfy the learning outcomes)
Indicative Sources *(Reading lists)*	**Core Materials** • EMC Education Services (Editor) (2015), *Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data*, John Wiley and Sons, ISBN-13: 978-1118876138. • Berry, M. and Lindoff, G. (2011) *Data Mining techniques: For Marketing, Sales and Customer Relationship Management*, 3rd Edition. John Wiley and Sons Inc. ISBN-13: 978-0470650936. • Cerrito, P. (2006) *Introduction to Data Mining: Using SAS® Enterprise Miner.*SAS Institute Inc. ISBN: 1-59047-829-0. • Collica, R. (2007) *CRM Segmentation and Clustering Using SAS Enterprise Miner.* SAS® Publishing. ISBN-13: 978-1-59-047508-9. • Delmater, R. and Hancock, M. (2001) *Data Mining Explained: A Manager's Guide to Customer-centric Business Intelligence.* Digital Press. ISBN: 978-1-55-558231-9. • Steven Finlay (2014) *Predictive Analytics, Data Mining, and Big Data: Myths, Misconceptions, and Methods*, Palgrave Macmillan, ISBN: 978-1-137-37927-6

	Optional Materials • Howson, C. (2008) *Successful Business Intelligence: Secrets to Making BI a Killer App.* McGraw-Hill Osborne. ISBN: 978-0071498517. • Parmenter, D. (2010) *Key Performance Indicators (KPI): Developing, Implementing, and Using Winning KPIs.* 2nd Edition. John Wiley and Sons. ISBN: 978-0470545157. • Jelen, B. and Alexander, M. (2008) *Excel 2007 Pivot Tables.* Pearson Education. ISBN: 978-0-273-71404-1. • Few, S. (2013) *Information Dashboard Design: Displaying Data for At-a-Glance Monitoring.* 2nd Edition. Analytics Press. ISBN-13: 978-1938377006. • Dunham, M. (2003) *Data Mining: Introductory and Advanced Topics.* Prentice and Hall. ISBN: 0-13-088892-3. Supplementary materials for SAS® Enterprise Supplementary materials for SAS® Enterprise Miner and Tableau® will be available on the module VLE site.