

University of the West of Scotland

Module Descriptor

Session: 2024/2025

Title of Module: Big Data			
Code: COMP10XXX	SCQF Level: 10 (Scottish Credit and Qualifications Framework)	Credit Points: 20	ECTS: 10 (European Credit Transfer Scheme)
School:	School of Computing, Engineering and Physical Sciences		
Module Co-ordinator:	Tahir Mahmood		
Summary of Module			
<p>This module is designed to expose students to the concepts, terminologies, tools, and techniques to work with big data. Big data is characterized by its large volume, velocity, and variety, posing challenges for traditional data processing methods. It has emerged as a key aspect underlying modern data-driven software systems across various industries and sectors. Understanding how to effectively store, process, and analyse the large amounts of data being generated is therefore a crucial skill for aspiring computing and software professionals.</p> <p>Students will be introduced to big data, the current technological landscape and platforms as well as work on practical examples to process big data using tools such as Apache Hadoop and Spark.</p> <p>The syllabus includes the following content:</p> <p>Introduction to Big Data</p> <ul style="list-style-type: none"> • Definition and evolution • 5 Vs of Big Data: Volume, Velocity, Variety, Veracity, and Value • Ecosystem and Landscape • Big Data Lifecycle: Generation, Acquisition, Storage, Processing, Analysis, and Visualization • Ethical and Legal Implications of Big Data <p>Data Storage and Compute</p> <ul style="list-style-type: none"> • Introduction to Cluster Computing Models and distribution systems • Structured and unstructured data • Replication and Partitioning • Data Mining <p>Big Data Infrastructure and Technologies</p> <ul style="list-style-type: none"> • Frameworks: Hadoop, Spark, and other distributed computing frameworks • Distributed File Systems: Definition and examples (HDFS, GFS) 			

- Relational and Non-relational Databases for Big Data Storage including graph databases.
- Big Data Technology stack: Hadoop, HDFS, MapReduce, Yarn, Spark, Storm, Hive

Big Data Analytics

- Business intelligence (BI) and self-service BI
- Visualizations and reporting from large, diverse data sets using tools such as Tableau or Apache Superset
- Case Studies on real-world data and problems

This module will work to develop a number of the key 'I am UWS' Graduate Attributes to make those who complete this module:

- Universal: Critical Thinker; Ethically-minded; and Research-minded.
- Work-Ready: Problem-Solver; Effective Communicator; and Ambitious.
- Successful: Autonomous; Resilient; and Driven.

Module Delivery Method					
Face-To-Face	Blended	Fully Online	HybridC	Hybrid 0	Work-Based Learning
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><i>If this module is delivered within the BSc (Hons) IT Software Development Programme the 'Blended' module delivery method applies.</i></p> <p>See Guidance Note for details.</p>					

Campus(es) for Module Delivery						
The module will normally be offered on the following campuses / or by Distance/Online Learning: (Provided viable student numbers permit) (tick as appropriate)						
Paisley:	Ayr:	Dumfries:	Lanarkshire:	London:	Distance/Online Learning:	Other:
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Add name

Term(s) for Module Delivery					
(Provided viable student numbers permit).					
Term 1	<input type="checkbox"/>	Term 2	<input checked="" type="checkbox"/>	Term 3	<input type="checkbox"/>

Learning Outcomes: (maximum of 5 statements)

These should take cognisance of the SCQF level descriptors and be at the appropriate level for the module.	
At the end of this module the student will be able to:	
L1	Demonstrate a detailed understanding of big data and how it is stored, processed, and analysed.
L2	Evaluate real-world data challenges, mapping them to big data solutions while considering ethical and legal implications.
L3	Select and justify appropriate methods, utilizing industry-standard tools across the big data lifecycle to address specific data problems.
L4	Implement and test solutions to given big data problems using appropriate tools, techniques, and technologies

Employability Skills and Personal Development Planning (PDP) Skills	
SCQF Headings	During completion of this module, there will be an opportunity to achieve core skills in:
Knowledge and Understanding (K and U)	<p>SCQF Level 10</p> <p>A critical understanding of the principal theories, concepts and principles within the field of big data</p> <p>Detailed knowledge and understanding of how to apply big data analytics</p>
Practice: Applied Knowledge and Understanding	<p>SCQF Level 10</p> <p>In using a wide range of the principal professional skills, techniques, practices to implement solutions to problems with big data</p> <p>Executing a defined project of research and development for a big data solution along the big data lifecycle</p>
Generic Cognitive skills	<p>SCQF Level 10</p> <p>Critically identify, define, conceptualise and analyse complex/professional problems and issues within the field of big data</p> <p>Offer professional sights, interpretations and solutions to problems and issues</p>
Communication, ICT and Numeracy Skills	<p>SCQF Level 10</p> <p>Use a range of ICT applications to work with big data</p>

	Communicate with peers, senior colleagues and specialists on a professional level	
Autonomy, Accountability and Working with others	SCQF Level 10 Exercise autonomy and initiative in some activities at a professional level during the practical classes and during the completion of the coursework.	
Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code:	Module Title:
	Other:	
Co-requisites	Module Code:	Module Title:

*Indicates that module descriptor is not published.

Learning and Teaching	
In line with current learning and teaching principles, a 20-credit module includes 200 learning hours, normally including a minimum of 36 contact hours and maximum of 48 contact hours.	
Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	Student Learning Hours (Normally totalling 200 hours): (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture/Core Content Delivery	24
Laboratory/Practical Demonstration/Workshop	24
Independent Study	152
	200 Hours Total
**Indicative Resources: (eg. Core text, journals, internet access)	

The following materials form essential underpinning for the module content and ultimately for the learning outcomes:

Han, J. and Kamber, M. (2018) Data Mining : Concepts and Techniques. 3rd edn. Haryana, India ; Burlington, Ma: Elsevier.

Howson, C. (2013) Successful business intelligence : unlock the value of BI & big data. New York McGraw Hill Professional. Kleppmann, M. (2017) Designing Data-Intensive Applications. 'O'Reilly Media, Inc.'

Karau, H. and Warren, R., 2017. High performance Spark: best practices for scaling and optimizing Apache Spark. " O'Reilly Media, Inc."

Singh, C. and Kumar, M., 2019. Mastering Hadoop 3: Big data processing at scale to unlock unique business insights. Packt Publishing Ltd. Birmingham, United Kingdom

Warren, J. and Marz, N., 2015. Big Data: Principles and best practices of scalable realtime data systems. Manning Publications Co., 20 Baldwin Road, PO Box 761, Shelter Island, NY 11964.

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(**N.B. Although reading lists should include current publications, students are advised (particularly for material marked with an asterisk*) to wait until the start of session for confirmation of the most up-to-date material)

Attendance and Engagement Requirements

In line with the [Student Attendance and Engagement Procedure](#): Students are academically engaged if they are regularly attending and participating in timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time.

For the purposes of this module, academic engagement equates to the following:

Attending all timetabled synchronous classes and engagement with asynchronous learning activities and resources.

Equality and Diversity

The University's Equality, Diversity and Human Rights Procedure can be accessed at the following link: [UWS Equality, Diversity and Human Rights Code](#).

Aligned with the overall commitment to equality and diversity stated in the Programme Specifications, the module supports equality of opportunity for students from all backgrounds and with different learning needs. Using our VLE, learning materials will be presented electronically in formats that allow flexible access and manipulation of

content (part-time and distant learning students should check with their programme leader for any queries). The module complies with University regulations and guidance on inclusive learning and teaching practice. Specialist assistive equipment, support provision and adjustments to assessment practice will be made in accordance with UWS policy and regulations.

(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)

Supplemental Information

Divisional Programme Board	Computing
Assessment Results (Pass/Fail)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
School Assessment Board	Business & Applied Computing
Moderator	TBA
External Examiner	A Jindal
Accreditation Details	n/a
Changes/Version Number	1.0

Assessment: (also refer to Assessment Outcomes Grids below)

Assessment for this module consists of a written report and a portfolio of practical work.

Assessment 1: A written report that describes a planned outline of a solution to a big data problem considering methods, tools, technologies and ethical as well as legal implications. (40%)

Assessment 2: Portfolio of practical work in which students will use a real-world data set and industry-standard tools following the big data lifecycle to document and implement a solution to a big data problem. (60%)

(N.B. (i) **Assessment Outcomes Grids** for the module (one for each component) can be found below which clearly demonstrate how the learning outcomes of the module will be assessed.

(ii) An **indicative schedule** listing approximate times within the academic calendar when assessment is likely to feature will be provided within the Student Module Handbook.)

Assessment Outcome Grids (See Guidance Note)

Component 1							
Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Learning Outcome (5)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Review/ Article/ Critique/ Paper	X	X				40	-

Component 2							
Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Learning Outcome (5)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Portfolio of Practical Work		x	X	x		60	-

Combined Total for All Components						100%	- hours
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Change Control:

What	When	Who
Further guidance on aggregate regulation and application when completing template	16/01/2020	H McLean
Updated contact hours	14/09/21	H McLean
Updated Student Attendance and Engagement Procedure	19/10/2023	C Winter
Updated UWS Equality, Diversity and Human Rights Code	19/10/2023	C Winter
Guidance Note 23-24 provided	12/12/23	D Taylor
General housekeeping to text across sections.	12/12/23	D Taylor

Version Number: MD Template 1 (2023-24)