Module Descriptor

Title	Data Visualisation and Analysis		
Session	2025/26	**Status**	Published
Code	ENGG08040	**SCQF Level**	8
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	M Alselek		

Summary of Module

This module provides students with a comprehensive introduction to the field of data visualisation. Students will explore the core principles and techniques used to visually represent data, enabling deeper insights and understanding of the information within. Emphasis will be placed on effectively communicating data through the application of relevant theories and practical techniques.

Key topics include the terminology, concepts, and methodologies underpinning data visualisation. Students will gain hands-on experience with a variety of tools to create and evaluate graphical representations of data. The module highlights best practices for visualising diverse data types and formats, focusing on principles for describing and exploring data, analysing hypotheses and relationships, and presenting evidence.

Using both R and Python, students will develop techniques to handle and visualise data across multiple formats. The structured learning approach combines lectures, tutorials, and hands-on exercises, complemented by online resources. Lectures will cover foundational theories, algorithms, and concepts, while tutorial sessions provide opportunities to apply these ideas to real-world data, both in creating visualisations and leveraging them for analysis.

Aims of the Module:

- To understand and apply the principles of data visualisation, including the attributes of effective visualisations.
- To develop skills in acquiring, managing, and preparing data for visualisation.
- To analyse and interpret subject-relevant datasets using visualisation techniques.
- To critically assess and evaluate existing visualisations from both quantitative and qualitative perspectives.

During the course of this module students will develop their UWS Graduate Attributes (https://www.uws.ac.uk/current-students/your-graduate-attributes/). Universal: Academic attributes - critical thinking and analytical & inquiring mind; Work-Ready: Academic attributes – knowledgeable, problem-solving; Successful: autonomous, driven, and innovative.

This module is developed, taking cognisance of the University's Curriculum Framework principles. Examples of this are found within the module such as active and engaging tutorial activity with contemporary industry examples of modular content, module assessment which

reflects industry activities, learning synergies across modules and levels of study and recorded lecture content supporting students to organise their own study time. Due to some of the unique content, this module is of particular importance in relation to PSRB AHEP-4 learning outcomes

Module Delivery Method	**On-Campus**[1] ☒	**Hybrid**[2] ☐	**Online**[3] ☐	**Work -Based Learning**[4] ☐
Campuses for Module Delivery	☐ Ayr ☐ Dumfries	☐ Lanarkshire ☐ London ☒ Paisley	☐ Online / Distance Learning ☐ Other (specify)	

Terms for Module Delivery	Term 1	☒	Term 2	☐	Term 3	☐
Long-thin Delivery over more than one Term	Term 1 – Term 2	☐	Term 2 – Term 3	☐	Term 3 – Term 1	☐

Learning Outcomes	
L1	Understanding various data visualisation methods across different data types.
L2	Demonstrating skills of implement the data visualisation techniques.
L3	Assessing the results of data visualisation and analysis tasks.
L4	Design and develop effective solutions for data display and analysis
L5	N/A

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)	**SCQF 8** On successfully completed of this module, the student will be able to demonstrate knowledge and understanding of: • Key concepts in data science, including tools, approaches and application scenarios

[1] Where contact hours are synchronous/ live and take place fully on campus. Campus-based learning is focused on providing an interactive learning experience supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus contact hours will be clearly articulated to students.

[2] The module includes a combination of synchronous/ live on-campus and online learning events. These will be supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus and online contact hours will be clearly articulated to students.

[3] Where all learning is solely delivered by web-based or internet-based technologies and the participants can engage in all learning activities through these means. All required contact hours will be clearly articulated to students.

[4] Learning activities where the main location for the learning experience is in the workplace. All required contact hours, whether online or on campus, will be clearly articulated to students

	• State-of-the-art tools to build useful visualisations for different types of data sets and application scenarios • Assess and evaluate existing visualisations from both quantitative and qualitative perspectives. • Using the best practices for visualising diverse data types and formats,
Practice: Applied Knowledge and Understanding	**SCQF 8** Understand and apply the fundamental concepts and techniques of data visualisation Using a range of the principal professional techniques and practices by developing a software-based solution to a data science problem
Generic Cognitive skills	**SCQF 8** Identify and analyse routine professional problems associated with real-world data sources
Communication, ICT and Numeracy Skills	**SCQF 8** Computer and numeracy skills and developing the ability to analyse data using Python and R. Present and convey, formally, information on implemented data science solutions
Autonomy, Accountability and Working with Others	**SCQF 8** Develop individual autonomy, group-working, time management, initiative and self- directed learning skills in assessment

Prerequisites	**Module Code** N/A	**Module Title** N/A
	Other	
Co-requisites	**Module Code** N/A	**Module Title** N/A

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. The learning and teaching for this module will be delivered via weekly lectures and tutorials. Lectures will introduce the basic concepts of data analysis and visualisations. Tutorials will be in class to further develop students' practical skill set. The approach is learner-centred with students actively engaged in a range of tasks to promote engagement with and analyses of different kinds of quality management techniques. Students will be given sufficient time and support to work on assignments.	
Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	**Student Learning Hours** (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture / Core Content Delivery	12
Tutorial / Synchronous Support Activity	24

Independent Study	164
n/a	0
n/a	0
n/a	0
TOTAL	200

Indicative Resources

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

1. KIRK, A., (2019) Data Visualisation, A Handbook for Data Driven Design. 2nd ed. Sage Publishing

2. WARE,C., (2019) Information Visualization: Perception for Design. 4th ed. Morgan Kaufmann.

3. Tamara Munzner, Boca Raton (2015) Visualization analysis and design, CRC Press, Taylor & Francis Group, CRC Press is an imprint of the Taylor & Francis Group

4. James, G. et al. (2023) An Introduction to Statistical Learning. Springer

5. PCs and Softwares: Students will need PCs having Python and R softwares during lectures and Tutorials

(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:

The School of Computing, Engineering and Physical Sciences considers attendance and engagement to mean a commitment to attending, and engaging in, timetabled sessions. You will scan your attendance via the scanners each time you are on-campus and you will login to the VLE several times per week. Where you are unable to attend a timetabled learning session due to illness or other circumstance, you should notify the Programme Leader that you cannot attend. Across the School an 80% attendance threshold is set. If you fall below this, you will be referred to the Student Success Team to see how we can best support your studies.

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 University's commitment to equality and diversity, this module supports equality of opportunity for students from all backgrounds and learning needs. Using the VLE, material will be presented electronically in formats that allow flexible access and manipulation of content. This module complies with University regulations and guidance on inclusive learning and teaching practice. Specialist assistive equipment, support provision

and adjustment to assessment practice in accordance with the University's policies 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	**Engineering Physical Sciences**
Overall Assessment Results	☐ **Pass / Fail** ☒ **Graded**
Module Eligible for Compensation	☐ **Yes** ☒ **No** **If this module is eligible for compensation, there may be cases where compensation is not permitted due to programme accreditation requirements. Please check the associated programme specification for details.**
School Assessment Board	Engineering
Moderator	S Qureshi
External Examiner	TBA
Accreditation Details	N/A
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	Original

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Component 1 – Data Visualisation Project (40%) This is a report with visualisation tasks to apply data visualisation techniques using Python or R to analyse and present insights from a real-world dataset. A 2,000-word report with sections covering: • Data acquisition and preparation. • Visualisation design and justification. • Critical evaluation of the visualisation outputs. • Insights and recommendations based on the visualisation.
Assessment 2
Component 2 – Unseen closed book class test (60%) This is unseen colosed-book exam with case study analysis and evaluation questions to assess knowledge of data visualisation principles, evaluation of visualisation effectiveness, and proposing improvements.
Assessment 3
N/A
(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.)

Component 1							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Data Visualisation Project (40%)	☒	☒	☒	☒	☐	40%	

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Unseen closed book class test (60%)	☒	☒	☒	☒	☐	60%	2

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
N/A	☐	☐	☐	☐	☐		
Combined total for all components						100%	2 hours

Change Control

What	**When**	**Who**