MODULE TITLE	**Tackling Sustainability Challenges using Data and Models**	**CREDIT VALUE**	**30**
MODULE CODE	**MTHM604**	**MODULE CONVENER**	**Prof Stuart Townley (Coordinator)**

DURATION: TERM	**1**	**2**	**3**
DURATION: WEEKS	**0**	**11**	**0**

Number of Students Taking Module (anticipated)	**50**

DESCRIPTION - summary of the module content

This module is central to the ethos of applied data science. It puts data science and modelling at the heart of tackling the major global challenges faced by modern society. The United Nations sustainable development goals of, for example, “zero hunger”, “clean water and sanitation” and “affordable clean energy” all involve massive data sets and complex modelling. More immediate concerns such as environmental emergencies and global pandemics are shining an international spotlight on “big data” and the important work of data scientists. This module aims to equip students for the digital workplace. It is all about making an impact on the contemporary big sustainability problems using multiple, inter-woven approaches. This will be realised by working with researchers, businesses, policy makers, app developers, NGOs and industry as “clients”. Collaborating in teams with expertise from multiple disciplines and developing highly desirable team-working skills, students will work on mini-projects that address the questions and issues raised by these clients and stake holders . Using locally curated and global, open sourced data, teams will develop data analytics, models and solutions for their clients. Students will communicate their findings in reports, posters, and through digital media.

AIMS - intentions of the module

In this module you will develop an interdisciplinary perspective on data science and modelling. Your learning will follow a three-stage cycle of (1) colloquia, followed by (2) group work, followed by (3) presentation or poster to a client and general audience. In more detail: (1) Contemporary, client/expert-led colloquia will introduce a “state of the art” challenge from ecology and conservation, environment and human health, renewable energy and sustainability science; (2) Each colloquium will be followed by break out-sessions with you working on mini-projects in small multi-disciplinary groups, with guidance from the module leader and classroom assistants to further your understanding of data science and modelling; (3) Finally, you will present findings from the group work back to peers/clients for discussion and feedback. Each of these three stages will be repeated four times to provide a balance of applications, data sources, and data science and modelling approaches. You will also gain important experience of planning and carrying out research projects and leading multi-disciplinary groups.

The module runs across 11 weeks organised as follows: Week 1 is an ice-breaking week. It will involve a colloquium lecture to set the module’s overall agenda, networking with data science researchers and clients, forming groups and working through on-line resources; Weeks 2&3 and Weeks 4&5 will work on mini-projects 1 and 2; Week 6 is a reading week; Week 7 further work with on-line resources and skills support; Weeks 8&9 and Weeks 10&11 will work on mini-projects 3 and 4. In each mini-project, the first week comprises a colloquium style lecture to introduce the themes and identify any deliverables if relevant, followed by supervised group work and formative assessment. Each second week involves further group and individual work, consolidation and preparation of summative assessment. During the intensive group work sessions, students will take turns in leading the activity of their group. Mid-way through this first week, the group lead will make an informal executive overview of work carried out by their team. At the end of this first week the team will also make a short group presentation of progress (formative/non-assessed). The group lead will provide an executive report at the end of this first week (assessed, 20%). In the second week students will prepare a group presentation on the theme (assessed, 30% for overall module group work). Students will also prepare an individual report based on the work from one or more of the themes (assessed, 50%) to be submitted in Term 3.

INTENDED LEARNING OUTCOMES (ILOs) (see assessment section below for how ILOs will be assessed)

Module Specific Skills and Knowledge:	
1	Use data to build an understanding of a variety of problems and challenges;
2	Work together in multi-disciplinary teams to produce balanced and informed reports on various problems and challenges;
Discipline Specific Skills and Knowledge:	
3	Identify the appropriate data sciences and modelling approach(es) and source suitable data for a given problem or challenge;
4	Use a variety of data science and modelling approaches to address problems and challenges;
Personal and Key Transferable/ Employment Skills and Knowledge:	
5	Communicate data-informed solutions to a wide range of clients and end-users;
6	Plan complex, multi-disciplinary tasks involving accessing complex data sets, storing data, version control of models and codes, and preparation of professional reports;
7	Lead a multi-disciplinary team to harness a wide range of skills and expertise.

SYLLABUS PLAN - summary of the structure and academic content of the module

The syllabus is developed around five colloquia. These colloquia are delivered by clients/experts from the engineering, environmental, human health and life sciences, or business/industry/partner organisations. The exact details of each colloquium will vary from year to year because one key aim is to keep abreast of contemporary issues from a data science and modelling perspective. These colloquia will be representative of the scope of the engineering, environmental, human health and life sciences. Each colloquia will then be followed by multi-disciplinary team work. By working in multi-disciplinary teams, you will understand the importance of data, data science and modelling in coming to informed responses to various challenges.
Sample themes for purposes of illustration:
Using Data and Models in Predictive Healthcare Technology (e.g. Deep Learning Acute Kidney Injury prediction from NHS data, Malaria/Dengue modelling for World Health Organisation treatment recommendations);
Textual Data and AI (e.g. towards a digital consultant psychiatrist – a.k.a *Chat Bot)*;
Integrating Renewable Energies using data across multiple time and spatial scales;
Geographical Information Systems and Ecosystem Services;
Micro-climates and Climate Change Mitigation/Adaptation;
Social Housing – Cluster analysis of behavioural patterns in use of domestic appliances;
Agri-tech. Using Big Data to deliver sustainable food.

LEARNING AND TEACHING

LEARNING ACTIVITIES AND TEACHING METHODS (given in hours of study time)

Scheduled Learning & Teaching Activities	55.00	**Guided Independent Study**	245.00	**Placement / Study Abroad**	0.00

DETAILS OF LEARNING ACTIVITIES AND TEACHING METHODS

Category	Hours of study time	Description
Scheduled Learning and Teaching Activities	10	Expert/client led colloquium/lectures
Scheduled Learning and Teaching Activities	30	Supervised group work
Scheduled Learning and Teaching Activities	5	Student presentations to a mixed audience of peers and experts
Scheduled Learning and Teaching Activities	10	Supervised individual work

Guided Independent Study	245	Reading, computer lab based activity, report writing, preparation for presentations

ASSESSMENT

FORMATIVE ASSESSMENT - for feedback and development purposes; does not count towards module grade

Form of Assessment	Size of the assessment e.g. duration/length	ILOs assessed	Feedback method
Informal group presentation and executive summary	5 x 5 minutes – within the guided project work	1-7	Oral

SUMMATIVE ASSESSMENT (% of credit)

Coursework	100	**Written Exams**	0	**Practical Exams**	0

DETAILS OF SUMMATIVE ASSESSMENT

Form of Assessment	% of credit	Size of the assessment e.g. duration/length	ILOs assessed	Feedback method
Group Presentations/Posters	30	4 x 10 minutes (or equivalent)	1-5	Oral/Written
Executive Report by group lead	20	10 minutes (or equivalent)	6, 7	Oral
Individual Report	50	3000 words (or equivalent)	1-6	Written

DETAILS OF RE-ASSESSMENT (where required by referral or deferral)

Original form of assessment	Form of re-assessment	ILOs re-assessed	Time scale for re-assessment
All	Coursework; Individual Report (5000 words or equivalent) (100%)	All	Ref/Def Period

RE-ASSESSMENT NOTES

Deferral – if you miss an individual assessment for certificated reasons judged acceptable by the Mitigation Committee, you will normally be either deferred in the assessment or an extension may be granted. The mark given for a re-assessment taken as a result of deferral will not be capped and will be treated as it would be if it were your first attempt at the assessment. If you miss a group work assessment for certificated reasons judged acceptable by the Mitigation Committee, you will complete an individual assignment pro-rata (percentage according to the missed component).
Referral – if you have failed the module overall (i.e. a final overall module mark of less than 50%) you will be required to resubmit the original assessment as necessary. The mark given for a re-assessment taken as a result of referral will be capped at 50%.

RESOURCES

INDICATIVE LEARNING RESOURCES - The following list is offered as an indication of the type & level of information that you are expected to consult. Further guidance will be provided by the Module Convener

Basic reading:
There is no set reading list. The colloquium lead will distribute relevant materials at the beginning of each theme.
Web-based and electronic resources:
ELE – *College to provide hyperlink to appropriate pages*
Other resources:
N.A.
Reading list for this module:
There are currently no reading list entries found for this module.

CREDIT VALUE	30	**ECTS VALUE**	15
PRE-REQUISITE MODULES	None		
CO-REQUISITE MODULES	None		
NQF LEVEL (FHEQ)	7	**AVAILABLE AS DISTANCE LEARNING**	No
ORIGIN DATE	Monday 14 December 2020	**LAST REVISION DATE**	Thursday 26 January 2023
KEY WORDS SEARCH	Interdisciplinarity; Data science; Computational Modelling; Ecology; Renewable Energy; Environmental Science; Expert-led learning; Grand Challenges		