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|---|--------------------------------------|------------------------|--|
| MODULE TITLE | Mathematics of Sustainability | CREDIT VALUE | 15 |
| MODULE CODE | ECMM911 | MODULE CONVENER | Dr Markus Mueller (Coordinator) |
| DURATION: TERM | 1 | 2 | 3 |
| DURATION: WEEKS | 11 | 0 | 0 |
| Number of Students Taking Module (anticipated) | 5 | | |

DESCRIPTION - summary of the module content

Environmental processes are continuously affected by human society which in return affects environmental processes. It is therefore important to develop approaches that lead to a sustainable interaction of humans and nature. In this module you will learn about quantitative approaches in environmental and sustainability science and how they can be used to enable processes that impact less on the environment. Your study will focus on three themes: life cycle analysis, sustainable resource management and limits to growth.

AIMS - intentions of the module

The aim of this module is to develop your understanding of the mathematical theory and its application to scientific problems concerning the environment and sustainable development. You will explore a variety of modelling approaches and methodologies around three themes covering environmental impact assessment of products and services, management of renewable resources, and limits to growth modelling.

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

On successful completion of this module *you should be able to*:

Module Specific Skills and Knowledge

1. Understand methods employed in the analysis of impact on the environment;
2. Develop models for sustainable management;
3. Use theory to draw conclusions about dynamically changing environments;
4. Use theory to draw conclusions about human-nature interactions;

Discipline Specific Skills and Knowledge

5. Comprehend mathematical methods to analyse physical and environmental processes;
6. Demonstrate knowledge of the fundamental concepts in analysing systems of human-nature interaction;

Personal and Key Transferable / Employment Skills and Knowledge

7. Formulate and solve problems;
8. Communicate reasoning and solutions effectively verbally and in writing;
9. Demonstrate appropriate use of learning resources;
10. Demonstrate self-management and time-management skills.

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

The aim is to make sure the course content remains current and applicable to modern day environmental and sustainability science. The specific approaches and topics may vary over time. Each approach will be covered in three-week blocks in which a methodology and underpinning theory is first introduced and then analysed and applied through mini-project based work. Topics to be covered include:

- life cycle analysis;
- sustainable resource management;
- limits to growth.

LEARNING AND TEACHING

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

| | | | | | |
|---|--------------|---------------------------------|---------------|---------------------------------|-------------|
| Scheduled Learning & Teaching Activities | 38.00 | Guided Independent Study | 112.00 | Placement / Study Abroad | 0.00 |
|---|--------------|---------------------------------|---------------|---------------------------------|-------------|

DETAILS OF LEARNING ACTIVITIES AND TEACHING METHODS

| Category | Hours of study time | Description |
|--|---------------------|--|
| Scheduled Learning & Teaching activities | 11 | Formal lectures |
| Scheduled Learning & Teaching activities | 3 | Student-led presentations |
| Scheduled Learning & Teaching activities | 24 | Computer-based modeling workshops |
| Guided Independent Study | 112 | Lecture & assessment preparation, computing, wider reading |

ASSESSMENT

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

| Form of Assessment | Size of Assessment (e.g. duration/length) | ILOs Assessed | Feedback Method |
|---------------------------|---|---------------|------------------|
| Workshops, 1 per approach | 3 workshops | 1-10 | Written and oral |

SUMMATIVE ASSESSMENT (% of credit)

| | | | | | |
|-------------------|----------|----------------------|------------|------------------------|----------|
| Coursework | 0 | Written Exams | 100 | Practical Exams | 0 |
|-------------------|----------|----------------------|------------|------------------------|----------|

DETAILS OF SUMMATIVE ASSESSMENT

| Form of Assessment | % of Credit | Size of Assessment (e.g. duration/length) | ILOs Assessed | Feedback Method |
|--------------------|-------------|---|---------------|------------------|
| Coursework | 3x30 | Written report, worksheet or interactive presentation (web page, video, app, pod cast or “mark-up” document, etc.) for each topic | 1-10 | Written and oral |
| Presentation | 10 | Oral presentation about one topic | 1-10 | Written and oral |

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 |
|-----------------------------|---|------------------|------------------------------|
| Coursework | Synthesis report (3000 words or equivalent) | 1-10 | Submit by end of August |

RE-ASSESSMENT NOTES

If a module is normally assessed entirely by coursework, all referred/deferred assessments will normally be by assignment.

If a module is normally assessed by examination or examination plus coursework, referred and deferred assessment will normally be by examination. For referrals, only the examination will count, a mark of 40% being awarded if the examination is passed. For deferrals, candidates will be awarded the higher of the deferred examination mark or the deferred examination mark combined with the original coursework mark.

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

ELE: <http://vle.exeter.ac.uk>

Reading list for this module:

| Type | Author | Title | Edition | Publisher | Year | ISBN | Search |
|------|---|--|---------|-------------|------|----------------|---------------------------|
| Set | Roe J., deForest R. and Jamshidi S. | Mathematics for Sustainability | | Springer | 2018 | 978-3319766607 | [Library] |
| Set | Meadows D.H., Randers J. and Meadows D.L. | The Limits to Growth: The 30-year Update | | Routledge | 2004 | 978-1844071449 | [Library] |
| Set | Deffeyes, K.S. | Beyond Oil: The View from Hubbert's Peak | | Hill & Wang | 2006 | 978-0809029570 | [Library] |

CREDIT VALUE 15

ECTS VALUE 7.5

PRE-REQUISITE MODULES None

CO-REQUISITE MODULES None

NQF LEVEL (FHEQ) 7

AVAILABLE AS DISTANCE LEARNING No

ORIGIN DATE Friday 12 July 2019

LAST REVISION DATE Wednesday 18 January 2023

KEY WORDS SEARCH Environmental science, sustainability science, life cycle analysis, management strategies.