ACME Module Descriptor

Module Code : ENV100
Module Title : Principles of Biology and Ecology

Level | SCQF | 07 | 20
School | School of Science, Engineering And Technology | 51
Division | Division of Science | Year | 2016/7
Tutor | Kimberley Bennett
External Examiner(s)
Prerequisites
Corequisites
Replaced

Brief Description
The module provides a greater level of detail on key concepts in biology and ecology for students with varied academic backgrounds and interests (e.g. biologists, engineers, etc.). It explores biological phenomena that underpin responses to environmental change.

Aims
The aim of this Module is to provide the student with a firm underpinning to key biological, physiological and ecological concepts and themes, which are essential for a broad understanding of modern environmental science.

Learning Outcomes
By the end of this module the student should be able to:
1. Explain the fundaments of how cells and organisms are put together, how they work and how they sense and react to the environment
2. Describe the meaning of the term physiology, explain core biochemical and physiological concepts and apply those concepts to understand how organisms meet environmental challenges
3. Describe ecological concepts regarding organism interactions and how these can be modified by natural and human driven environmental change. It can be difficult to predict outcomes in complex systems
4. Differentiate between adaptation/phenotypic plasticity, recognise importance of selection/drift in evolution and how processes produce population responses to the environment
5. Appreciate physiology is integrative, physiological capabilities influence individual/species tolerances and underly species ranges they can occupy in different environments
6. Describe and evaluate methods for monitoring abundance, diet and habitat preference and recognise that these approaches underly population management and conservation efforts

Indicative Content
1. Cell Biology
   Cell biology, including structure, division, communication, and sensing and reacting to the environment
2. Physiological concepts
   Physiological concepts including homeostasis and homeostatic mechanisms, phenotypic plasticity and physiological ecology
3. Evolutionary principles
   Evolutionary principles, including genetics and epigenetics, inheritance, selection and drift
4. Ecological principles
   Ecological principles including succession; competition; abundance and distribution
5. Field trip
   Field trip to examine environmental impacts on animal distribution, abundance and physiology

Statement on Teaching, Learning and Assessment
This module will be delivered through a series of lectures, tutorials and a whole-day field trip in which the interactions between organisms and their environment will be investigated. The tutorials will be used to support the field trip and development of the portfolio. Assessment will be through submission of an online test and a portfolio, built up of a report on the field trip and an experimental design intended to explore further the observations and outcomes of the field trip plus key reading material discussed in tutorials.

Teaching and Learning Work Loads:
Total : 200
Lecture :
Tutorial/Seminar :
Supervised Practical Activity :
Unsupervised Practical Activity :
Assessment :
Independent :

Assessment

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ACME Module Descriptor

Module Code : ENV101
Module Title : Introduction to Environmental Science

Level 07 SCQF 20
School School of Science, Engineering And Technology S1
Division Division of Science Year 2016/7
Tutor ANDREW SPIERS
External Examiner(s)
Prerequisites
Corequisites
Replaced

Brief Description
The module provides an introduction to environmental science for students with varied academic backgrounds and interests (e.g. biologists, engineers, etc.), in which the underlying biology, ecology, chemistry, and human factors driving environmental change are introduced.

Aims
The aim of this Module is to provide the student with an introduction to the key concepts and themes in biology, ecology, chemistry, and anthropomorphic factors, which are essential for a broad understanding of modern environmental science.

Learning Outcomes
By the end of this module the student should be able to:
1. Describe biological diversity in the context of ecosystems (including local geology), niches and ecological roles, and how key species can be identified and monitored.
2. Explain how species interact in ecosystems using webs and trophic interactions, and how disturbances can affect the entire system.
3. Describe nutrient cycles and how key chemicals can be assayed. Explain the prevalence and cycling of pollutants.
4. Explain how human activities affect ecosystems, webs and biocheochemical cycles, and how this has a long-term impact on environments.
5. Appreciate how biology, ecology, chemistry and anthropomorphic factors are linked and integrated in environmental science.

Indicative Content
1. Biological diversity
   Biological diversity, understanding how species are identified, niches and ecological roles.
2. The importance of ecosystems
   The importance of ecosystems, webs and trophic interactions in an ecological context.
3. Understanding ecosystems
   Understanding ecosystems in the context of local geology, topography and hydrology.
4. Role of nutrient cycles
   The role of nutrient cycles and impact of pollutants in the environment; analytical technics for quantifying key chemicals.
5. Biogeochemical processes
   Biogeochemical processes, nutrient cycles; interconnectedness of spheres (atmosphere, biosphere, ocean sphere, cryosphere, geosphere).

Statement on Teaching, Learning and Assessment
This module will be delivered through a series of lectures, tutorials and a whole-day field trip in which the interactions between landscapes, biology and human activity will be investigated. The tutorials will be used to support the field trip and extended reading for individual students. Assessment will be through a single examination at the end of the module.

Teaching and Learning Work Loads:

Total : 200
Lecture : 24
Tutorial/Seminar : 4
Supervised Practical Activity : 8
Unsupervised Practical Activity : 0
Assessment : 24
Independent : 140

Assessment

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<th>Issue</th>
<th>Submission</th>
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Additional Assessment Information
A field trip to examine one ecosystem subject to anthropomorphic factors will be used to discuss how local geology and topography effect natural vegetation and biodiversity, and how human activities such as farming, water control and roads impact on ecosystems. The field trip will be integrated into the overall module delivery and be assessed as part of the final examination. Additional Tutors: Wilfred Otten Kimberly Bennett

Supportive Reading
Reece, J.B. Et Al. 2013 Campbell Biology, 10Th Ed. Benjamin/Cummings
Begon M Et Al. 2006 Ecology: From Individuals To Ecosystems, 4Th Ed. Wiley/Blackwell

Teachability Issues for this module are:
Oral,Visual,Aural,Diagrammatic,Reading,Writing,Collaboration,Physical

Key Transferable Skills for this module are:
Communication,Problem Solving,Research,Planning

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ACME Module Descriptor

Module Code : ENV102
Module Title : Environmental data handling and presentation

Brief Description
This module uses a case study approach to introduce students to the technology and methodology for acquiring, processing and presenting environmental data.

Aims
The aim of this Module is to provide the student with the analytical and computational skills for handling and presenting environmental data.

Learning Outcomes
By the end of this module the student should be able to:
1. Acquire understanding of the main techniques and technologies for data collection and evaluate the challenges associated with this process.
2. Demonstrate competency in the use of methods for summarizing and presenting environmental data and apply these methods using a range of appropriate software packages.
3. Demonstrate competency in the use of methods for handling and visualizing data from imaging and sensing technologies.

Indicative Content
1. Introduction
Living in a data-rich world. The nature and challenges of environmental data.
2. Methods for data collection
Sources of data in environmental sciences, techniques and technologies, observation vs experimentation, sampling methods, crowdsourcing environmental data.
3. Data exploration and presentation
Type of data/type of variables - qualitative vs quantitative, describing methods, summary statistics and graphical representation, finding patterns in data and formulation of research hypothesis.
4. Handling spatio-temporal data
Methods for processing, analysing and visualizing imaged data and data from sensing technology, introduction to spatial interpolation methods and time series analysis.

5. Case studies
Application of analytical and visualization methods to a range of environmental applications including monitoring and assessing contamination and pollution, monitoring environmental impact at different scales, remote sensing Earth surface for a range of application including ecosystem services, soil mapping, climate implications, land use change, and species diversity.

6. Data handling and presentation software
SPSS and R statistical software; ArcGIS, Miner3D and ImageJ software.

Statement on Teaching, Learning and Assessment
This is a single trimester module, which will use problem-based learning to introduce students to the methodology and technology used for collection, handling and presentation of environmental data. A teaching approach based on case studies relevant to environmental sciences will be adopted to introduce the exploratory and visualization methods methods via a combination of interactive lectures and laboratory classes to provide practical implementation of the methods using appropriate statistical software. Learning will be assessed by two pieces of assessment: a first coursework assessing student learning on techniques and technologies for data collection, statistical exploration and presentation (counting for 50% of the overall module) and a second coursework (counting for 50% of the overall module) to assess student learning on methods for acquiring, handling and visualizing imaged data and data from sensory technologies.

Teaching and Learning Work Loads :

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Additional Assessment Information
The first coursework will be issued at the beginning of the semester and students will be requested to submit a first draft in week 6 which will be formatively assessed during the feedback week, week 7. Students will be asked to incorporate the feedback received in their coursework and submit a final version in week 8. Additional Tutors: Ruth Falconer Wilfred Otten

Supportive Reading
Hinton, P.R., Mcmurray I., Brownlow, C. 2014 Spss Explained, 2Nd Edn. Routledge
Piegorsch, W. W., Bailer, A.J 2005 Analysing Environmental Data Wiley

Teachability Issues for this module are:
Oral, Visual, Aural, Computer-Based, Reading, Writing, Collaboration

Key Transferable Skills for this module are:
Communication, Team Work, Problem Solving, Research, ICT Skills, Planning

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ACME Module Descriptor

Module Code : ENV203
Module Title : Environmental Statistics

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**Brief Description**
This module introduces students to the statistical methodology and its applications for solving real-world environmental problems.

**Aims**
The aim of this Module is to provide students with the statistical and computational skills for the collection, analysis and interpretation of environmental data.

**Learning Outcomes**
By the end of this module the student should be able to:
1. Acquire knowledge of the main methods for data collection and evaluate the challenges associated with this process.
2. Acquire understanding of the main statistical methods and apply these methods to the analysis of environmental data using a range of appropriate software packages.
3. Develop appropriate strategies and skills for the analysis and evaluation of real data problems including skills for interpretation of results and communication.

**Indicative Content**
1. **Introduction to statistics**
   What defines statistics and its necessity in the contemporary data-rich world. The nature and challenges of environmental data.
2. **Methods for data collection**
   Different sources of data, types of variables - qualitative vs quantitative, observation vs experimentation – experimental and survey design, sampling methods.
3. **Introduction to probability**
   Events and random variables, probability distributions: Binomial, Poisson and Normal distribution- the Central Limit Theorem.
4. **Exploratory data analysis and the development of hypothesis**
   Descriptive statistics, summarizing and visualizing datasets, finding trends in data and the formulation of research hypothesis.
5. **The hypothesis testing procedure**
   Null and alternative hypothesis, the statistical test and interpretation based on p-values; the Chi-Square test, t-test, One-way ANOVA and regression, test power calculation and sample size estimation.
6. **Header 6**
   Multiple regression analysis, factorial ANOVA and the General Linear Model; Generalized Linear Models: logistic regression and the Poisson model; mixed models for fixed and random effects.
7. **Introduction to multivariate methods**
   Cluster analysis, Principal component and Redundancy analysis.
8. **Case studies**
   Application of statistical methods for solving a range of environmental problems.
9. **Specialist Resources**
   Computer lab, SPSS, R statistical software.

**Statement on Teaching, Learning and Assessment**
This is a single trimester module, which will use problem-based learning to introduce students to the statistical methodology for collection, analysis and interpretation of environmental data. A teaching approach based on case studies relevant to environmental sciences will be adopted to introduce the statistical methods via a combination of interactive lectures and laboratory classes to provide practical implementation of the methods using appropriate statistical software. Learning will be assessed by two pieces of assessment: an individual project assessing student learning on methods for data collection, analysis and interpretation (counting for 60% of the overall module) and a final exam (counting for 40% of the overall module) to assess the overall student understanding of the statistical methods.

**Teaching and Learning Work Loads**:
- **Total**: 200
- **Lecture**: 14
- **Tutorial/Seminar**: 0
- **Supervised Practical Activity**: 27
- **Unsupervised Practical Activity**: 0
- **Assessment**: 40
- **Independent**: 119

**Assessment**

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**Additional Assessment Information**
The coursework will be issued at the beginning of the semester and students will be requested to submit a first draft in week 8 which will be formatively assessed during the feedback week, week 7. Students will be asked to incorporate the feedback received in their coursework and submit a final version in week 9.

**Supportive Reading**
- Hinton, P.R. 2014 Statistics Explained, 3Rd Edn Routledge
- Piegorsch, W. W., Bailier, A.J 2005 Analysing Environmental Data Wiley

**Teachability Issues** for this module are:
- Oral, Visual, Aural, Computer-Based, Reading, Writing, Collaboration

**Key Transferable Skills** for this module are:
- Communication, Team Work, Problem Solving, Research, ICT Skills, Planning

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ACME Module Descriptor

Module Code : ENV204
Module Title : Earth's critical zone

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Brief Description
The interface, extending from the outer vegetation bounds down to the active ground water was recently named the critical zone as it supports life, provides food, regulates climates, provides drinking water, yet is increasingly impacted upon by human activities. Understanding the complex interactions in this zone requires an integrated approach ranging from disciplines studying tectonic processes, weathering, fluid transport and biological processes.

Aims
The aim of this Module is to provide the student with an understanding of the earth's critical zone, the processes contributing to its formation, functioning and decline, and its relevance in a changing world.

Learning Outcomes
By the end of this module the student should be able to:
1. Able to describe and explain what the critical zone is.
2. Describe and explain the physical, chemical and biological processes in the critical zone.
3. Understand the flow of water through the canopy, the soil and groundwater.
4. Describe and explain drivers, pressures, response and impact associated with the state of critical zones.
5. Demonstrate critical awareness of literature on critical zone science and ability to synthesize this into current gaps in our knowledge.

Indicative Content
1. Introduction
   Introduction to the critical zone concept, formation and decline
2. Relevance
   Relevance of critical zone to mankind
3. Land surface and critical zone processes
   Processes on the land surface impacting on the critical zone
4. Vadose processes
   Processes in the vadose zone
5. Groundwater zone processes
   Processes in the groundwater zone and how they interact with the layers above
6. Header 6
   Human impact on the critical zone and consequences

Statement on Teaching, Learning and Assessment
This module uses a combination of lectures and literature review guided by tutorials and will be assessed through a coursework where students demonstrate the learning outcomes through a written assessment using knowledge gathered from the lectures and literature.

Teaching and Learning Work Loads:

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Assessment

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Additional Assessment Information
Assessment will be in the form of a literature review demonstrating awareness of current understanding of processes in the critical zone, based upon material covered in lectures and published papers on the topic. A detailed brief of areas expected to be covered in the review will be provided in week 3.

Supportive Reading:

Teachability Issues for this module are:
Oral, Visual, Aural, Reading, Writing

Key Transferable Skills for this module are:
Problem Solving, Research, ICT Skills, Planning

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ACME Module Descriptor

Module Code: ENV205
Module Title: Environment and Human Interactions

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Brief Description
This module expands the content of the introduction course "Introduction to Environmental Science", but has a greater emphasis on the effect of human on the environment as well as how the environment impact on human health.

Aims
The aim of this Module is to provide the student with an understanding of the interactive relationship between humans and the environment and be able to recognise the main impacts of humans on the environment and the routes by which human health is affected by the environment.

Learning Outcomes
By the end of this module the student should be able to:
1. Students understand the most important sources of natural and anthropogenic GHGs, their timescale and what does not get covered by international treaties
2. Explain how the IPCC scientific reports are constructed (learning about the principles of peer reviewed science, the role of organisations and stakeholders in managing the human impact on ecosystems).
3. Understand the concept of environmental health and how this can be quantified
4. Explain how principles of toxicology pertain to environmental health science
5. Identify a range of chemical and physical hazards in common environments and describe the pathways by which humans are exposed.
6. Develop and understanding of micro-organisms in the environment, the cycles of disease transmission and role of demography and epidemiology in ill health

Indicative Content
1. Human impact on the environment
   Pollution, greenhouse gas emissions; growing energy demands
2. Processes underpinning climate change
   Identify natural and human processes underpinning climate change and understand how to differentiate these two sources of change.
3. Introduction to environmental health
   Quantitative methods, monitoring, control measures, regulations.
4. Chemical and physical hazards in common environments
   Identify a range of chemical and physical hazards in common environments and describe the pathways by which humans are exposed and understanding of the physiological responses.
5. Micro-organisms in the environment
   Develop an understanding of micro-organisms in the environment, the cycles of disease transmission and role of demography and epidemiology in ill health.

Statement on Teaching, Learning and Assessment
There will be lectures and tutorials. Tutorials are suited for more 'higher order thinking' and for students to make connections between the content. Lectures will therefore cover the scientific principles, while in the tutorials the students will discuss about this content through assigned activities. The discussions in the tutorials will thus help students achieve the intended learning outcomes.

Teaching and Learning Work Loads:

| Total | 200 |
| Lecture | 24 |
Assessment

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Additional Assessment Information
All material will be tested in an exam; in addition students will prepare an individual presentation demonstrating in depth understanding of a specific factor associated with human-environment interactions; students will be offered a topic from a list and guided through tutorials. Additional Tutors: Kimberley Bennett Andrew Spiers

Supportive Reading
Andrew S. Goudie *The Human Impact On The Natural Environment: Past, Present, And Future*

Teachability Issues for this module are:
Oral, Visual, Aural, Reading, Writing

Key Transferable Skills for this module are:
Communication, Problem Solving, Research, ICT Skills, Planning

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ACME Module Descriptor

Module Code : ENV306
Module Title : Environmental Monitoring

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Brief Description
Environmental monitoring often occurs by combining a range of methods that are obtained at a range of spatial and temporal scales. This module will provide a broad overview over environmental monitoring techniques including water, soil and air quality and introduce the students to methods of data plotting, analysis interpretation and how data are used for intervention.

Aims
The aim of this Module is to teach the student an understanding in observatory and analytical techniques for monitoring and managing the environment.

Learning Outcomes
By the end of this module the student should be able to:
1. Awareness of different spatial scales of environmental monitoring techniques
2. Able to plan and execute an environmental data collection plan
3. Handling complex data sets from multiple sources
4. Critically assess environmental data and understand how they can be used to underpin conclusions

Indicative Content
1. Micro-local-global
Methods and spatial scales in environmental monitoring: micro-local-global
2. Sampling strategies
Sampling strategies in heterogeneous environment
3. Complex data sets
Handling complex data sets from multiple sources; linking different data sets and processes
4. Collecting field data
Multiple methods to address a specific question
5. Geostatistical methods

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https://oasis.abertay.ac.uk/oasis/sits.urd/run/SIW POD
Quantifying spatial correlation, spatial interpolation methods
6. Header 6
Time series analysis and environmental forecasting

Statement on Teaching, Learning and Assessment
The module uses a combination of lectures, to introduce students to a variety of methods and how sampling in a spatially heterogeneous site should be done, and field work where students implement their experimental design for monitoring different techniques, learn how they interlink and underpin their conclusions. Tutorials will guide students through the experimental design. The module requires independent design and planning by the student.

Teaching and Learning Work Loads:

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Assessment

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<tr>
<th>Type</th>
<th>Description</th>
<th>Final Grade Weighting (%)</th>
<th>Assessment Week Number</th>
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<tbody>
<tr>
<td></td>
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<td>Issue</td>
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</tr>
<tr>
<td>Report</td>
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</table>

Additional Assessment Information
The assessment is in the form of a report describing the research question, the methods used to answer the question, the experimental design developed by the student, and the analysis conducted to underpin conclusions. Additional Tutor: Wilfred Otten

Supportive Reading
G. Bruce Wiersma 2004 Environmental Monitoring Hardcover
Mark Baskaran 2011 Handbook Of Environmental Isotope Geochemistry (Advances In Isotope Geochemistry) Hardcover

Teachability Issues for this module are:
Oral, Aural, Diagrammatic, Computer-Based, Reading, Writing, Collaboration

Key Transferable Skills for this module are:
Communication, Team Work, Problem Solving, Research, ICT Skills, Self Evaluation, Planning

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ACME Module Descriptor

Module Code: ENV307
Module Title: Contemporary and Emerging Technologies in Environmental Sciences

Brief Description
Environmental scientists have access to a wide range of techniques, often highly specialised and operating at a range of spatial scales. This model will expose the students to a range of contemporary and emerging technologies as well as equips them with skills to acuire knowledge about new technologies.

Aims
The aim of this Module is to provide the student with an understanding of the broad range of techniques available to environmental scientists to monitor water, air and land quality and processes.

Learning Outcomes
By the end of this module the student should be able to:
1. Knowledge of different analytical and biological techniques to monitor environmental data in situ and the laboratory.
2. Knowledge of large scale facilities available to environmental studies and how to access these.
3. Be able to design the use of and analyse the data from studies using isotopes.

https://oasis.abertay.ac.uk/oasis/sits.urd/run/SIW_POD
Indicative Content

1. Methods of measurements
   Modern methods in air quality and flux measurements
2. Quality monitoring
   Monitoring hydrology and water quality
3. Analytical sampling methods
   Analytical methods for environmental samples
4. Microbiological sampling methods
   Microbiological methods for environmental samples
5. Facilities and environmental studies
   Large scale facilities for environmental studies

Statement on Teaching, Learning and Assessment
The module makes use of a combination of lectures introducing examples of contemporary and emerging technologies, site visits to large scale facilities with student led enquiries to develop in depth understanding of techniques. Through independent study each student will acquire in depth knowledge of a suit of technologies and submit this as a portfolio for assessment.

Teaching and Learning Work Loads :
- Total : 200
- Lecture : 10
- Tutorial/Seminar : 14
- Supervised Practical Activity : 8
- Unsupervised Activity : 0
- Assessment : 26
- Independent : 142

Assessment

<table>
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<tr>
<th>Type</th>
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<th>Final Grade Weighting (%)</th>
<th>Final Grade</th>
<th>Final Grade</th>
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Additional Assessment Information
The assessment is in the form of a submitted portfolio in which the students demonstrate through independent study an understanding of a range of technologies selected from a provided list including examples of their use in environmental studies. Students will be assisted through tutorials and lectures/site visits. Additional Tutor: Wilfred Otten

Supportive Reading
Mark Baskaran 2011 Handbook Of Environmental Isotope Geochemistry (Advances In Isotope Geochemistry) Hardcover

Teachability Issues for this module are:
Oral, Computer-Based, Reading, Writing, Collaboration

Key Transferable Skills for this module are:
Team Work, Problem Solving, Research, ICT Skills, Self Evaluation, Planning

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ACME Module Descriptor

Module Code : ENV308
Module Title : Geostatistics, Modelling and Visualization

<table>
<thead>
<tr>
<th>Level</th>
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<th>Year</th>
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School
School of Science, Engineering And Technology

Division
Division of Science

Year
2016/7

Tutor
Ruth Falconer

External Examiner(s)

Prerequisites

Corequisites

Brief Description
To introduce the students to the role of computer modelling, statistics and visualisation in environmental science, specifically the use of statistical and computer models to represent, understand and explore climatic, biogeochemical and ecological systems.

Aims
The aim of this Module is to provide the student with knowledge and understanding of the range and appropriateness of models used in environmental science which will be practically applied to key problems in the field of environmental science.

Learning Outcomes
By the end of this module the student should be able to:
1. To acquire skills to describe and conceptualize environmental problems
2. To formalize the conceptual model in terms of mathematical expressions and implement using modelling packages
3. To apply the most appropriate visualisation methods to communicate and interpret model output

Indicative Content
1. Models in environmental science
Climate models, Earth system models, Ecological models, Hydrological Models. Model types (process based, empirical, bottom up, top down) and data needs - how to select a modelling approach.
2. Models
Individual and Agent Based Models
3. Modelling approaches
Top down modelling approaches
4. Geostatistics
Geostatistics
5. Timeseries
Timeseries
6. Population dynamics
Population Dynamics
7. Case Studies
Different type of models will be introduced via case studies: Model development: problem description, developing a model, testing model, visualisation of model results
8. Visualization
Visualization

Statement on Teaching, Learning and Assessment
Student will be exposed to theoretical aspects during a lectorial and will subsequently put theory into practice via practical computer based problems.

Teaching and Learning Work Loads:

<table>
<thead>
<tr>
<th>Total</th>
<th>Lecture</th>
<th>Tutorial/Seminar</th>
<th>Supervised Practical Activity</th>
<th>Unsupervised Practical Activity</th>
<th>Assessment</th>
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Assessment

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<td>15</td>
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</tr>
</tbody>
</table>

Additional Assessment Information
Portfolio consists of weekly practical-computer based exercises.

Supportive Reading
Wainwright & Mulligan 2013 *Environmental Modelling: Finding Simplicity In Complexity*
Webster, R & Oliver, M. *Geostatistics For Environmental Scientist, 2Nd Edn.*

Teachability Issues for this module are:
Oral, Visual, Computer-Based, Reading, Writing

Key Transferable Skills for this module are:
Team Work, Problem Solving, Research, ICT Skills, Self Evaluation, Planning

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ACME Module Descriptor

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<th>Module Title</th>
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<td>ENV309</td>
<td>Food Security</td>
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<table>
<thead>
<tr>
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<table>
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<tbody>
<tr>
<td>School of Science, Engineering And Technology</td>
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</tbody>
</table>
Brief Description
This module equips the student with vital knowledge to address global issues of hunger, poverty, environmental degradation and health associated with access to sufficient amounts of good quality food.

Aims
The aim of this Module is to introduce the students to multiple aspects of Food Security and how this impact on the environment.

Learning Outcomes
By the end of this module the student should be able to:
1. Knowledge of all aspects of Food Security
2. Understanding global and local scales of Food Security
3. Ability to settle an argument underpinned by evidence

Indicative Content
1. Food and nutritional demands
   Global limits
2. Quantity, quality, safety
   Quantity, quality, safety
3. Local and global scales
   Securing Food Production at local and global scales
4. Consumer behaviours
   Changing consumer behaviours
5. Resilient food chains
   Resilient food chains
6. Header 6
   Organic versus intensive agriculture
7. Contemporary issues in food security
   Debate on contemporary issues around food security

Statement on Teaching, Learning and Assessment
Two forms of assessment will be used to test how students use available knowledge to put forward arguments around the food security debate. Assessment will be in the form of student led discussion platforms and a written assessment.

Teaching and Learning Work Loads:

- Total: 200
- Lecture: 12
- Tutorial/Seminar: 14
- Supervised Practical Activity: 0
- Unsupervised Practical Activity: 0
- Assessment: 50
- Independent: 124

Assessment

<table>
<thead>
<tr>
<th>Type</th>
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</tr>
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Additional Assessment Information
Two forms of assessment will be used to test how students use available knowledge to put forward arguments around the food security debate. Assessment will be in the form of student led discussion platforms and a written assessment. Additional Tutor: Jonathan Wilkin

Supportive Reading
Lester R. Brown Outgrowing The Earth: The Food Security Challenge In An Age Of Falling Water Tables And Rising Temperature Available Online

Teachability Issues for this module are:
Oral, Visual, Aural, Reading, Writing, Collaboration

Key Transferable Skills for this module are:
Communication, Team Work, Problem Solving, Research, Planning, Interpersonal

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