Novel Strategies in Carbon Management	
Module Ref No:	**F800**
Date of Validation:	**2020**
SCQF Level:	**10**
SCQF Credits:	**15**

1. Rationale

The connection between increasing greenhouse gas emissions such as carbon dioxide and methane, and the subsequent changes to climate systems, is now largely accepted globally. It is apparent that the management of carbon emissions, and introduction of innovative methods to enhance carbon sequestration will become a requirement for a variety of industrial and service sectors. There are increasingly introductions of novel initiatives to determine the optimum management techniques and systems to reduce emissions, sequester carbon, mitigate impacts and adapt to future climates. This module aims to provide honours students with an overview of these innovations in carbon management across disciplines and industries. Case studies will illustrate carbon management strategies in context, and in relation to carbon reduction policy and targets. The module will also review carbon economics and a range of innovative tools to support carbon management (i.e. carbon foot -printing and carbon budget modelling).

2. Learning Outcomes

At the conclusion of this module the student should be able to:

LO1:	Outline the global carbon cycle and appraise associated climate change issues: examine the sources, sinks and the human intervention in these.
LO2:	Appraise the options for changing management practices in selected situations to modify carbon balances, mitigate impacts and adapt to future change.
LO3:	Appraise the relationship between carbon and climate policy and economics with carbon management strategies.
LO4:	Evaluate the projected impact of carbon management strategies on the environment, economy and society using and appraising a carbon management tool.

3. Content

3.1	**Global Carbon Cycle and Environmental Change** Review of carbon sources and sinks with implications of increased carbon emissions on climate systems and associated environmental change.
3.2	**Carbon Management for Climate Change** Integration of innovations in engineering, processes and economics with the science of carbon management and climate adaptation and mitigation, to provide graduates with a holistic understanding of carbon management for climate change.
3.3	**Carbon Management for Sustainable Development** Evaluation of current and proposed carbon management options - at international, national and local level - that have been devised to address the impacts of carbon emissions, either through technological change, policy, market mechanisms or regulation with sympathy to social and behavioral considerations.
3.4	**Conceptual and Analytical Assessment** Execution of carbon foot - printing, modelling and economic analysis to illustrate conflict associated with carbon management strategies such as assessing economic versus carbon sequestration drivers in woodland planning design or modelling carbon emissions associated with different agriculture practices (i.e. conventional versus conservation).

4. Approaches to Learning and Teaching

Notional Study Hours: Typically, students will have to undertake about **150 hrs** of study to successfully achieve the learning outcomes for this module; this will be made up of a combination of both scheduled and independent study as indicated below.	
Scheduled Study: Typically consisting of:	**30 hrs**
Lectures	15 hrs
Seminars	4 hrs
Tutorials	6 hrs
Fieldwork	2 hrs
External visits	3 hrs
Independent Study:	**120 hrs**

5. Graduate Attributes

Opportunity to develop the following aspects of graduate attributes will be included within this module:

Graduate Attribute	Learning Activity and Aspect Developed
1. Academically competent	Through participating in group discussions, tutorials, field and industrial visits students will gain breadth and depth of knowledge, understanding and skills of their chosen subject. Group activities will provide students with recognition of informed argument and debate as means of challenging accepted knowledge and understanding. In participating in group activities and discussions students will gain ability to communicate effectively for different purposes and in different contexts. In undertaking guided and self – study together with assessment research and reporting students will also gain ability to contextualise knowledge and ideas in relation to the need to manage carbon (or carbon equivalents) and methods to achieve carbon efficiency.
2. Critical thinker	Through completion of the modules assessment and tutorials students will gain a capacity for independent and creative thinking; ability to identify and solve problems; and a capacity to collect, synthesise and analyse information in a reasoned manner
3. Desire for learning and personal development	Self-study and an assessment framework will enable students to pursue carbon management related topical areas of interests that will help motivate students to learn and develop skills through engagement with subject matter.
4. Responsible member of society	This module will help raise an understanding of the global nature and impact of inefficient carbon management, together with benefits of mitigating this across industries, through self and directed study.
5. Employability	Through guided study, self - study and assessment students will gain professional/academic knowledge, and understanding of national and international policy, and will gain skills (e.g. using literature, scientific writing, and delivering seminars) that will be valuable in the workplace.

6. Assessment

This module will be assessed using the following methods:

Assessment Method	Contribution to Grade (%)	Nature of Assessment
Written Report / Essay	50%	Case study or systematic report / literature review (data support from literature expected). All LOs, Word count 2,500.
Seminar	50%	30 minute seminar appraising a Carbon Management

		Tool for a sector of your choice. (All LO's)

7. Reading

Required:

Students will be required to read a wide range of current scientific publications (including peer-reviewed journal articles – relevant pdfs available from Moodle).

Journal Articles (examples):

- ARROWAYS D (ed.) (May 2019). Soil Carbon and Climate Change: The 4 per mile initiative. Soil and Tilliage Research (Special Edition). https://www.sciencedirect.com/journal/soil-and-tillage-research/vol/188/suppl/C

Books:

- RICHARDS E (Ed) (2019). Carbon Balance Management: A Critical Environmental Approach. ISBN: 9781641161343.
- REAY D. (2019) Climate – smart Food. . eBook. https://www.palgrave.com/gb/book/9783030182052 ISBN 978-3-030-18206-9

Webpages:

- Creative Carbon Scotland: available at https://www.creativecarbonscotland.com/carbon-management/
- IPCC Reports (2014, Chapter 2): available at https://www.ipcc.ch/reports/
- Scotland's Climate Change Delivery Plan: available at http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/EmissionsReductions/
- UKCIP: available at http://www.ukcip.org.uk/
- Climate Change (Scotland) Act 2009: available at http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/climatechangeact
- The Stern Review 2006: The Economics of Climate Change available at http://www.lse.ac.uk/GranthamInstitute/publication/the-economics-of-climate-change-the-stern-review/

Additional:

- University of Cambridge (2009): Carbon Management: A Practical Guide for Suppliers (University of Cambridge). Available at https://www.cisl.cam.ac.uk/resources/archive-publications/carbon-management-a-practical-guide-for-suppliers
- BERNERS – LEE M (2019). There is No Planet B. ISBN 9781108439589 © Cambridge University Press.
- FAO (2013). Tackling Climate Change through Livestock. http://www.fao.org/3/i3437e/i3437e00.htm

8. Staff

Module Leader:	Dr. Jennifer Carfrae (Edinburgh), John MacDonald (Aberdeen) Dr Yolanda Fernandez (Ayr)
Other contributing staff:	Professor Bob Rees Dr Michael MacLeod Dr Luiza Toma Professor Eileen Wall