HR305-15 Bioenergy & Biorefining

26/27

Department
Life Sciences
Level
Undergraduate Level 3
Module leader
Guy Barker
Credit value
15
Module duration
10 weeks
Assessment
100% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

The concept of “one world living” has stimulated a demand for sustainable feedstocks and resources for a range of industrial applications . Economic and government policies have generated a market for “first generation” biofuels, however, there are growing public concerns that the crops used as feedstock for these fuels are utilising land mass more suited for food production and are therefore not truly sustainable. The development of a truly sustainable “second generation” biofuel is ongoing and there is increasing interest to exploit plants as feedstock’s for other industrial applications via the development of bio-refineries. There is a need to take account of ethics and increasing competition for land use for different purposes in order to develop a sustainable future in which biologically based technologies will play an important role

Module aims

This module aims to introduce students to a fast moving field of research. This research relies on the development of new technologies arising from the integration of multiple disciplines and are part of emerging biotechnology solutions for a changing climate. These new technologies have the potential for rapid industrial take up as well as being of public interest.
The module is taught from the perspective of providing an understanding of these new technologies and the importance of sustainability in feedstock production, process technologies and energy use. In addition, the importance of government polices which aim to ensure security of

fuel supplies and reduce carbon emissions on the creation of sustainable markets will be introduced. The module is based on the discussion of primary research papers and will provide insight into cutting edge research.
This module aims to introduce the drivers behind the current intrest in biofuels and bio based energy sources. It will also illustrate the complex arguments which are being debated in the press and elsewhwere in trying to develop a sustainable future based on biofeedstocks

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

1. Introduction.
2. Initial analysis of impact of differing land use, sustainability of different biofuels in light of carbon emissions and
   agricultural practices.
3. Life-cycle analysis and economics justification.
4. Background.
5. Biofuels or sustainable energy?
6. 1st generation biodiesiel cleanliness.
7. Advanced biodiesel.
8. First generation bio-ethanol from sugar cane, sugar beet and wheat including economics, impact of price and
   sustainability. Cellulosic ethanol.
9. Biomass crops.
10. Sustainability of supplies –the importance of balance.
11. Algae.
12. Cellulosics and alternative technologies for lignin breakdown.
13. Concept of biorefining.
14. Adding value.
15. Biogas and fuel cells.
16. Gussing example.
17. Industrial biotechnology.
18. Alternative technologies for lignin breakdown.
19. Adding Value
20. Revision

Learning outcomes

By the end of the module, students should be able to:

- Demonstrate understanding of the main issues with current processes in agriculture
- Demonstrate understanding of the different types of biofuels and sustainable energy, and current research techniques used to assess and analyse them
- Demonstrate understanding of new biotechnologies associated with climate, economic and governmental changes
- Demonstrate understanding of sustainability in process technologies production

- Demonstrate understanding of sustainability in feedstock production
- Demonstrate understanding of sustainability in energy production and use production

Subject specific skills

a. Demonstrate clear understanding of the scientific topic
b. Contain evidence of extended reading and lateral integration of material not covered in the lectures
c. Demonstrate independent thought and deep understanding
d. Specifically answer the set question using information from multiple lectures and sources
e. Be structured and formatted in a way that demonstrates understanding and logical flow
f. Use multiple sources to construct complex scientific arguments and integrating these to build and develop the student's own scientific conclusions.

Transferable skills

1. Critical appraisal of source material
2. Self directed learning
3. Adult learning

Study

Study time

Type	Required
Lectures	20 sessions of 1 hour (13%)
Private study	128 hours 30 minutes (85%)
Assessment	1 hour 30 minutes (1%)
Total	150 hours

Private study description

128.5 hrs of self-study and directed reading to prepare for the closed-book examination

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group B

	Weighting	Study time	Eligible for self-certification
Assessment component			
Closed-book computer-based end-of-year examination	100%	1 hour 30 minutes	No
In-person locally-timetabled closed-book computer-based end-of-year examination			
Reassessment component is the same			

Feedback on assessment

Pastoral meetings with personal tutor

Past exam papers for HR305

Availability

Courses

This module is Core optional for:

- UIPA-C1L8 Undergraduate Life Sciences and Global Sustainable Development
  - Year 3 of C1L8 Life Sciences and Global Sustainable Development
  - Year 3 of C1LA Life Sciences and Global Sustainable Development: Biological Sciences
  - Year 3 of C1LB Life Sciences and Global Sustainable Development: Ecology

This module is Optional for:

- UBSA-C700 Undergraduate Biochemistry
  - Year 3 of C700 Biochemistry
  - Year 3 of C700 Biochemistry
- ULFA-C1A2 Undergraduate Biochemistry (MBio)
  - Year 3 of C1A2 Biochemistry
  - Year 3 of C700 Biochemistry
- Year 4 of ULFA-C702 Undergraduate Biochemistry (with Placement Year)
- Year 3 of ULFA-C1A6 Undergraduate Biochemistry with Industrial Placement (MBio)
- UBSA-3 Undergraduate Biological Sciences

    - Year 3 of C100 Biological Sciences
    - Year 3 of C100 Biological Sciences
    - Year 3 of C102 Biological Sciences with Cell Biology
    - Year 3 of C103 Biological Sciences with Environmental Resources
    - Year 3 of C104 Biological Sciences with Microbiology
    - Year 3 of C105 Biological Sciences with Molecular Genetics
    - Year 3 of C107 Biological Sciences with Virology
- Year 3 of ULFA-C1A1 Undergraduate Biological Sciences (MBio)
- Year 4 of ULFA-C113 Undergraduate Biological Sciences (with Placement Year)
- Year 3 of ULFA-C1A5 Undergraduate Biological Sciences with Industrial Placement (MBio)