390331 - BUA - Non-Food Biomass

Coordinating unit: 390 - ESAB - Barcelona School of Agricultural Engineering
Teaching unit: 745 - EAB - Department of Agri-Food Engineering and Biotechnology
Academic year: 2018
Degree: BACHELOR'S DEGREE IN BIOSYSTEMS ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan

Teaching staff

Coordinator: GIL GORCHS ALTARRIBA
Others: EDUARD HERNANDEZ YAÑEZ - JOSEP CLARAMUNT BLANES

Degree competences to which the subject contributes

Specific:
1. Technology for fuel production and industrial products with biological origin.

Transversal:
2. ENTREPRENEURSHIP AND INNOVATION - Level 2. Taking initiatives that give rise to opportunities and to new products and solutions, doing so with a vision of process implementation and market understanding, and involving others in projects that have to be carried out.

Teaching methodology

Students have to learn the concepts that are presented together with applied examples and questions. In the practical sessions, the student works individually or in teams of 2-3 people and carries out the proposed activity to improve the ability to observe, solve problems, locate biomass information and data, to present results, reports, and to discuss the vision of the different groups.

Learning objectives of the subject

When passing the subject, the student will have a broad knowledge of biomass non-food uses and products, the techniques used to obtain and transform it, as well as the economic, social and environmental implications that these uses entail. In particular, the student must be able to:

- Describe the different sources of biomass and their potential as a source of energy and renewable bioproducts
- Achieve a basic knowledge about the primary production of biomass, as well as the adequate logistics system (harvest, transport and storage) that allows its use in industrial and energy sectors
- Characterize the transformation processes of biomass in biofuels and the applications of biofuels and bioproduct
- Identify the economic, social and environmental implications linked to non-food and products of biomass
### Study load

<table>
<thead>
<tr>
<th></th>
<th>Total learning time: 150h</th>
<th>Hours large group: 40h</th>
<th>26.67%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
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<tr>
<td></td>
<td>Hours small group: 20h</td>
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<td>13.33%</td>
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<td></td>
<td>Guided activities: 0h</td>
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<tr>
<td></td>
<td>Self study: 90h</td>
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<td>60.00%</td>
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### Content

<table>
<thead>
<tr>
<th>INTRODUCTION, DEFINITION AND BIOMASS</th>
<th>Learning time: 17h</th>
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<tbody>
<tr>
<td>general overview</td>
<td>Theory classes: 4h</td>
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<tr>
<td></td>
<td>Laboratory classes: 2h</td>
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<tr>
<td></td>
<td>Self study : 11h</td>
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</tbody>
</table>

**Description:**
- In this content, the non-food uses of biomass are presented:
  - The historical perspective of the use of biomass for energy and non-food products
  - The biomass weight in primary energy and non-food products
  - The regulatory and normative definition of biomass
  - The availability of land and water for the production of biomass

**Related activities:**
- Activity 1: Theory lessons
- Activity 2: Individual assessment test
- Activity 4: Classroom or computer practices

<table>
<thead>
<tr>
<th>SOURCES OF BIOMASS AND LOGISTICS FOR ITS PROCESSING and use</th>
<th>Learning time: 44h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 12h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 6h</td>
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<td></td>
<td>Self study : 26h</td>
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</table>

**Description:**
- This content is dedicated to the sources of biomass and the logistics for its use: Sources of biomass; primary biomass production; harvest systems, machinery; conditioning and transport (bales, strips, chips, pellets, sawdust); the storage

**Related activities:**
- Activity 1: Theory lessons
- Activity 2: Individual assessment test
- Activity 3: Laboratory practices
- Activity 5: Visits to industries and research centers
### BIOMASS ENERGETIC APPLICATIONS

**Learning time:** 44h  
Theory classes: 12h  
Laboratory classes: 6h  
Self study: 26h

**Description:**  
The technology and processes of conversion of biomass for their energy use are presented:  
The processes of conversion of biomass into biofuel:  
The processes of conversion of biofuels into heat, power and electricity, by combustion, co-combustion, gasification, etc.

**Related activities:**  
Activity 1: Theory lessons  
Activity 2: Individual assessment test  
Activity 3. Laboratory practices  
Activity 4: Classroom or computer practices  
Activity 5: Visits to industries and research centers

### INDUSTRIAL APPLICATIONS AND bioproducts OF BIOMASS

**Learning time:** 29h  
Theory classes: 8h  
Laboratory classes: 4h  
Self study: 17h

**Description:**  
This content is dedicated to the industrial applications of biomass and bioproducts:  
Processes for the use of biomass (conversion of biomass into bioproducts)  
Products and industrial uses  
Concept of Biorefinery and examples

**Related activities:**  
Activity 1: Theory lessons  
Activity 2: Individual assessment test  
Activity 3. Laboratory practices  
Activity 4: Classroom or computer practices  
Activity 5: Visits to industries and research centers
## ECONOMIC, SOCIAL AND ENVIRONMENTAL DIMENSION OF biomass NON-FOOD USES

**Description:**
This content is devoted to presenting and evaluating the economic, social and environmental implications of non-food use of biomass:
- Regulation
- Impact on food and traditional uses of biomass
- Energy balance and in greenhouse gases
- Challenges and perspectives of biomass non-food uses

**Related activities:**
- Activity 1: Theory lessons
- Activity 2: Individual assessment test
- Activity 4: Classroom or computer practices

**Learning time:** 16h
- Theory classes: 4h
- Laboratory classes: 2h
- Self study: 10h

### Planning of activities

<table>
<thead>
<tr>
<th>(ENG) ACTIVITAT 1: CLASSES D'EXPLICACIÓ TEÒRICA</th>
<th>Hours: 98h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 38h</td>
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<td></td>
<td>Self study: 60h</td>
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<table>
<thead>
<tr>
<th>(ENG) ACTIVITAT 2: PROVES INDIVIDUALS D'AVALUACIÓ</th>
<th>Hours: 2h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
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<table>
<thead>
<tr>
<th>(ENG) ACTIVITAT 3: PRÀCTIQUES DE LABORATORI</th>
<th>Hours: 20h</th>
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<tbody>
<tr>
<td></td>
<td>Laboratory classes: 8h</td>
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<tr>
<td></td>
<td>Self study: 12h</td>
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<tr>
<th>(ENG) ACTIVITAT 4: PRÀCTIQUES D'AULA (INFORMÀTICA O AULA)</th>
<th>Hours: 20h</th>
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<tbody>
<tr>
<td></td>
<td>Laboratory classes: 8h</td>
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<tr>
<td></td>
<td>Self study: 12h</td>
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<thead>
<tr>
<th>(ENG) ACTIVITAT 5: VISITES A PLANTES I CENTRES DE TRANSFORMACIÓ I D'INVESTIGACIÓ</th>
<th>Hours: 10h</th>
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<tbody>
<tr>
<td></td>
<td>Laboratory classes: 4h</td>
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<tr>
<td></td>
<td>Self study: 6h</td>
</tr>
</tbody>
</table>

- Learning time: 16h
  - Theory classes: 4h
  - Laboratory classes: 2h
  - Self study: 10h

- Hours: 2h
  - Theory classes: 2h

- Hours: 20h
  - Laboratory classes: 8h
  - Self study: 12h

- Hours: 20h
  - Laboratory classes: 8h
  - Self study: 12h

- Hours: 10h
  - Laboratory classes: 4h
  - Self study: 6h
Qualification system
Bibliography

Basic:


Young, Raymond A.; Rowell, Judith K.; Rowell, Roger M. Paper and composites from agro-based resources. Boca Raton [etc.]: Lewis, 1996. ISBN 1566702356.


Complementary:


Others resources:

Hyperlink

Biomass Energy Europe

EUBIONET III

Future crops for fodd, feed, fiber and fuel
Interactive european network for industrial crops and their applications

RuralCat