Institute of Agricultural Engineering and Safety

SUBJECT DESCRIPTION

THEORY OF BIOMASS PRODUCTION TECHNOLOGY

Subject code: IFIS M023

Title of the study subject in Lithuanian: Biomasės gamybos technologinių procesų teorija

Title of the study subject in English: Theory of biomass production technology

Credit value: 6 credits ECTS, 160 hours, 72 contact hours, student independent work 88 hours.

Types of students' work and workload:

<table>
<thead>
<tr>
<th>Types of contact work</th>
<th>Hours</th>
<th>Types of independent work</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>52</td>
<td>Abstract</td>
<td>30</td>
</tr>
<tr>
<td>Laboratory works</td>
<td>8</td>
<td>Preparation for practicums and laboratory works</td>
<td>15</td>
</tr>
<tr>
<td>Practicals</td>
<td>8</td>
<td>Preparation for exam</td>
<td>43</td>
</tr>
<tr>
<td>Consultations</td>
<td>2</td>
<td></td>
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<tr>
<td>Examination</td>
<td>2</td>
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</tbody>
</table>

Subject purpose:

<table>
<thead>
<tr>
<th>Study cycle</th>
<th>Study programme</th>
<th>Type of subject</th>
</tr>
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<tbody>
<tr>
<td>Second</td>
<td>Biomass Engineering</td>
<td>Compulsory</td>
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</table>

Aim of the study subject: To provide theoretical knowledge about the separate biomass production processes and to develop capacity to calculate and evaluate the main parameters of technological processes and modes of biomass production.

Prerequisites for the study subject: Required basics of study compulsory subjects, knowledge of biomass production and maintenance, biomass harvesting machinery construction and operation.

Outcomes of the study subject:

Knowledge and understanding:
- A student knows the biomass production processes theoretical justification,
- A student understand the importance of setting optimal parameters for biomass production processes efficiency.

Abilities and Skills:
- A student is able to determine the optimal operating parameters of biomass production processes,
- A student is able to adapt, assess and validate the separate parameters and modes of biomass production technological processes,
- A student is educated of logical thinking, independence and self-confidence in making engineering and technological solutions.

Moral values:
- To develop responsibility for the healthy surrounding environment,
- To seek the rational use of natural, human, technical and technological factors,
- To develop the commitment of lifelong learning and development of professional competencies.
Assessment criteria for the outcomes of the study subject:
- The subject of study the basic concepts, terminology understanding and consumption.
- The assimilation of the knowledge of study results.
- The application of the knowledge of study results into practice in different situations.
- Performance quality of independent work, formulation of generalizations and conclusions.

Contents of the study subject:
Lectures: 52 contact hrs./ 43 hrs. of student independent work

1. General knowledge of biomass production machinery and technological processes, theoretical approaches, key terms and concepts. 4/5 hrs.
2. The basics of theory of traditional and environmentally friendly tillage machinery interactions with the soil physical-mechanical properties. 6/5 hrs.
3. The theoretical analysis of biomass crops sowing and planting machines working technological processes. 4/5 hrs.
4. The theoretical analysis of biomass crops monitoring machinery and technological processes. 6/5 hrs.
5. The basics of woody energy plants cutting theory. 6/4 hrs.
6. The basics of herbaceous energy plants cutting theory. 6/4 hrs.
7. The basics of theory of cereals, tuberous, beetroot and oilseed plant harvesting machinery and working technological processes. 8/5 hrs.
8. The basics of plant biomass chopping process theory. 6/5 hrs.
9. The basics of theory of aerodynamic dryer-column. 6/5 hrs.

Laboratory works: 8 contact hrs./ 9 hrs. of student independent work

1. Investigation of soil physical-mechanical properties influence to the biomass growing machinery working technological processes. 3/3 hrs.
2. Determination of chopped plant mass quality. 3/3 hrs.
3. Determination of plant biomass frictional properties. 2/3 hrs.

Practicals: 8 contact hrs./ 6 hrs. of student independent work

1. Theoretical calculations of plant biomass harvesting machinery working technological processes. 4/3 hrs.
2. Theoretical calculations of technological processes of plant biomass preparation for the conversion. 4/3 hrs.

Abstract themes and selection procedures: Each student will receive a separate abstract task, which will be indicated in the subject (one of the biomass production technological processes), the main required data for process calculation (eg., machine, working width, working depth, cutting height, productivity, soil or plant properties, the operating parameters and etc.). Abstract topics will be of study subject content, for example:
   a. To analyze, select and calculate the technological process of energy herbal plant seeding.
   b. To analyze, select and calculate the technological process of oilseed environmentally friendly cultivation.
   c. To analyze, select and calculate the technological process of woody plant cutting.
   d. and etc.

Study methods: Instructional material of lectures is presented using multimedia tools. Detailed discussion and theory material is used to convey the audience of the board. Laboratory works and practicals are performed in specialized studies laboratories, where are the theme adequate laboratory equipment (stands). They will be given hands-on tasks that students will perform alone or in groups
using the methodological tools, and in consultation with the leading lecturer. Abstract is carried out in the course of the semester in order to better assimilate the lecture material and to check the work of self knowledge.

**Structure and methods of cumulative assessment of student learning outcomes:** A ten-point criteria-based scale is applied for the assessment.

**Structure of the cumulative assessment**

<table>
<thead>
<tr>
<th>Form of assignment</th>
<th>Weight score</th>
<th>Deadline of the account</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>0.2</td>
<td>3-1 weeks prior to the examination session</td>
</tr>
<tr>
<td>Laboratory works and practicals</td>
<td>0.3</td>
<td>before examination session</td>
</tr>
<tr>
<td>Exam</td>
<td>0.5</td>
<td>during examination session</td>
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</table>

Abstract is done in writing by solving the presented teacher's task. Abstract is defended by the word to the task presented teacher. Laboratory works and practicals are performed in writing and reported (defended) orally. After depending of all students works they are stapled into one wrapper. The teacher brought out of all the works average. The exam can only be defended as a positive settlement of abstract, laboratory works and practicals. Examination shall be in writing of all study course content.

**Interaction between study programme learning outcomes and study methods and methods of student learning outcomes assessment:**

<table>
<thead>
<tr>
<th>Study programme learning outcomes</th>
<th>Subject learning outcomes</th>
<th>Learning methods</th>
<th>Assessment methods of student learning outcomes</th>
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<tbody>
<tr>
<td>Analysis and evaluation of energy consumption in companies of biomass production and processing for the improvement of technological processes and determination of the indicators of product lifecycle.</td>
<td>The students understand the importance of setting optimal parameters for efficiency of biomass production processes</td>
<td>Lectures and discussions, laboratory works and practicals in specialized laboratories, case studies, brainstorming, individual readings, homework</td>
<td>Evaluation of individual tasks and case studies of laboratory works and practicals, homeworks and exams by using the cumulative ten-point scoring system</td>
</tr>
<tr>
<td>Investigation, analysis and evaluation of biomass properties, possibilities of its use, conversion technologies and technological processes in energetic and other branches of economy.</td>
<td>Students will know the theoretical justification of biomass production processes</td>
<td>Lectures and discussions, laboratory works and practicals in specialized laboratories, case studies, brainstorming, individual readings, homework</td>
<td>Evaluation of individual tasks and case studies of laboratory works and practicals, homeworks and exams by using the cumulative ten-point scoring system</td>
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<tr>
<td>Ability to prepare technical tasks of designing bioenergy technologies of biomass production and processing, as well as to design technological systems and algorithms of technological process operation.</td>
<td>Able to adapt, assess and validate the parameters and modes of separate biomass production technological processes</td>
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</table>
To develop students’ logical thinking, independence and self-confidence in making engineering and technological solutions

To develop students’ responsibility for the healthy surroundings

To achieve the sustainable management of combined natural, human, technical and technological factors

Provision of continuous training and improvement of professional competencies

Lectures and discussions, laboratory works and practicals in specialized laboratories, individual readings, homework

Evaluation of individual tasks, homeworks and exams by using the cumulative ten-point scoring system

**Main literature references for subject study:**


**Additional literature references for subject study:**