University of Zagreb Faculty of Agriculture
Svetošimunska cesta 25, 10000 Zagreb
Phone: +385 (0)1 2393 777
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Field crops and bioenergy cropping systems (146066)

Course coordinator

Prof. Željko Jukić, PhD

Course description

1. Developing student opinions and attitudes toward biomass production and its use.
2. Creating and developing student's independent and creative decision-making of choosing certain crop species for the biomass and energy production from the field.
3. Creating pre conditions for training specialists in biomass production from the field to produce food, feed and energy

ECTS: **3.00**

Teaching hours: 30
Lectures: 18
Auditory exercises: 2
Seminar: 6
Field exercises: 4

Grading

Sufficient (2): 60%
Good (3): 70%
Very good (4): 80%
Excellent (5): 90%

Lecturer

- Prof. Dubravko Maćešić, PhD
- Prof. Zlatko Svečnjak, PhD
- Prof. Darko Uher, PhD
- Prof. Krešimir Bošnjak, PhD

Associate teacher for exercises

- Prof. Krešimir Bošnjak, PhD
- Prof. Željko Jukić, PhD
- Prof. Zlatko Svečnjak, PhD
- Prof. Darko Uher, PhD

Associate teacher for seminars

- Prof. Željko Jukić, PhD

Type of course

- Graduate studies / Environment, agriculture and resource management (Elective course, 4 semester, 2 year)

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General competencies

Students receive the necessary theoretical and practical knowledge on the basis of which it will be able to independently plan the cultivation of certain arable crops to be used for the production of biomass and energy. After the completion of lectures and assuming regular of exercises, students will be able to independently develop crop rotation system to produce food and energy.

Types of instruction

- Lectures
  Classical lectures will be conducted to particular study problems that should be solved in small student's groups. Independent student's work and argumentation will be especially encouraged.
- Other
  Exercises During exercises the students will learn how to carry out procedures for some analysis of plant material that can be used to evaluate quality of plant material.
- Field work
  Field work - the students will participate: in planning of field experiments, in observations during vegetation period of some energy crops, and in planning of different activities before and after harvest of some energy crops.
- Seminars
  A student or group of students (3 students), will choose one topic from the course. The students have to prepare power point presentation and also, the students have to present chosen topics, in form of oral presentation.

Learning outcomes

Learning outcome	Evaluation methods
Perceiving the importance of farming and cropping systems for the the renewable energy production.	Participation in discussion, written exam
Critical thinking about the biomass production and biofuels from farming (field crops).	Participation in discussion, seminar essay
Knowing the difference in the cultivation of plants used for food production for humans, feed and energy.	Participation in discussion, written exam
Critical thinking about the different systems of crop production.	Participation in discussion, seminar essay
Knowing the impact of specific crop rotation systems for energy production on the environment.	Participation in discussion, written exam
Critical thinking about crops that could be used for biomass production and which have not grown in Croatia.	Participation in discussion, seminar essay
Higher levels of knowledge about energy crops that will enable students to participate in the development of studies and policy documents.	Participation in discussion, written exam
Ability to analyse and review a strategic documents in the field of production of biomass and biofuels from field	Participation in discussion, written exam

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Working methods

Teachers' obligations

Impart knowledge to students in a simple and understandable way. Participation in the laboratory and field exercises and arrange and conduct seminars. Organize and carry out partial exams/preliminary exams and written exams and assess and evaluate students' knowledge.

Students' obligations

Regular attendance and active participation in class during lectures, exercises and seminars. Independently and in small groups solving theoretical and practical tasks. Preparation of seminars individually or in a small groups, and actively participate in discussions. Preparation of written exam.

Methods of grading

Evaluation elements	Maximum points or Share in evaluation	Grade rating scale	Grade	Direct teaching hours	Total number of average student workload	ECTS
Lecture + excercises	10			24	30	1
Seminar	20			6	15	0.5
Written exam	80	<60% 60-70 % 71-80 % 81-90 % 91-100 %	Insufficient (1) Sufficient (2) Good (3) Very good (4) Excellent (5)		45	1.5
Total				30	90	3

Evaluation elements	Description	Deadline	Recoupment
Lecture + excercises	Used for the correction of note		
Seminar	Grading scale and grade: The structure of the content of the written work (40%); Persuasiveness of presentations (60%)		
Written exam	Students have to answer questions covering topics taught during lectures.	Exam time. Determined at the beginning of the semester	

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Weekly class schedule

1. FIELD CROPS FOR BIOMASS AND ENERGY PRODUCTION L - Definitions of terms related to renewable sources of energy. Corn as crop for biomass and bioenergy production. Different parts of the same crop (plant) for energy production. Differences in management practices of corn for food and energy production.
2. FIELD CROPS FOR BIOMASS AND ENERGY PRODUCTION L - Corn as crop for biomass and bioenergy production. Different parts of the same crop (plant) for energy production. Differences in management practices of corn for food and energy production. Legumes as crop for biomass and bioenergy production. Existing and potential legumes for biomass and energy production in the World and RH (annual, perennial). Different parts of the same crop (plant) for energy production. Differences in management practices of legumes for food and energy production.
3. FIELD CROPS FOR BIOMASS AND ENERGY PRODUCTION L - Legumes as crop for biomass and bioenergy production. Existing and potential legumes for biomass and energy production in the World and RH (annual, perennial). Different parts of the same crop (plant) for energy production. Differences in management practices of legumes for food and energy production.
4. FIELD CROPS FOR BIOMASS AND ENERGY PRODUCTION L - Grasses and legumes as crop for biomass and bioenergy production. Existing and potential grasses and legumes for biomass and energy production in the World and RH (annual, perennial). Different parts of the same crop (plant) for energy production. Differences in management practices of grasses and legumes for food and energy production.
5. FIELD CROPS FOR BIOMASS AND ENERGY PRODUCTION L - Grasses and legumes as crop for biomass and bioenergy production. Existing and potential grasses and legumes for biomass and energy production in the World and RH (annual, perennial). Different parts of the same crop (plant) for energy production. Differences in management practices of grasses and legumes for food and energy production. Grasses and small grain legumes as crop for biomass and bioenergy production. Existing and potential grasses and small grain legumes for biomass and energy production in the World and RH (annual, perennial). Differences in management practices of grasses and small grain legumes for forage and energy production.
6. FIELD CROPS FOR BIOMASS AND ENERGY PRODUCTION L - Grasses and small grain legumes as crop for biomass and bioenergy production. Existing and potential grasses and small grain legumes for biomass and energy production in the World and RH (annual, perennial). Differences in management practices of grasses and small grain legumes for forage and energy production.
7. FIELD CROPS FOR BIOMASS AND ENERGY PRODUCTION E - Quality parameters of field crops for energy production.
8. FIELD CROPS FOR BIOMASS AND ENERGY PRODUCTION FW - Visiting experimental plots with grasses and forages at the Faculty of Agriculture University of Zagreb.
9. SUSTAINABLE CROP ROTATION SYSTEMS FOR BIOMASS AND ENERGY PRODUCTION L - Different types of crop rotations (integrated and specialised). Factors which have impact on selection certain crop rotation [biomass utilization, processing industry, croppping systems that balance the need for increasing productive capacity with maintenance of other critical ecosystem functions, possible competition between food and energy production, impact on the soils, (organic matter, carbon sequestration) and ecosystem].
10. SUSTAINABLE CROP ROTATION SYSTEMS FOR BIOMASS AND ENERGY PRODUCTION L - Food, feed and energy production in existing crop rotations. Position of field crops in cropping systems when crops are used for biomass and energy production (main crop, additional, preceding crop).
11. SUSTAINABLE CROP ROTATION SYSTEMS FOR BIOMASS AND ENERGY PRODUCTION

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FW - Visiting experimental plots with grasses and forages at the Faculty of Agriculture University of Zagreb.

12. MODELING OF BIOMASS AND ENERGY PRODUCTION CROPPING SYSTEMS L - Basic rules which takes place in making good balanced, ecological asseptable and profitable crop rotations.
13. MODELING OF BIOMASS AND ENERGY PRODUCTION CROPPING SYSTEMS S - Different ways of data collecting for modeling biomass and bioenergy production cropping systems and their interpretation (climatic characteristics, soil properties, data from satelite, data from Bureau od Statistics, data from web pages, internet data base searching etc.).
14. MODELING OF BIOMASS AND ENERGY PRODUCTION CROPPING SYSTEMS S - Different ways of data collecting for modeling biomass and bioenergy production cropping systems and their interpretation (climatic characteristics, soil properties, data from satelite, data from Bureau od Statistics, data from web pages, internet data base searching etc.).
15. MODELING OF BIOMASS AND ENERGY PRODUCTION CROPPING SYSTEMS S - Different ways of data collecting for modeling biomass and bioenergy production cropping systems and their interpretation (climatic characteristics, soil properties, data from satelite, data from Bureau od Statistics, data from web pages, internet data base searching etc.).

Obligatory literature

1. Bassam El N. (2009): Bioenergy Crops – A Development Giude and Species Reference. Earthscan, London, Washington DC.
2. Halford, N.G., Karp, A. (2011): Energy Crops. Royal Society of Chemistry, 2011.

Recommended literature

1. Campbell, G.M., Web, C., McKee, S. Cereal – Novel Uses and Processes (1997): Plenum Press, New York and London.
2. Barnes, R.F., Nelson, C.J., Collins, M., Moore, K.J. Forage (2003): Volume 1; 6th edition, Blackwell Publishing DC, 2121 State Avenue Ames, Iowa, 50014.
3. Deublein, D., Steinhauser, A. (2011): Biogas from Waste and Renewable Resources. WILEY-VCH Verlag Gmbh&Co. KgaA, Boschstr. 12, 69469 Weinheim.
4. Bassam El N. (2010): Handbook of Bioenergy Crops. Earthscan, London, Washington DC.

Similar course at related universities

- „Field Crop Systems“ Cornell University
- “Biobased Products and Energy Crops” University of Hohenheim