University of Zagreb Faculty of Agriculture
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Water management in landscape design (281918)

Course coordinator

Asst. Prof. Marina Bubalo Kovačić, PhD

Course description

The aim of the module is to introduce students about the meaning of water in landscape and about possible problems with excess and deficit water in landscape. Following chapters will be included In lectures: Basic of hydrology. Regulation of watercourse and regulation of excess water in landscape. Regulation of deficit water in landscape and calculation of particular parameters (plant water requirements and its distribution). Possible source of water in irrigation and its quality. Methods and systems in irrigation landscape and its application.
In auditory practice students will design projects regarding regulation of water, like: Designed (dimensioned) of channel for surplus surface water regulation. Calculation of water deficit, crop water requirement and to designed sprinkler irrigation system.
Field work students will have possibility to see built watercourse, regulated canals and application of irrigation.

ECTS: **3.00**

E-learning: **L1**

Teaching hours: 30
Lectures: 20
Practicum: 10

Lecturer

- Asst. Prof. Marina Bubalo Kovačić, PhD
- Assoc. Prof. Monika Zovko, PhD

Grading

Sufficient (2): 60-70 %
Good (3): 71-80 %
Very good (4): 81-90 %
Excellent (5): 91-100 %

Type of course

- Graduate studies / MS Courses taught in English (Elective course, 1 semester, 1 year)

General competencies

Become aware of the problem from excess surface water and necessity protection of certain areas from flooding and surrounding water, which implies hydro technical measures and solutions and planning and solutions hydro technical constructions are done in collaborate with other experts. Determination of surplus and deficit of water in soil. Subsurface pipe drainage design on agricultural areas and wavy terrain (depression). Planning and programming of sprinkler and drip irrigation system on agriculture areas and landscapes.

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Types of instruction

- Lectures
  All lectures will be held in classroom using PowerPoint. After each lecture, the students are invited (included) to continue with questions and discussions in a informal atmosphere.
- Auditory Exercises
  Students will have independent work in all exercises, such as: Design of channels of different purpose in landscape, which are based on their own measured parameters; To dimension the channel if the certain parameters are known; Calculation and design of spacing between the pipes if the certain parameters are known; To calculate irrigation norm, irrigation rate, duration of irrigation, time frame between two irrigation and draw sprinkler irrigation system on a plot at scale 1:2500 based on certain parameters.
- Field work
  Students will visit on terrain different hydro technical solutions for protection from harmful water activity - protective embankment along of river, unloading channel, retention and accumulation.

Learning outcomes

Learning outcome	Evaluation methods
To introduce and to give students basic knowledge about water (properties of water, protection of water, protection from water, water management and used water in landscape). To point out to students on problems of excess and deficit water in soil (landscape) and its solution.	Written, oral
To give basic elements and knowledge about calculation in hydrology, drainage and irrigation particular systems in landscape.	Written
To introduce to students the importance of sustainable landscape.	Written, oral

Working methods

Teachers' obligations

Teaching, connected theoretical and experiential knowledge. Setting to students questions during of lectures, stimulating comments, discussions..

Students' obligations

Presence on lectures, independent work at exercises and finished of exercises before the final 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
Written	50 %	0-59% 60-70 % 71-80 % 81-90 % 91-100 %	Insufficient (1) Sufficient (2) Good (3) Very good (4) Excellent (5)	10	30	1
Oral	50 %	0-59%	Insufficient (1)	20	30	2

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Evaluation elements	Maximum points or Share in evaluation	Grade rating scale	Grade	Direct teaching hours	Total number of average student workload	ECTS
		60-70 % 71-80 % 81-90 % 91-100 %	Sufficient (2) Good (3) Very good (4) Excellent (5)			
Total	100 %			30	60	3

Evaluation elements	Description	Deadline	Recoupment
Final exam: written	Written exam is final form of exam and grade make 50% from total grade.	Immediately after reviewed and positive evaluated exercises	If written exam is not positive than it have to be repeated in ones from gave deadlines.
Final exam: oral	Oral exam is final exam and make 50% from total grade.	In the exam deadlines. There are two summer, two autumn and two winter deadlines	In ones from gave deadlines.

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Weekly class schedule

1. Introduction to hydrology. L - In this teaching unit students will get basic knowledge about water (property, quality... of water).
2. Hydraulical elements of watercourse-open channels. L - In this teaching unit students will get knowledge about hydraulic elements, which are important for design of watercourses and channels.
3. Regulation of watercourses and open channels. L - In this teaching unit it will be spoken about regulations of watercourses, types of regulations and comprised in landscape.
4. Basics of dimension design of watercourses and open channels. A - In this teaching unit students will design projects about dimensions of watercourse or channel based on the basic hydraulic elements.
5. Protection of landscape from outside excess water. L - In this teaching unit it will be spoken about protection of landscape from all types of outside excess water (flood, water, catchment basin water...).
6. Excess water in landscape and its drainage. L - In this teaching unit students will get basic knowledge about types of excess water in soil and its drainage using suitable type of drainage.
7. Basic of drainage design of excess water in landscape . A - In this teaching unit students will design project about drainage of excess water with drainpipes.
8. Deficit water in landscape. L - In this teaching unit students will get knowledge about negative effect of deficit water in landscape.
9. Calculation of plant water requirement. L - It will be spoken about plant water requirement and methods of its calculation.
10. Sources of water in irrigation and its quality. L - It will be spoken about all types of water sources in irrigation (rivers, ground water, acumulations...) and its quality.
11. Basic elements in design of irrigation. L - It will be spoken about all necessaries elements to design irrigation system.
12. Methods, systems and equipment in irrigation of landscape. L - In this teaching units students will get knowledge about methods and systems which are used in irrigation of landscape and necessary equipment.
13. Basic of design of water distribution for irrigation of landscape. A - In this teaching unit students will design irrigation project in landscape using a system of irrigation.
14. Field work. F - In field work students will have possibility to see built watercourse, regulated channels, accumulation, retention and application of irrigation system.
15. Examination

Obligatory literature

1. Šimunić, I.: Regulation and protection of water (manuscript), University of Zagreb, Faculty of agriculture, Zagreb, 2011.

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Recommended literature

1. Viessman, W. Jr., Lewis, L.G.: Introduction to Hydrology, Harper-Collins-College-Publishers, New York, 1996.
2. Ayers R.S., Westcot, D.W.: Water quality for agriculture, FAO Irrigation and Drainage paper (No. 29, rev.1, Rome, 1989.
3. Smith, M.: Cropwat a computer program for irrigation planning and management, FAO Irrigation and Drainage Papers, No.46, Rome, 1992.
4. Vermeiren, I., Jobling, G.A.: Localized irrigation, design, installation, operation, evaluation, Irrigation and Drainage Papers, No 36, Rome, 1980.
5. FAO: Crop Water Requirements, Irrigation and Drainage Paper No. 24, revised, Rome, 1977.

Similar course at related universities

- Protection of water- Faculty of Agricultural Science and Food Ss. Cyril and Methodius, University of Scopie (Macedonia).
- Modern drainage and irrigation systems- Faculty of agrculture and food technology, University of Mostar (Bosnia and Herzegowina)
- Agricultural soil amelioration-Faculty of agriculture, University of Osijek.