

**Course name: Hydraulic Structures – design and exploitation**

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|---|---|
| ECTS  | 6.0   |
| Course status                                   | facultative   |
| Course final assessment /evaluation of outcomes | Graded credit   |
| Prerequisite                                    | basics of physics, fluid mechanics, hydrotechnical structures |

**Main field of study: Environmental Engineering**

|                                     |                  |
|-------------------------------------|------------------|
| Educational profile                 | General academic |
| Code of studies and education level | master of thesis |
| Semester of studies                 | winter           |
| Language of instruction             | English          |

**Course offered by:**

|  |  |
|--|--|
| Name of faculty offering the course    | Environmental Engineering and Land Surveying |
| Name of department offering the course | Hydraulic Engineering and Geotechnics        |
| Course coordinator                     | Karol Plesiński, Ph.D.                       |

**Learning outcomes:**

| Symbol of outcome                          | Description of the learning outcome   | Reference to main field of study outcomes | Area symbol* |
|--|---|---|--------------|
| KNOWLEDGE – student knows and understands: |   |   |              |
| HSD_K1                                     | <i>the need of introduce modern structures like hydraulic structures close to nature and regarding fluvial geomorphology (oversized grain structure, cross-ribbed). To acquaint the student with the principle of work of innovative hydraulic structures, they are block ramps.</i>  | IS2_W12                                   | T            |
| SKILLS – student is able to:               |   |   |              |
| HSD_S1                                     | <i>calculate hydrodynamics and hydraulics parameters of these objects. Is able to design the block ramp, which will be assisted methods of computing (HEC-RAS numerical model) and calculation programs (VCMaster). In addition, it will be determined impact of the proposed structures in the bed of a mountain stream (flow regime change, changes in hydrodynamic parameters, changes in the morphology of the bed of the stream and sediment transport).</i> | IS2_U06                                   | T            |
| SOCIAL COMPETENCIES – student is ready to: |   |   |              |
| HSD_C1                                     | <i>critically assess his knowledge, continuous self-education and improve his competences</i>   | IS2_K01                                   | T            |

**Teaching contents**

|          |  |
|----------|--|
| Lectures | 15 hours   |
| Topics   | 1. Hydraulic structures introduction and the classical hydraulic structures.<br>2. The block ramps and other hydraulic structures close to nature. |

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|---|--|
|   | <ol style="list-style-type: none"> <li>3. Numerical modeling and calculation of hydraulic structures.</li> <li>4. Exploitation problems of block ramps.</li> <li>5. Methods of river training close to nature.</li> <li>6. Hydraulic parameters of water flowing in river channels.</li> <li>7. Bed-load transport in river channels.</li> </ol> |
| Accomplished learning outcomes                          | HSD_K1, HSD_C1   |
| Means of verification, rules and criteria of assessment | Single-choice test, positive assessment should be given at least 50% of correct answers to given questions: <50% – insufficient (2.0); 50–60% – sufficient (3.0); 61–70% – satisfactory plus (3,5); 71–80% – good (4.0); 81–90% – good plus (4,5); 91–100% – very good (5.0). The share of the lecture grade in the final grade is 50%.          |
| Classes:  | 30 hours   |
| Topics  | <ol style="list-style-type: none"> <li>1. Design of block ramp.</li> <li>2. Numerical modeling of hydraulic parameters in the block ramp.</li> <li>3. Field trip – the kind of block ramp, examples from Polish Carpathians (optional).</li> </ol>   |
| Accomplished learning outcomes                          | HSD_S1   |
| Means of verification, rules and criteria of assessment | Passing reports on exercises – a grade from exercises is an arithmetic average of formative grades. The share of the grade for the project exercises in the final grade of the subject is 50%.   |

#### References:

|               |   |
|---------------|---|
| Basic         | <ol style="list-style-type: none"> <li>1. Plesiński K., Radecki-Pawlik A. 2017. Block Ramps: Field Example. [w:] Radecki-Pawlik A., Pagliara S., Hradecky J. (eds.). Open Channel Hydraulics, River Hydraulic Structures and Fluvial Geomorphology: For Engineers, Geomorphologists and Physical Geographers. CRC Press, Taylor &amp; Francis Group, Boca Raton, London, New York, 82–97.</li> <li>2. Radecki-Pawlik A., Plesiński K. 2017. Boulder ramps: selected hydraulic, environmental and designing problems. The case of Polish Carpathian streams. Wydawnictwo UR Kraków, pp. 102, monograph.</li> <li>3. Pagliara S., Radecki-Pawlik A., Palermo M., Plesiński K. 2017. Block ramps in curved rivers: morphology analysis and prototype data supportrf design criteria for mild bed slopes. <i>River Research and Applications</i>, 33(3), 427–4371.</li> </ol>   |
| Supplementary | <ol style="list-style-type: none"> <li>1. Radecki-Pawlik A., 2009. Bystrza jako bliskie naturze rozwiązanie utrzymania koryt rzek i potoków górskich. <i>Nauka Przyr. Technol.</i> 3, 3.</li> <li>2. Bartnik W., Książek L., Michalik A., Radecki-Pawlik A., Strużyński A. Modeling of fluvial processes along a reach of the Skawa River using CCHE2D model. <i>Zeszyty Naukowe Akademii Rolniczej we Wrocławiu, seria Konferencje</i>, XXXVII, 481, 155–165.</li> <li>3. Książek L., Radecki-Pawlik A. 2008. Modeling of hydrodynamics conditions within the outlet of a sand-gravel Upland River – The Raba River, Polish Carpathians. <i>Proc. Int. Conf. on Fluvial Hydraulics, River Flow 2008</i>, 2.</li> <li>4. Bartnik W., Banasik K., Książek L., Radecki-Pawlik A., Strużyński A. 2005. Forecasting of fluvial processes on the Skawa River within back-water reach of the Świnna Poręba Water Reservoir. <i>Publs. Inst. Geophys. Pol. Acad. Sc.</i>, E-5 (387), 57–85.</li> </ol> |

**Structure of learning outcomes**

|  |     |         |
|--|-----|---------|
| Area of academic study: R – Agricultural, forestry and veterinary sciences | 0.0 | ECTS ** |
| Area of academic study: T – technical sciences                             | 6.0 | ECTS**  |

**Structure of student activity**

|                              |    |      |     |        |
|------------------------------|----|------|-----|--------|
| Contact hours                | 57 | hrs. | 2.3 | ECTS** |
| Including: lectures          | 15 | hrs. |     |        |
| classes and seminars         | 30 | hrs. |     |        |
| consultations                | 10 | hrs. |     |        |
| participation in research    | 0  | hrs. |     |        |
| obligatory traineeships      | 0  | hrs. |     |        |
| participation in examination | 2  | hrs. |     |        |
| e-learning                   | 0  | hrs. | 0.0 | ECTS** |
| student own work             | 93 | hrs. | 3.7 | ECTS** |

\*Areas of academic study in the fields of: A – the arts; H – humanities; M – medical, sport and health sciences; N – natural sciences; P – biological sciences; R – agricultural, forestry and veterinary sciences; S – social studies; T – engineering and technology

\*\* stated with an accuracy to 0.1 ECTS, where 1 ECTS = 25–30 hours of classes