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| **Course title** | **UNIT OPERATIONS IN ECOLOGICAL ENGINEERING** |
| **Code** | ZDIT51 |
| **Study** | Postgraduate Interdisciplinary University Programme Environment protection and Nature Conservation |
| **Semester** | III. |
| **ECTS** | 5 |
| **Course state** | Elective |
| **Professors** | Mirela Planinić, PhD, associate professor; Ana Bucić-Kojić, PhD, associate professor |
| **Colaborators** | - |
| **Entrance conditions** | No enrolment requirements. |
| **Aim** | Getting acquainted with: the environmental impact of the industry; preventive environmental protection strategies to processes, products and supporting activities (cleaner production, sustainable development); design of environmental friendly processes; waste processing equipment. |
| **Learning outcomes** | - to explain the basic principles of unit operations used in process-ecological engineering<br>- to describe and analyse the advantages/disadvantages of unit operations with regard to their impact on environment<br>- to suggest and explain the application of a suitable (ecological friendly) unit operations for specific case (case study) |

**Connections between students activity, learning outcomes and evaluation**

| Students activity | ECTS | Learning outcomes | Course activity | Evaluation methods | Points* | |
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| | | | | | min | max |
| Lecture attendance | 0.5 | 1-2 | Lectures | Course attendance record | 0 | 5 |
| Literature survey, case study | 1.5 | 3 | Seminar paper | Evaluation of seminar paper | 40 | 70 |
| Preparation for the oral exam | 3 | 1-3 | Final exam (case study) | Oral exam | 20 | 25 |
| **Total** | **5** | | | | **60** | **100** |

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| **Consultations** | Consultations will be held according to the previous agreement with students | | |
| **Teaching form** | **Lectures** | **Seminars** | **Exercises** |
| **No. of hours** | 10 | 5 | - |
| **Content** | Preliminary unit operations (screening and shredding; grit removal; flow equalization; quality equalization; neutralization). Coagulation and flocculation (theory, coagulants, rapid mixing and flocculation). Sedimentation (settling: type I, II, III and IV; sedimentation basins, inclined settling). Filtration (single-medium filters, multimedia filters, deep-bed filtration, trickling filters, biological filtration). Adsorption (contacting techniques, fixed-bed adsorption columns, moving-bed countercurrent adsorption columns). Oxygen transfer in mixers (oxygen transfer, mixing, compressor requirements). Solids handling (thickening, stabilization, dewatering, drying, incineration). Others unit operations (flotation, absorption). | | |

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| **Compulsory literature** | T.D. Reynolds, P.A. Richards: Unit Operations and Processes in Enviromental Engineering. 2nd Ed., PWS Publishing Company, London, 1995.<br>L. Theodore, A.J. Buonicore, J.D. McKenna, I.J. Kugelman, J.S. Jeris, J.J. Santoleri, T.F. McGowan: Waste Management. U Perry's Chemical Engineering Handbook, R.H. Perry, D.W. Green (ur.), 7th Ed., McGraw-Hill, New York,1997.<br>Metealf & Eddy: Wastewater Engineering: Treatment, Disposal, Reuse. McGraw-Hill, New York, 1979. |
| **Optional literature** | Scientific journals and on-line bases |
| **Completion condition** | Attendance and active participation in courses, preparation of seminar paper |
| **Exam form** | Oral exam |
| **Possible teaching languages** | Croatian |
| **Form of quality monitoring** | Procedures and processes for conducting certain activities related to monitoring, security and improving the quality of studies will be conducted in accordance with the applicable Manual for monitoring and quality assurance of higher education in the Josip Juraj Strossmayer University of Osijek.<br>Course teacher can carry out other ways of monitoring the quality depending on the specifics of the case. |