

Technologies with low environmental impact (ENVIRONMENTAL ENGINEERING, IVth Year of study, Vth Semester)

Credit value (ECTS) 5

Course category

Domain discipline (mandatory)

Course holder:

Assist. dr. Isabela Maria SIMION

Discipline objectives (course and practical works)

The general objective of the discipline

Understanding of theoretical and practical notions related to the main methods and technologies with low impact on the environment used in the depollution of environmental factors.

Specific objectives of the discipline

Knowledge and correct use of the basic principles of the main methods of depollution of environmental factors.

Description of depollution facilities for environmental factors as water, air and soil.

Identification and elaboration of schemes for the depollution of environmental factors, based on the acquired knowledge.

Contents (syllabus)

| Course (chapters/subchapters) |
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| 1. INTRODUCTIN: Water pollution – generalities. 1.1. General notions. 1.2. Types of water pollution. 1.3. The main pollutants 1.4. The main sources of pollution. |
| 2. Wastewater treatment methods. 2.1. Main treatment methods: physico-mechanical; physico-chemical; biochemical or biological. 2.2. Wastewater treatment plants. |
| 3. Processes and equipment in physico-chemical treatment. Processes definition and characterization of physico-chemical treatment equipment (grills, sieves, separators, decanters, aeration tanks) |
| 4. Biological treatment (biochemical) of wastewater. 4.1. Parameters that influence the biological process. 4.2. The process of aerobic treatment with active sludge, in continuous regime, with recirculation, schemes for the process with active sludge. |
| 5. Treating sludge process. Active sludge definition and input and output parameters exposing in the aeration basin. |
| 6. Soil remediation technologies. Aspects on pollutant migration in the unsaturated area of soils. |
| 7. Biotechnologies for remediation of ecological systems - bioremediation; soil bioremediation technologies and water. Bioremediation technologies of soils and waters. |
| 8. Accelerated in-situ bioremediation. 8.1. Advantages and limitations of "in situ" bioremediation. 8.2. Advantages and disadvantages of the natural attenuation monitored. |
| 9. Soils phytoremediation-definition and classification of methods of phytoremediation. Definition and classification of phytoremediation methods (Phytoextraction; Phytodegradation; Rizofiltration; Phytofiltration; Phytostabilization; Phytovolatilization). |

10. Technologies and procedures for air remediation. The main industrial processes that should be carried. The main techniques and procedures applied industrially for air pollution, their classification and description.

| Practical works |
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| 1. Methods of physical-mechanical water depollution. Filtration and ultrafiltration. Sedimentation in the gravitational and centrifugal field. Flotation. |
| 2. Chemical methods of water pollution. Neutralization of acid and alkaline waters. Oxidation with chlorine and ozone. Reduction. Precipitation. Coagulation and flocculation. Ion exchange. |
| 3. Methods for determining the efficiency of water purification processes. Documentation on water quality and memory, research conducted at national and international level. |
| 4. Technological schemes of wastewater treatment plants. Working visits to wastewater treatment plants with all the stages of wastewater treatment. |
| 5. Drinking water. Primary drinking water standards. Microorganisms in drinking water. Pollutants in drinking water. By-products of drinking water disinfection. Other problems related to drinking water. |
| 6. Recap and evaluation. |

| Project |
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| Design of a wastewater treatment plant. |
| 1. General aspects regarding wastewater treatment. |
| 2. Technologies adopted for wastewater treatment according to NTPA 001. |
| 3. Calculations regarding the degree of treatment on each adopted technological variant specific to the treatment. |
| 4. Technological design of the selected equipment. |
| 5. Buildings and installations provided within the wastewater treatment plant. |
| 6. The technique of safety, protection and hygiene at work in sewerage networks. |
| 7. Recap and evaluation. |

Bibliography

1. **Dima M., Dinu I., Ciocan D., Ciocan C.T., 2013** - *Bazele proiectării stațiilor de epurare*, Ed. Alma Group Media/Print, Cluj Napoca.
2. **Dinu I., 2011** - *Contribuții la valorificarea nămolurilor organice ca îngrășământ ecologic agricol*, Ed. Politehniun, Universitatea „Gheorghe Asachi” din Iași.
3. **Lăzăroiu Gh., 2006** - *Soluții moderne de depoluare a aerului*, Editura AGIR, Bucuresti.
4. **Morar R., Muntean I., Cuglesan I., Almăsan I., 2004** - *Tehnologii de depoluare a mediului*, Ed. Dacia, Cluj-Napoca.
5. **Porcar D., 2006** - *Procedee și echipamente de epurare a atmosferei*, Note de curs, Cluj-Napoca.
6. **Popa R.G., 2010** - *Tehnici de protecție și depoluare a solurilor*, Universitatea, Constantin Brancusi, Tg-Jiu, Facultatea de Inginerie, Note de curs.
7. **Rădulescu H., 2001** - *Poluare și tehnici de depoluare a mediului*, Ed. Eurobit, Timișoara.
8. **Robescu L.D., Stroe F., Presură A., Robescu D.N., 2011** – *Tehnici de epurare a apelor uzate*, Editura Tehnică, București.
9. **Robescu L.D., 2009** - *Modelarea proceselor biologice de epurare a apelor uzate*, Politehnica Press, București.

Evaluation

| Evaluation form | Evaluation Methods | Percentage of the final grade |
|-----------------|---|-------------------------------|
| Course | Exam | 70% |
| | Attendance courses | |
| Practical works | Laboratory activity | 30% |
| Project | Knowledge of project design Project presentation | 100% |

Contact

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