



FACULTY: ENVIRONMENTAL ENGINEERING

COURSE TITLE: Analytic Hierarchy Process (AHP) methodology in environmental engineering

Number of contact hours: 30

Duration: 1 semester (spring)

ECTS credits: 4

Programme description: The main aim of this course is to introduce the Analytic Hierarchy Process (AHP) methodology and to teach the basic principles of its application in environmental engineering. The Analytic Hierarchy Process (AHP) is one of the most popular multi-criteria analysis methods. In this process, the decision maker carries out simple pairwise comparison judgments which are then used to develop overall priorities for ranking the alternatives. The practice shows that most decision-making situations is considered by decision-makers from the perspective of more than one criterion. The reason for this approach is the complexity of the world around and multidimensionality of human perception. Helpful could be multi-criteria methods, which try to take into account the multitude of requirements defined by the decision maker. The Analytic Hierarchy Process (AHP) is a relatively new method. Its popularity raises the fact that it has free software for potential users (Expert Choice, HIPRE).

Specific problems discussed during lectures, workshops and seminars will cover:

- the principles of building the proper structure of the hierarchy of criteria;
- the possibility of implementing the results of environmental engineering tools or models (e.g. ecolabeling programs, LCA software or Eco-Indicator 99 H/A points) as an input for the AHP analysis;
- the assessment of an analyzed issue from a sustainable development perspective;
- the issue of many evaluating groups with different evaluation criteria;
- the process of weights assignment.

Students will gain practical knowledge in application of HIPRE software to perform AHP analysis of discussed environmental problems. Project exercise will finalize as a joint group project on multi-criteria analysis of chosen environmental issue.

Course type: lectures (15), workshops (15)

Literature:

- **Applications and Theory of Analytic Hierarchy Process - Decision Making for Strategic Decisions;** Edited by Fabio De Felice, Thomas L. Saaty and Antonella Petrillo
- Flaga-Maryańczyk A., Stypka T., **Application of the modified AHP method and eco-labels for biomass boiler selection for a small hotel in a mountain region. A case study**
- Haas A., Meixner O., **AHP Tutorial** [Internet: <http://www.boku.ac.at/mi/ahp/ahptutorial.pdf>]
- Huang I.B., Keisler J., Linkov I., **Multi-criteria decision analysis in environmental sciences: Ten years of applications and trends.**
- Saaty T.L., **Decision making with the analytic hierarchy process**
- Stypka T., Berbeka K., **Drinking water consumption in Cracow – An assessment from a sustainable development perspective.**
- Stypka T., Flaga-Maryańczyk A., Schnotale J., **Application of the AHP method in environmental engineering: three case studies.**
- Stypka T., Flaga-Maryańczyk A., **Comparative analysis of municipal solid waste systems: Cracow case study.**
- Stypka T., Flaga-Maryańczyk A., Schnotale J., **Developing an environmentally sound selection method for heating appliances using ecolabeling, analytic hierarchy process and cost-benefit analysis: A heat pump case study.**
- **Web-HIPRE.** Accessed at: <http://hipre.aalto.fi/>

Assessment method: joint group projects

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