COURSE DESCRIPTION CARD - SYLLABUS

Course name

Municipal Energy Systems

Course

Field of study

Environmental Engineering Second-cycle Studies

Area of study (specialization)

Heating, Air Conditioning and Air Protection

Level of study

Second-cycle studies

Form of study

part-time

Year/Semester

1/2

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

Number of hours

Lecture

20

Laboratory classes

Other (e.g. online)

Tutorials

6

Projects/seminars

10

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

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Faculty of Environmental Engineering and Energy

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Responsible for the course/lecturer:

Prerequisites

1.Knowledge:

Engineering air protection; meteorology and climatology; fluid mechanics; environmental management? at the level required for the degree Environmental Engineering

2.Skills :

The use of differential calculus to describe physical phenomena. Ability to conduct measurements of physical quantities and the analysis of experimental results

3.Social competencies:

Ability to work in a team. Awareness of the need for continuous replenishment of knowledge and skills.

Course objective

Broaden and deepen the knowledge and skills of a systemic approach to the prevention of air pollution and the active development of air quality, especially in urban structure

Course-related learning outcomes

Knowledge

1.Knowledge :

Engineering air protection; meteorology and climatology; fluid mechanics; environmental management? at the level required for the degree Environmental Engineering

2.Skills :The use of differential calculus to describe physical phenomena. Ability to conduct measurements of physical quantities and the analysis of experimental results

3.Social competencies:

Ability to work in a team. Awareness of the need for continuous replenishment of knowledge and skills.

Skills

1. Student is able to develop? Study of air protection? for the plant

2. The student is able to determine the effect of building structures and technical conditions for emission dispersion of pollutants from point sources and low mobile

3. The student is able to determine the impact of natural and anthropogenic factors (including the structure of energy supply, urban structure, emissions) on air quality in the city

4. The student is able to design the optimal technology to reduce nuisance air emissions

Social competences

1. The student understands the complexity of the technical environment? the natural and the need for cooperation of specialists from different fields to solve theoretical and practical problems

2. The student is aware of the responsibility of environmental protection specialist for the quality of life especially in the urban agglomeration

3. Student recognizes the need for systematic and deepen and broaden their knowledge and skills

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:
lecture:

written exam - duration 70 minutes. ; Individual possible discussion after the results of the written work; Evaluation of written work - based on points earned from individual tasks; Bonus activity during lectures; taking into account assessments of the exercises in the final assessment

tutorials:

- Final colloquium - 3 calculation examples

Project:

- preparation and defending the project on energy planning,

- continuous assessment during lectures (rewarding activity of the students)..

Programme content

The spread of pollutants from point emitters, mathematical model of Euler; boundary conditions and simplifying assumptions? formula calculation Pasquile? a? Sutton. Determination of instantaneous concentrations, medium and frequency exceeding the established concentrations of gases according to the formula Pasquile? A? Sutton; the notion of roughness of the terrain, diffusion coefficients, the apparent height of the emission determination influx of dust.

Chemical processes in the plume, precipitation and leaching of contaminants from streaking phenomenon of flow around buildings, shade and trace aerodynamic. Emitters low dispersion of pollutants from low emitters and in the canyon street model boxed; load emission (Emission).

Environmental aspects of internal and external affecting the air quality in the urban area.

Energy analysis and ecological accordance with the procedure LCA, supply structure in the energy of the city.

Energy balance of the city; natural and anthropogenic components of the balance sheet, their characteristics. Urban heat island, source, structure, consequences analysis. City island pollution sources, variability.

Photochemical reactions in the atmosphere; photochemical smog and acid.

Air quality standards expressed immission values ??of permissible concentrations of selected pollutants; upper and lower assessment threshold. Air Quality Index (AQI) Energy and Air Quality Indicator (EAQI).

Monitoring atmospheric; principle of location of measuring stations. Remote measurement of concentrations: the principle of absorption spectroscopy? DOAS and Differential Absorption? DIAL.

Physiological characteristics of the odor, the basic concepts related to the assessment of odor; Source odorów.Metody measurements of odor - odorymetria; electronic nose.

The principles and mechanisms underlying technologies pollution reduction odor.

Topics design exercises:

study of air protection for the agglomeration of several sources of emissions.

Topics of laboratory exercises:

Educational trips:

1.Elektrociepłownia Poznań Karolin EC-II, along with the installation of semi-dry flue gas desulphurisation

2.Automatyczna immission measuring station concentrations of air pollutants

3.Laboratoria Provincial Inspectorate for Environmental Protection

exercise laboratory

Research dispersion of pollutants from point sources and low line - physical model

Teaching methods

Presentations, lecuture, discussion.

Bibliography

Basic

1. Szargut J., Ziębik A.: Termodynamika techniczna. Warszawa, WNT 2001.

2. Marecki J.: Podstawy przemian energetycznych. Warszawa, WNT 2000.

3. Chmielniak T: Technologie energetyczne. Warszawa, WNT 2008.

4. Szargut J., Guzik J.: Programowany zbiór zadań z termodynamiki technicznej. Warszawa, WNT 1980.

5. Rocznik statystyczny Rzeczpospolitej Polskiej 2010. Warszawa, ZWS 2011.

6. Mróz, T.M.: Planowanie modernizacji i rozwoju komunalnych systemów zaopatrzenia w ciepło. Wydawnictwo Politechniki Poznańskiej, seria rozprawy Nr 400, 2006.

Additional

1. Kreith, F., West, R.E.: CRC Handbook of Energy Efficiency. CRC Press Inc. 1997.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	36	1,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	64	2,5

[1] delete or add other activities as appropriate