Course title: **Solids in power and heat engineering** Materiały sypkie w energetyce		
Field of study:		
Type of study: **full-time studies**	The level of education: **first-cycle studies**	Education profile: **general academic**
Type of subject: Wybierz element.	Semester: Wybierz element.	Course language: **English**
Course type: **lecture, tutorial, laboratory**	Number of hours: **15L, 15T, 15Lab**	ECTS Credit points: **6**

SYLLABUS

COURSE CONTENT

Form of classes - lectures	**Hours**
Energy, Heat and Power – needs and common and future production technologies.	2
Solid materials and their properties. Types, resources and applications. Particle size distribution of solids.	3
Production and preparation of solids materials for agriculture, pharmaceutical industry, food industry, cement industry, and environmental applications. UPS and waste.	3
Multiphase flows and fluidization engineering – fundamentals.	2
Geldart group of powders. Regimes of fluidization. Gas distributors. BFB. CFB.	1
Solids crushing, milling and separation. Pellets and briquettes.	1
Problems of solids material types handling, transportation and storage.	1
Control and measurement technologies for solids materials.	1
Advanced and perspective applications. Nanosolids and dopping.	1
Form of classes - tutorial	**Hours**
Engineering calculations of some chosen gas, liquid and solids properties.	4
Calculations of some chosen engineering problems associated with thermodynamics and multiphase flows.	4
Force balance. Fluidization velocities.	4
Cyclone separators – design procedure and calculations	2
Test	1
Form of classes - laboratory	**Hours**
Organization of laboratory activities – rules and precautions.	1
Investigation of solids properties. Size, structure and morphology.	2
Determination of particle size distribution of solids.	2
Minimum fluidization velocity for various solids types. Terminal velocity.	2
Cyclone separators for gas-solids flow. Cyclone separation efficiency.	3
Visualization of various gas-solid flow regimes.	2

Fluidized bed combustion of solids.	2
Summary discussion	1

COURSE STUDY METHODS

1. blackboard
2. multimedia presentation
3. laboratory equipment
4. literature resources

METHODS OF ASSESMENT (F - formative; S - summative)

F1. - activity during class hours
F2. - evaluation of work during laboratory exercises
S1. - evaluation of laboratory reports

STUDENT WORKLOAD

Form of activity	Workload (hours)
Participation in lectures	15 h
Participation in classes	15 h
Laboratory	15 h
Participation in project classes	-
Participation in seminar	-
Preparation course on e-learning	-
Test	1
Entrance test for laboratory classes	-
Project's defence	-
Exam	-
Consultation hours	15 h
DIRECT TEACHING, hours/ ECTS	**61 h / 3 ECTS**
Preparation for tutorials	30 h
Preparation for laboratories	15 h
Preparation for projects	-
Preparation for seminars	-
Preparation for e-learning classes	-
Participation in e-learning classes	-
Working on project	15
Preparation for tests	30 h
Preparation for exam	-
SELF-STUDY, hours/ ECTS	**90 h / 4 ECTS**
TOTAL (hours)	**∑ 151**
TOTAL ECTS	**7 ECTS**

PRIMARY AND SUPPLEMENTARY TEXTBOOKS

Papers and journals in Digital Libraries, particularly: *Applied Energy, Powder Technology, International Journal of Heat & Mass Transfer, Progress in Energy and Combustion Science, Fuel Processing Technology*.

Kunii D., Levenspiel O., *Fluidization Engineering*, London Academic Press, 1991.
Yang W. C. (Ed.), *Handbook of Fluidization and Fluid-Particle Systems*, Marcel Dekker, New York, 2003.
Davidson J., Clift R., Harrison D., *Fluidization*, Academic Press London, 1985.

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