

(faculty stamp)

Syllabus

1. Name of the subject: Advanced Mathematics			2. Course code:	
3. Valid in academic year: 2016/2017				
4. Course: MSc (second degree programme)				
5. Type of studies: full time stationery course				
6. Field of study: POWER ENGINEERING				
7. Profile of studies: General academic				
8. Programme: CLEAN FOSSIL AND ALTERNATIVE FUELS ENERGY (KIC INNOENERGY)				
9. Semester: 1				
10. Responsible unit: Institute of Thermal Technology (RIE-6)				
11. Lecturer: prof. Andrzej J. Nowak, dr G. Szapajko				
12. Group of subjects: Core subject				
13. Status: Obligatory				
14. Language of instruction: English				
15. Prerequisites: subject has to be preceded by Mathematics as well as by Basic Numeral Methods				
16. Course objectives: To provide students with basic methods of optimization and solving of differential equations encountered in analysis of engineering problems. Moreover students are informed about probability and mathematical statistics, theory and methods of estimation as well as processing of measurements results and improving their likelihood.				
17. Learning outcomes:¹				
	Description of learning outcome	Method of assessments	Type of classes	Reference to learning outcomes
1	Student is able to define design variables, objective function, equality and inequality constrains, properly classifies optimization problems.	Exam	Lecture and computer lab	K2A_W05, K2A_W07,
2	Student is capable of selecting appropriate method and carrying out optimization of one and many design variables.	Colloquium and elaborate	Lecture and computer lab	K2A_W05, K2A_W07, K2A_U08, K2A_U09, K2A_U19, K2A_U20, K2A_U23
3	Student is able to define idea of genetic and evolutionary algorithms.	Colloquium and elaborate	Lecture and computer lab	K2A_W05, K2A_W07, K2A_U08, K2A_U09, K2A_U19, K2A_U20, K2A_U23

¹ 5-8 learning outcomes should be given

4	Student is capable of selecting appropriate method and solving typical differential equation.	Colloquium and elaborate	Lecture and computer lab	K2A_W05, K2A_W07, K2A_U08, K2A_U09, K2A_U19, K2A_U20, K2A_U23
5	Student is capable of selecting appropriate method, determining estimates and confidence intervals of probability distribution as well as standard measurement uncertainty.	Colloquium and elaborate	Lecture and computer lab	K2A_W05, K2A_W07, K2A_U08, K2A_U09, K2A_U19, K2A_U20, K2A_U23
6	Student is capable of using coordination method for improving of measurements confidence interval.	Colloquium and elaborate	Lecture and computer lab	K2A_W05, K2A_W07, K2A_U08, K2A_U09, K2A_U19, K2A_U20, K2A_U23

18. Type of classes and their duration

Lecture: 30h Project: 30h

19. Content of the course:

Lecture

Design variables, objective function, equality constrains, classification of the optimization problems. Linear programming. Minimization of function dependent on one variable. Minimization of function dependent on many variables without and with constrains. Fundamentals of genetic and evolutionary algorithms.

Lectures are conducted in an interactive way with use of audiovisual tools. During the lecture problem questions/topics are raised, students take part in the discussion and brainstorm, trying to find solution/answers, assess existing solutions as well as develop critical thinking. Students are encouraged to participate in discussions which are moderated by the tutor. Students will be able to assess the dynamic nature of complex systems and change over time. They will be able to apply the tools and concepts of system dynamics and systems thinking in their present lives.

Computer laboratory

Projects: problem formulation and minimization of function dependent on one design variable, problem formulation and linear programming, problem formulation and solution of set of two differential equations
Estimation of probability distribution parameters. Determination of confidence interval of expected value and variance. Improving of measurements confidence applying coordination method.

20. Examination: yes

21. Basic literature:

1. Y.A. Cenge, *Heat Transfer – Practical Approach*, McGraw-Hill, New York 2003
2. J.H. Lienhard IV, J.H. Lienhard V, *A Heat Transfer Textbook*, Phlogiston Press, Cambridge, Massachusetts, USA, 2006
<http://web.mit.edu/lienhard.www/ahtt.html>

22. Other reading: Scientific journals available in university network (Scopus, Science direct etc.)

23. Work load of the student necessary to achieve the learning outcomes

Lp.	Type of classes	Number of contact hours / student work
1	Lectures	30/10
2	Recitations	/
3	Lab	30/20
4	Project	
5	Seminar	
6	Other (participation in consultations associated with project execution)	10/20
	number of hours (subtotal)	70/50

24. Total number of hours: 120**25. Number fo ECTS credits:**² 4**26. Number of ECTS credit points gained during classes (contact hours):****27. Number of ECTS credits gained during practice oriented classes (labs, projects):****26. Remarks:**Teaching tools: **learning by doing****The overall assessment consist of two steps:**

1. Check of fulfilling of module LO consequently OLOs criteria.
2. Assessment and grading of the quality of students work and reached LO.

EIT OLOs assessed in the subject :

- Value judgments and sustainability competencies (EIT OLO 1)
- Creativity skills and competencies (EIT OLO 3)
- Research skills and competencies (EIT OLO 5)
- Intellectual transforming skills and competencies (EIT OLO 6)

The Method of assessments indicated in point 17 includes assessment of learning outcomes and OLOs

Grading:Grading formula: $FG = PMWF_{lec} * PMG_{lec} + PMWF_{lab} * PMG_{lab}$

Where:

- FG-final grade
- $PMWF_{lec}$ – Lecture part weighting factor – 0,6
- PMG_{lec} – Grade of achieved LOs relevant to lecture
- $PMWF_{lab}$ – Laboratory part weighting factor – 0,4
- PMG_{lab} – Grade of achieved LOs relevant to laboratory

All LO weighting factors associated with part of the module (PM) equal 1.

Accepted:

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² 1 ECTS point – 30 hours workload

(Date and signature of the responsible instructor)

(date and signature of the director of the institute, chair, Director of Foreign Language College/head or director of inter-faculty unit)