COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics [S1Energ2>Mat1]

Course

Field of study
Power Engineering

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
30

Projects/seminars
0

Number of credit points

5,00

Coordinators

dr inż. Jolanta Pozorska
jolanta.pozorska@put.poznan.pl

Lecturers

Prerequisites

The student should have knowledge of mathematics in the field of high school and basic scope extended by differential calculus (in the scope of extended).

Course objective

Acquainting with problems of linear algebra and learning methods and applications of differential and integral calculus of functions of one variable.

Course-related learning outcomes

Knowledge:
1. The student has knowledge of the principles of solving polynomials, exponents and roots in the set of complex numbers.
2. The student has knowledge of string properties and convergence criteria for number series.
3. The student has knowledge of the derivative and how to determine it and how to use it.
4. The student has knowledge of matrices, methods of elementary operations on matrices, principles of solving systems of linear equations.
5. The student has knowledge of the indefinite integral and methods of integration.

Skills:
1. The student is able to perform operations on complex numbers, find real and complex roots of certain types of polynomials.
2. The student can examine the convergence of numerical sequences and series.
3. The student is able to determine the derivative of a function of one variable, apply it to the limits of functions (de L'Hospital rule) and study the variability of functions.
4. The student can perform operations on matrices, determine the inverse matrix of elementary operations methods, calculate the determinant of matrices, solve a system of linear equations using the Gaussian elimination method.
5. The student can calculate the indefinite integral - integration before substitution and through parts.
6. The student is able to obtain the above information from literature and other sources and integrate obtained information, interpret and draw conclusions from them.

Social competences:
1. The student is aware of the level of its knowledge in the field of energy research.
2. The student is aware of the deepening and expansion of knowledge in order to solve new technical problems.
3. The student is able to properly set priorities for the implementation of tasks specified by himself or others, including is able to think and act strictly in the area of description of processes in technical and exact sciences.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

1. Lecture: Knowledge acquired during the lecture is verified by a 90 minute exam consisting theoretical and tasks.
Assessment threshold: 50% of points obtained from an exam. The exam issues will be sent via e-mail at least two weeks before the exam.
2. Knowledge acquired during the exercises is verified by two tests carried out during 7 and 15 classes and activity during classes. Each test consists of the same number of points. Passing threshold: 50% of points - the sum of points obtained from tests and activity during classes.

Programme content

Problems of linear algebra. Methods and applications of differential and
integral calculus of functions of one variable.

Course topics

Lecture:
1. COMPLEX NUMBERS: a Gaussian form of complex number, a polar form of complex number.
2. COMPLEX NUMBERS: Euler form of complex number, powers and roots.
3. COMPLEX NUMBERS: polynomials.
4. MATRIX ACCOUNT: operations on matrices, concept of inverse matrix - calculation, matrix determinant - properties and methods of determination.
5. SYSTEMS of LINEAR EQUATIONS: Kronecker-Capell theorem,
solving systems of linear equations by Gauss elimination method.
6. SEQUENCES AND NUMBER SERIES: limitation, monotonicity, string boundaries, definition of the number e and its application, criteria for convergence of numerical series.
7. DIFFERENTIAL ACCOUNT OF ONE VARIABLE FUNCTION: derivative of function.
8-10. DIFFERENTIAL ACCOUNT OF ONE VARIABLE FUNCTION: extrema of differentiable function, monotonicity intervals, second derivative - convexity, concavity, inflection points, derivativesmof higher orders, de L'Hospital rule.
11-14. TOTAL ACCOUNT OF ONE VARIABLE FUNCTION: indefinite integral - basic methods of integration and integration of functions: faithful, irrational and trigonometric.
15. Repetition of issues.
Tutorials:
1. COMPLEX NUMBERS: a Gaussian form of complex number, a polar form of complex number.
2. COMPLEX NUMBERS: Euler form of complex number, powers and roots.

3. COMPLEX NUMBERS: polynomials.
4. MATRIX ACCOUNT: operations on matrices, concept of inverse matrix - calculation, matrix determinant - properties and methods of determination.
5. SYSTEMS of LINEAR EQUATIONS: Kronecker-Capell theorem,
solving systems of linear equations by Gauss elimination method.
6. SEQUENCES AND NUMBER SERIES: limitation, monotonicity, string boundaries, definition of the number e and its application, criteria for convergence of numerical series.
7. TEST I
8. DIFFERENTIAL ACCOUNT OF ONE VARIABLE FUNCTION: derivative of function.
9-10. DIFFERENTIAL ACCOUNT OF ONE VARIABLE FUNCTION: extrema of differentiable function, monotonicity intervals, second derivative - convexity, concavity, inflection points, derivativesmof higher orders, de L'Hospital rule.
11-14. TOTAL ACCOUNT OF ONE VARIABLE FUNCTION: indefinite integral - basic methods of integration and integration of functions: faithful, irrational and trigonometric.
15. TEST II

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples on the board. Conducted in an interactive way with the formulation of questions to a group of students. Initiating discussions during the lecture.
2. Exercises: solving tasks given by the teacher on the board along with analyzing the next stages. The method of solving the task by students on the board is reviewed by the tutor. Completed with tasks for independent solution at home.

Bibliography

Basic:
1. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, T. 1-2, PWN, Warszawa 2011.
2. I. Foltyńska, Z. Ratajczak, Z. Szafrański, Matematyka dla studentów uczelni technicznych, T. 1-3, Wydawnictwo Politechniki Poznańskiej, Poznań 2004.
3. M. Gewert, Z. Skoczylas, Analiza matematyczna 1/Definicje, twierdzenia, wzory/ Oficyna Wydawnicza GiS, Wrocław 2011.
4. M. Gewert, Z. Skoczylas, Analiza matematyczna 1/Przykłady i zadania/ Oficyna Wydawnicza GiS, Wrocław 2011.
5. F. Leja, Rachunek różniczkowy i całkowy, PWN, Warszawa 2008.
Additional:
1. W. Żakowski, Matematyka, T. 1-2, WNT, Warszawa 2003.
2. W. Stankiewicz, J. Wojtowicz, Zadania z matematyki dla wyższych uczelni technicznych, T. 1-2, PWN, Warszawa 2003.
3. M. Lassek, Matematyka dla studentów technicznych, T. 1-2, Wydawnictwo Wspierania procesu edukacji, Warszawa 2004.

Breakdown of average student's workload

	Hours	ECTS
Total workload	132	5,00
Classes requiring direct contact with the teacher	62	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	70	2,50