Politechnika Krakowska
im. Tadeusza Kościuszki

Karta przedmiotu

obowiązuje studentów rozpoczynających studia w roku akademickim 2021/2022

Wydział Inżynierii Lądowej

Kierunek studiów: Budownictwo

Profil: Ogólnoakademicki

Forma sudiów: stacjonarne

Kod kierunku: BUD

Stopień studiów: II

Specjalności: Structural Design and Management in Civil Engineering (profile: Structural Design),Building and Engineering Constructions (profile: Building Structures),Structural Design and Management in Civil Engineering (profile: Construction Technology and Management)

1 Informacje o przedmiocie

Nazwa przedmiotu	Matematyka w inżynierii lądowej
Nazwa przedmiotu w języku angielskim	Mathematics in Civil Engineering
Kod przedmiotu	WIL BUD oIIS C1 21/22
Kategoria przedmiotu	Major subjects
Liczba punktów ECTS	2.00
Semestry	1

2 Rodzaj zajęć, liczba godzin w planie studiów

Semestr	Wykład	Ćwiczenia audytoryjne	Laboratoria	Laboratoria komputerowe	Projekty	Seminarium
1	20	0	0	10	0	0

3 Cele przedmiotu

Cel 1 Familiarizing students with selected problems of mathematical statistics and their application in the construction industry

Cel 2 Familiarizing students with selected elements of functional analysis, variational calculus, function approximation and partial differential equations.

Cel 3 Familiarizing students with selected advanced calculation methods of deterministic and stochastic types.

Cel 4 Preparing students for research work and student participation in research.

4 WYMAGANIA WSTĘPNE W ZAKRESIE WIEDZY, UMIEJĘTNOŚCI I INNYCH KOMPETENCJI

1 The course is a continuation and development of the subject Applied mathematics and numerical methods, implemented during the first cycle of Civil Engineering bachelor studies. The student should have a basic knowledge of algebra (vector and matrix calculus), numerical methods and should know the basics of work in modern computing systems.

5 EFEKTY KSZTAŁCENIA

EK1 Wiedza The student knows the basics of mathematical statistics, such as ways of describing phenomena, random variables, probability distributions, estimators and stochastic hypotheses; and knows how to use this knowledge in construction problems

EK2 Wiedza The student knows the basics of functional and differential analysis, as well as elements of function approximation theory; and knows how to use this knowledge in construction problems.

EK3 Umiejętności The student is able to use basic and advanced computational, deterministic and probabilistic, methods to solve problems of statistics, algebra and differential analysis.

EK4 Kompetencje społeczne The student is able to work on her/his own and in smaller (2-3) teams in the implementation of laboratory projects.

6 TREŚCI PROGRAMOWE

WYKŁAD		
LP	TEMATYKA ZAJĘĆ OPIS SZCZEGÓŁOWY BLOKÓW TEMATYCZNYCH	LICZBA GODZIN
W1	Statistics and its basic concepts. Division: descriptive and mathematical statistics. Basic knowledge of descriptive statistics: description of the structure of phenomena, description of the dynamics of phenomena, description of interdependence.	4
W2	Basics of mathematical statistics. Random variable and its types and parameters distribution. Random variable distributions.	2
W3	Elements of estimation theory. Types of estimation. Confidence intervals.	2
W4	Hypothesis verification. Stages of verification of hypotheses. Hypotheses and their types, statistics tests.	2
W5	Approximation of a given function in a discrete and continuous manners. Weighted least squares method. Chebyshev polynomials. Spline interpolation. Function orthogonal series.	3

Wykład		
Lp	Tematyka zajęć Opis szczegółowy bloków tematycznych	Liczba godzin
W6	Differential equations: Initial and boundary problems - applications in mechanics. Types of boundary conditions. Types of partial equations and their applications in mechanics. Analytical and numerical methods of solving partial equations.	3
W7	Fourier series: Development of a given function in a discrete and continuous manners. Application for analytical solution of differential equations. Analysis of beams and plates.	2
W8	Selected modern calculation methods of deterministic and stochastic types. Monte Carlo method. Genetic Algorithms. Neural networks. Inverse problems.	2

Laboratoria komputerowe		
Lp	Tematyka zajęć Opis szczegółowy bloków tematycznych	Liczba godzin
K1	Reminder of the principles of working in Matlab / Octave environment: variable types, mathematical functions, defining arrays and editing their elements, matrix and tensor operations, 2D graphics.	2
K2	Selected applications of mathematical statistics for algebra problems (Monte Carlo integration, principal components analysis).	2
K3	Selected problems of approximation of the function of one variable (weighted least squares method, properties of Chebyshev polynomials).	2
K4	Numerical analysis of problems of transient heat flow and forced vibrations.	2
K5	Application of Fourier series to solve problems of beams and plates.	2

7 Narzędzia dydaktyczne

N1 Lectures

N2 Discussion

N3 Multimedia presentations

N4 Laboratory assignments

N5 Consultations