

Obuda University John von Neumann Faculty of Informatics		Institute of Applied Mathematics		
Name and code: <i>Calculus of variations and applications</i> NMVVS1PMNE		Credits: <i>2021/22 year I. semester</i>		
Subject lecturers: Prof. dr. habil. Alexandru Kristály				
Prerequisites (with code):		Calculus I, II		
Weekly hours:	Lecture:	Seminar.:	Lab. hours:	Consultation:
Way of assessment:				
Course description:				
<i>Goal:</i> to provide an introduction into some basic problems formulated in terms of the Calculus of Variations.				
<i>Course description:</i> key problems are presented from Calculus of Variations as the isoperimetric problem, Euler-Lagrange equation, brachystochron problem, optimization problems (Torricelli points), minimization arguments, variational principles (Ekeland, Borwein-Preiss, Ricceri), critical points, minimax theorems, applications in PDEs.				

Lecture schedule	
<i>Education week</i>	<i>Topic</i>
1.	Introduction in Calculus of Variations: examples
2.	Isoperimetric problems
3.	Brunn-Minkowski inequalities: a quick tour
4.	Euler-Lagrange equation
5.	Brachystochron problem (classical and the tunnel problem)
6.	Weber-type problems: Torricelli points
7.	Weber-type problems on non-euclidean spaces: influence of gravity
8.	Busemann-type inequalities: Thales theorem and applications
9.	Minimization arguments: compact case
10.	Minimization arguments: non-compact case
11.	Variational principles (Ekeland, Borwein-Preiss, Ricceri)
12.	Critical points
13.	Minimax theorems
14.	Applications in elliptic PDEs (existence results)
Midterm requirements	
<i>Education week</i>	<i>Topic</i>

Final grade calculation methods	
Achieved result	Grade
89%-100%	excellent (5)
76%-88<%	good (4)
63%-75<%	average (3)
51%-62<%	satisfactory (2)
0%-50<%	failed (1)
Type of exam	
Project presentation & Written exam	
Type of replacement	
Project presentation	
References	
Mandatory: Kristály A., Radulescu V., Varga Cs., Variational Principles in Mathematical Physics, Geometry, and Economics, Cambridge University Press, Enciclopedia of Mathematics and its Applications. No 136, 2010.	
Recommended: Struwe M., Variational Methods, Applications to Nonlinear Partial Differential Equations and Hamiltonian Systems, Fourth edition. A Series of Modern Surveys in Mathematics [Results in Mathematics and Related Areas. 3rd Series. A Series of Modern Surveys in Mathematics], 34. Springer-Verlag, Berlin, 2008.	