Attachment No. 5 to Rector's ordinance No. 22/2020

DESCRIPTION OF THE COURSE OF STUDY

Course code	0541.6.MAT1.C.WGR	
Name of the course in	Polish	**Wstęp do geometrii różniczkowej**
	English	**Introduction to Differential Geometry**

1. LOCATION OF THE COURSE OF STUDY WITHIN THE SYSTEM OF STUDIES

1.1. Field of study	mathematics
1.2. Mode of study	full-time studies
1.3. Level of study	Undergraduate (Bachelor)
1.4. Profile of study*	general academic profile of studies
1.5. Person/s preparing the course description	dr Michał Zakrzewski
1.6. Contact	zakrzewski@mimuw.edu.pl

2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

2.1. Language of instruction	Polish and English
2.2. Prerequisites*	Mathematical Analysis III and IV, Linear Algebra and Geometry

3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

3.1. Form of classes		lectures and classes
3.2. Place of classes		classes in the UJK teaching room
3.3. Form of assessment		Exam (lectures), graded credit (classes)
3.4. Teaching methods		Lectures – information lecture Classes - discusions, solving problems
3.5. Bibliography	**Required reading**	1. Oprea J. Geometria różniczkowa i jej zastosowania, Wydawnictwo Naukowe PWN, 2002. 2. Petersen P. Classical Differential Geometry. Available at: http://www.math.ucla.edu/~petersen/DGnotes.pdf 3. Panasyuk A. Wyklady z geometrii rożniczkowej. Available at: http://wmii.uwm.edu.pl/~panas/talks/geomrozn.pdf
	Further reading	1.) Aubin T. A Course in Differential Geometry, AMS, 2001. 2.) Dubrovin B., Fomenko A., Novikov, S. P.; Modern Geometry t. I i II, Springer GTM 93 i 104, 1984 – 1985. 3.) Petersen P.; Manifold Theory. Available at: http://www.math.ucla.edu/~petersen/manifolds.pdf

4. OBJECTIVES, SYLLABUS CONTENT AND INTENDED LEARNING OUTCOMES

4.1. Course objectives ***(including form of classes)***

Lecture

C1 - basics of differential geometry

C2 - introduction to the elements of the theory of curves and surfaces

C3 - basics of modern abstract differential geometry

Classes

C1 - problems concerning curves and embedded surfaces

C2 - to develop the habit of learning, improving one's own work and formulating questions to deepen one's own understanding of differential geometry

4.2. Detailed syllabus ***(including form of classes)***

Lectures

Vector calculus, geometry in space with scalar product. R^2 and R^3 symmetry groups. Curves and surfaces as simplest manifolds. Differential forms. Riemann metric on a surface. Curvature of a surface. Gauss's Theorema Egregium and Gauss-Bonnet theorem. Mean curvature and minimal surfaces. Remarks on general Riemannian geometry and its applications.

Classes

Vector calculus, geometry in space with scalar product. R^2 and R^3 symmetry groups. Curves and surfaces as simplest manifolds. Differential forms. Riemann metric on a surface. Curvature of surfaces. Gauss's Theorema Egregium and Gauss-Bonnet theorem. Mean curvature and minimal surfaces. Remarks on general Riemann geometry and its applications.

4.3 Intended learning outcomes

Code	**A student, who passed the course**	**Relation to learning outcomes**

within the scope of **KNOWLEDGE:**		
W01	formulates basic theorems about curves and embedded surfaces	MAT1A_W01 MAT1A_W02 MAT1A_W03 MAT1A_W04 MAT1A_W05 MAT1A_W11
W02	gives definitions of scalar product, diffeomorphism, smooth transformation, metric tensor, patch	MAT1A_W01 MAT1A_W02 MAT1A_W03 MAT1A_W04 MAT1A_W05 MAT1A_W11
within the scope of **ABILITIES:**		
U01	calculates the curvature and torsion of a smooth curve	MAT1A_U01 MAT1A_U02 MAT1A_U08
U02	calculates Gaussian curvature and mean curvature	MAT1A_U01 MAT1A_U02 MAT1A_U08
U03	uses the concepts of metric tensor and differential form and knows their applications in geometry	MAT1A_U01 MAT1A_U02 MAT1A_U08
U04	Knows the basic relationships between geometry and topology of curves and surfaces	MAT1A_U01 MAT1A_U02 MAT1A_U08
within the scope of **SOCIAL COMPETENCE:**		
K01	Analyzes the logical accuracy of his own and other people's speech, strives for precision in writing down text	MAT1A_K01 MAT1A_K02
K02	Strives to fully understand issues by asking appropriate questions.	MAT1A_K02

4.4. Methods of assessment of the intended learning outcomes

Teaching outcomes *(code)*	**Method of assessment (+/-)**																				
	Exam oral/written*			**Test***			**Project***			**Effort in class***			**Self-study***			**Group work***			**Others* e.g. standardized test used in e-learning**		
	Form of classes			***Form of classes***			***Form of classes***			***Form of classes***			***Form of classes***			***Form of classes***			***Form of classes***		
	L	*C*	*...*	*L*	*C*	*...*	*L*	*C*	*...*	*L*	*C*	*...*	*L*	*C*	*...*	*L*	*C*	*...*	*L*	*C*	*...*
W01	+				+					+	+		+	+							
W02	+				+					+	+		+	+							
W03	+				+					+	+		+	+							
U01					+					+	+		+	+							
U02					+					+	+		+	+							
U03					+					+	+		+	+							
U04					+					+	+		+	+							
K01	+				+					+	+		+	+							
K02	+									+	+		+	+							

delete as appropriate

4.5. Criteria of assessment of the intended learning outcomes

Form of classes	**Grade**	**Criterion of assessment**
lecture (L) (including e-learning)	**3**	at least 50% and no more than 60% of the total number of points possible
	3,5	more than 60% and no more than 70% of the total number of points possible
	4	more than 70% and no more than 80% of the total number of points possible
	4,5	more than 80% and no more than 90% of the total number of points possible
	5	more than 90% of the total number of points possible

classes (C)* (including e-learning)	**3**	at least 50% and no more than 60% of the total number of points possible
	3,5	more than 60% and no more than 70% of the total number of points possible
	4	more than 70% and no more than 80% of the total number of points possible
	4,5	more than 80% and no more than 90% of the total number of points possible
	5	more than 90% of the total number of points possible

5. BALANCE OF ECTS CREDITS – STUDENT'S WORK INPUT

Category	**Student's workload**	
	Full-time studies	**Extramural studies**
NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER /CONTACT HOURS/	***65***	
*Participation in lectures**	30	
*Participation in classes, seminars, laboratories**	30	
*Preparation in the exam/ final test**	3/2	
INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/	***35***	
*Preparation for the lecture**	10	
*Preparation for the classes, seminars, laboratories**	15	
*Preparation for the exam/test**	5/5	
TOTAL NUMBER OF HOURS	***100***	
ECTS credits for the course of study	**4**	

delete as appropriate

Accepted for execution *(date and legible signatures of the teachers running the course in the given academic year)*

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