"APPROVED"
Dean of the Faculty of New Technologies and Chemistry
Prof., PhD, Eng. Stanisław Cudziło

Course title: ***Ceramic materials***
Course title in Polish: ***Materiały ceramiczne***
Course Code: WTCNTCSM-MC2eng

Course details:

Entity offering the course: Faculty of New Technologies and Chemistry
Entity receiving the course: Faculty of New Technologies and Chemistry
Syllabus valid for enrolments as of: March 2016

Default type of the protocol:

graded course credit

Official language:

English

Short description:

The objectives of the course is:
to provide an introduction into the field of ceramic materials,
to introduce the advanced ceramic materials,
to familiarize students with mchmical and phisical properties of cermic materials,
to teach how to investigate properties of ceramic materials.

Description:

1. Type and classification of ceramic materials.
2. Atomic bonds present in ceramic materials.
3. The structure of ceramic materials.
4. Electrical, magnetic, optical and thermal properties of ceramic materials.
5. Characteristic of advanced ceramic materials.
6. Properties and application of piezoelectric ceramic materials.
7. Properties and application of superconducting ceramic materials.
8. The structure, properties and application of ceramic composites.
9. The methods of ceramic materials investigation.

Laboratories:

1. Structure analysis and hardness tests of ceramic materials. Sample preparation, microscopic observation and hardness measurements. (4 godz.).
2. Phase analysis of ceramic materials. Sample preparation, chemical composition analysis – EDS and phase composition analysis XRD. (4 godz.)
   The mechanical properties of ceramic materials investigation. Compression resistance and impact strength. (4 godz.)

Bibliography:

Mandatory:

- C. Barry Carter, M Grant Norton, Ceramic Materials: Science and Engineering, Springer. 2013. ISBN-10: 1461435226, ISBN-13: 978-1461435228, Edition: 2nd ed. 2013.

Complementary:

- M.W. Barsoum, Fundamentals of Ceramics. Series in Material Science and Engineering.2002. ISBN-10: 0750309024, ISBN-13: 978-0750309028, Edition: 1Hazardous Materials Characterization: Evaluation Methods, Procedures, and Considerations; Donald A. Shafer, Wiley 2005

Learning outcomes:

Symbol	Learning objectives and skills acquired	Reference to learning objectives in the given field of study
W1	Student is familiar with material structure and mechanisms of phase transformation in ceramic materials. One has basic knowledge about relations between technological process parameters and structure and properties as well.	K_W05
W2	Student knows the systematics of division, type of materials and ten-dency in the application and development range.	K_W19
W3	Student is familiar with the test, measurement, analysis and description methods of ceramic material structure using light and scanning microscopy, XRD and EDS.	K_W14;
U1	Student is able to identify and formulate specification of simple and practical engineer tasks which are characteristic for investigation la-boratory activity.	K_U09

U2	Student can evaluate methods and engineering tools suitability in process of engineering problem solving. One is able to solve complex and unusual issue related to materials engineering.	K_U07;
K1	Student can think and act in creative and initiative way.	K_K03

Assessment methods and criteria:

The course is evaluated by final written test.
Laboratory – completion of the exercise requires to get the positive mark from preliminary test before the exercise, the exercise execution and the laboratory report.
Completion of the course requires the positive assessments of laboratory exercises and to pass a written test including open questions and / or the multiple choice test.
Achieving effects W1, W2 and K1 is verified during the final test, and the effects W1, U1 and K1 are checked during the execution of laboratory exercises.
score 2 - less than 50% of correct answers;
score 3 - 50 ÷ 60% of correct answers;
score 3.5 - 61 ÷ 70% of correct answers;
score 4 - 71 ÷ 80% of correct answers;
score 4.5 - 81 ÷ 90% of correct answers;
score 5 rating - above 91% correct answer
The very good mark is received by the student who possessed the knowledge, skills and competences foreseen by learning outcomes, and also shows interest in the subject, in a creative approaches to assigned tasks and shows independence in acquiring knowledge, is persistent in overcoming difficulties and systematic work.
The good mark is received by the student who possessed the knowledge and skills provided by a curriculum at a good level and is able to solve the tasks and problems of medium difficulty.
The satisfactory mark is received by the student who possessed the knowledge and skills provided by the curriculum sufficiently. Independently solves tasks and problems with a low degree of difficulty. His/Her knowledge and skills are noticeable gaps that can complement but under the guidance of a teacher.
The failing mark is received by the student who does not possess the necessary knowledge, skills and competences required.
The final evaluation consists of the evaluation obtained on the final test, evaluation of the laboratory and the commitment and approach to student learning.

Internship:

N/A

Study format

full-time studies

Level of the studies

Graduate degree

Course type

elective

Introductory courses and prerequisites

Sructural and functional materials: The knowledge of principal characteristic of structural and functional materials.
Materials properties condytioned by structure The knowledge of correlation between structure and propertes of structural and functional materials.

Programy

Field of study: Materials Science
Specialization: all specializations

Form of teaching, lecture's number / qualification

Semester	x - examination, + - credit, # - project						ECTS points
	Total	lectures	exercises	laboratories	projects	seminars	
III	30	18/ +		12 / +			2

Author

Dr. Tomasz CZUJKO – prof. of MUT

ECTS Bilans

Lp.	Activity	Workload in hours.
1	Participation in lectures	18
2	Individual studies of lecture topics	18
3	Participation in exercises	

4	Individual preparation for exercises		
5	Participation in laboratory exercises	12	
6	Individual preparation for laboratory exercises	12	
7	Participation in seminars		
8	Individual preparation for seminars		
9	Implementation of the project		
10	Participation in consultations		
11	Preparation for the examination		
12	Participation in the examination		
		Hours.	**ECTS**
Student's aggregate workload		60	2
Classes with teachers: 3 + 1 + 5 + 7 + 9 + 10 + 12		30	1
Classes with practical aspects: 5 + 6 + 9		24	1
Classes related to scientific activity: 1 + 2 + 3 + 4 + 7 + 8		36	1

AUTHOR OF
COURSE INFORAMATION CARD

Dr. Tomasz CZUJKO – prof. of MUT

MANAGER OF THE UNIT
RESPONSIBLE FOR THE COURSE

Dr. Tomasz CZUJKO – prof. of MUT