COURSE CURRICULUM

Basic course data	
Institution /Academic unit:	**University of Applied Sciences in Ferizaj** **Faculty of Engineering and Informatics**
Course Title:	**Composite materials**
Level of studies:	**Bachelor**
Type:	**Elective course**
Year:	**II**
Hours per week:	**4**
Credits:	**5**
Time / location:	**9 – 12, Hall 005**
Lecturer:	**Asoc. Prof. Dr. Milihate Aliu**
Contact details:	**milihate.aliu@ushaf.net**
Course description:	Composite materials and their classification. Matrix and their types, reinforcements and their types, and fibers. Metallic and ceramic matrix composites and their characteristics. Physical, mechanical and chemical properties of composite materials. The role of reinforcements in improving the properties of the composite. Methods of manufacture of composites. The rule of Mixtures.
Objectives of the subject:	1. To explain the notion of composite material. 2. To explain the formation of composites reinforced with different materials: inorganic (ceramic) particles of different sizes and shapes, metals and fibers. 3. To explain the role of the nature of reinforcing phase on the reinforcement of the metallic and ceramic matrix. 4. To explain the influence of fiber orientation on the mechanical properties of the composite. 5. To explain the influence of particle size and shape on the physical, chemical and mechanical properties of the composite. 6. To explain the layered structure of the composites.
Expected learning outcomes:	1. To obtain basic knowledge on composites and their types. 2. Understanding in particular the role of reinforcement in improving the properties of composites.

Contribution to student workload which should correspond to student learning outcomes			
Activity	**Hours**	**Day/week**	**Overall**
Lectures	2	15	30
Theoretical exercises / Labs	2	15	30
Practical work	2	5	10
Consultations with the teacher	1	15	15
On site training	-	-	-
Kollokfiume, seminars	2	5	10
Homework	-	-	-
Student self study time (in library or at home)	1	15	15
Preparing for the final exam	1	10	10
Time spent in assessment (tests, quizzes, final exam)	-	-	-
Projects, presentations, etc.	1	5	5
Total			**125 hours**

Teaching Methodology:	• Presentation of the lesson topic at Powerpoint (students will be given prior each lecture) • Case study or task (for exercises) linked to the lesson topic • Repeating of the preliminary lesson topic by students, analysis and discussions • Practical visit to the factory
Assessment and grading:	Students will be assessed with using the following elements. • Attendance: 0% • Midterm exam or seminars 0-10% • Exercises 0 - 15% • Group work and case studies 0-35 % • Final exam 0-50 % Total 100% Grading scale: % value Grade 90 -100% 5 (excellent) 80 – 89% 4 (good) 70 - 79% 3 (satisfactory) 60 - 69% 2 (pass) 0 - 59% 1 (failed)

Required or recommended literature resources:	
Required literature:	Lectures elaborated and prepared by professor. 1. Prof. Asoc. Dr. Milihate Aliu, "Materialet kompozite", Dispensë, 2016
Recommended literature:	2. Jang, B. Z.; *Advanced Polymer Composites: Principles and Applications*, ASM International, Materials Park, OH, 1994. 3. Reinforced plastics handbook; Donald V. Rosato, Dominick V. Rosato, and John Murphy; Elsevier; 2004; page 586. 4. History of Composites, Tim Palucka and Bernadette Bensaude-Vincent.

Course details:

Week	**Lectures**
Week 1:	**Module 1: Introduction to composite materials** - Components and phases of composite formation - Classification of composites - Characteristics of composites - Application of composite materials
Week 2:	**Module 2: Matrix and Reinforcements** - Matrix materials and their characteristics - Reinforcements and their characteristics
***Week 3*:**	**Module 3: Fibers** - Glass fibers - Silica or silica dioxide fibers - Boron fibers - Silicon carbide (SiC) and boron carbide (B_4C) fibers - Aluminum oxide fibers - Carbon fibers - Aramide fibers - Hybrid fibers - Natural fibers
Week 4:	**Module 4: Particles as reinforcements:** glass, carbon, Calcium carbonate ($CaCO_3$) and clay particles - **whiskers**

Week 5:	**Module 5: Influence of fiber orientation on mechanical properties of composites.**
***Week 6*:**	**Module 6: Types of bonds between matrix and reinforcements** - Mechanical bonding - Physical bonding and - Chemical bonding - Cohesion and adhesion forces
Week 7:	**Module 7: Classification of composites** - Macrocomposites - Microcomposites and - Nanocomposites - **Particle Dislocation** - **Particle aggregation**
Week 8:	**Module 8: Practical visit to the factory** - Introduction to components and their preparation for composite production stages
Week 9:	**Module 9: Particle reinforced composites** - Dispersion strengthened - Large particle reinforced a) Concrete b) Modified concrete - **Influence of particle size and shape on composite properties**
Week 10:	**Module 10: Fiber reinforced composites** - Influence of fiber length on composite strength - Influence of fiber orientation on composite strength a) Continuous fiber composites b) Discontinuous and aligned fiber composites **c)** Discontinuous and randomly oriented fiber composites -

***Week 11*:**	**Module 11: Structural composites** - Laminar composites - Sandwich structures
***Week 12*:**	**Module 12: Metal matrix composites**
***Week 13*:**	**Module 13: Ceramics matrix composites**
***Week 14*:**	**Module 14: Polymer matrix composites**
***Week 15*:**	**Module 15: Presentation of seminar topics by students** The student(s) will be required to prepare and deliver a Seminar, on the assigned topic with the help of Power Point Presentation as well as submit a type written report. The seminar shall also include a detailed question answer session.

Academic policies and rules of conduct:
Set the code of conduct according to the statute of UASF. • First of all, the student should be mindful and respectful towards the institution and the academic rules • They should respect the schedule of lectures, exercises, practical work and be attentive to the class. • It is mandatory to have and show the ID on the exam and during the factory visits • When preparing seminar papers, the student must follow the instructions given by the teacher for the research and technical execution of the paper.