

COURSE CURRICULUM

Basic course data	
Institution /Academic unit:	University of Applied Sciences in Ferizaj Faculty of Engineering and Informatics
Course Title:	Recycling of polymer materials / Ecology
Level of studies:	Bachelor
Type:	Elective course
Year:	III
Hours per week:	4
Credits:	5
Time / location:	13-16, Hall 006
Lecturer:	Asoc. Prof. Dr. Milihate Aliu
Contact details:	milihate.aliu@ushaf.net
Course description:	<p>Wastes and administration of waste products. Fundamentals of recycling of main polymer waste, recycling symbols. Additives, pyrolysis and hydrolysis as well as hydration of sorted polymer materials. Decomposition of waste materials. Energy recovery from waste polymer materials. Reprocessing (recycling) technology of thermoplastics. Impact of recycling on environmental protection. All modules included in this course will be linked directly to examples and discussions in the field of economics, benefiting engineering experiences during company visits that deal with this activity.</p>
Objectives of the subject:	<ul style="list-style-type: none"> • The main objective of the course is to make the students familiar with the basic knowledge of concepts and principles of plastic wastes and their recycling. • To learn the basic concepts of polymer construction, structure and morphology, with particular emphasis on thermoplastic polymers. • Students will be provided with basic knowledge of the thermal properties of polymer materials, especially melting temperature and polymer reprocessing, to learn how these properties depend on the polymer structure. • To study advanced plastics recycling process. • Set parameters and produce good plastics products. • To learn the recycling processes of plastics including the step-by-step recycling stages. • To provide students knowledge on the

	ecological environment.		
Expected learning outcomes:	<p><i>After successfully completing the course, students will be able to:</i></p> <ul style="list-style-type: none"> • Select waste disposal method. • Select proper separation method. • Identify primary and secondary recycling methods. • Understand recycling methods of various plastics. • Know the technology of thermoplastics recycling. • Know the technology of degradation of unused tyres or rubber. • Know about methods and techniques of protecting and preserving the environment. <p>This course should also develop these skills among students:</p> <ul style="list-style-type: none"> • Communication and presentation • Teamworking <p>These skills are mainly developed through discussion and active participation in lectures and exercises in cases of environmental pollution, from active participation in seminars, presentations and through the preparation and evaluation of the case.</p>		
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	1	5	5
Consultations with the teacher	1	15	15
On site training	1	5	5
Kollokfieme, 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
Teaching Methodology:			
<i>Lectures and exercises combined with case studies and</i>			

	<i>classroom discussions, seminar work, engineering experience in companies dealing with the field.</i>												
Assessment and grading:	<p>Students will be assessed with using the following elements.</p> <ul style="list-style-type: none"> • Attendance: 5% • Midterm exam or seminars 10% • Group work and case studies 35 % • Final exam 50 % <p>Total 100%</p> <p>Grading scale:</p> <table> <thead> <tr> <th>% value</th> <th>Grade</th> </tr> </thead> <tbody> <tr> <td>90 -100%</td> <td>5 (excellent)</td> </tr> <tr> <td>80 – 89%</td> <td>4 (good)</td> </tr> <tr> <td>70 - 79%</td> <td>3 (satisfactory)</td> </tr> <tr> <td>60 - 69%</td> <td>2 (pass)</td> </tr> <tr> <td>0 - 59%</td> <td>1 (failed)</td> </tr> </tbody> </table>	% value	Grade	90 -100%	5 (excellent)	80 – 89%	4 (good)	70 - 79%	3 (satisfactory)	60 - 69%	2 (pass)	0 - 59%	1 (failed)
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Required or recommended literature resources:													
Required literature:	<ol style="list-style-type: none"> 1. Mr. Sc. Ismet Malsiu, ligj. i SHL., RIPËRPUNIMI (RIKIKLIMI) I MATERIALEVE POLIMERE/ EKOLOGJIA, Ligjërata të autorizuara, Ferizaj 2013. 												
Recommended literature:	<ol style="list-style-type: none"> 2. M.sc.Marianthi GURI., REDUKTIM, RIPERDORIM, RIKIKLIM - 3R, METODA EKOLOGJIKE TË TRAJTIMIT TË MBETJEVE URBANE, Tiranë, 2008. 3. D.S.Achilias, A.Giannoulis, G.Z.Papageorgiou, „RECYCLING OF POLYMERS FROM PLASTIC PACKAGING MATERIALS USING THE DISSOLUTION-REPRECIPITATION TECHNIQUE”, Springer-Verlag 2009. 4. “RECYCLING AND RECOVERY OF PLASTICS”, edited by J. Brandrup. M. Bittner, W. Michaeli and G. Menges, Hanser, 1996 (huazuar nga interneti). 5. Ivanka Popovic . “RECIKLAŽA POLIMERNIH MATERIALLA”, interna skripta,TMØ. Beograd.(huazuar nga interneti), 6. D.S.Achilias, A.Giannoulis, G.Z.Papageorgiou, „RECYCLING OF POLYMERS FROM PLASTIC PACKAGING MATERIALS USING THE DISSOLUTION-REPRECIPITATION TECHNIQUE”, Springer-Verlag 2009. 7. 												
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Week	Lectures
Week 1:	Module 1: Introduction to polymers <ul style="list-style-type: none"> - Classification of polymers - Polymer structure and morphology
Week 2:	Module 2: Waste and their classification: <ul style="list-style-type: none"> - Industrial waste - Commercial waste - Glass waste - Plastic waste - Rubber waste
Week 3:	Module 3: Administration of waste products: <ul style="list-style-type: none"> - Collection, gathering, classification or sorting, transportation, treatment and recycling.
Week 4:	Module 4: Recycling Process for plastics waste <ul style="list-style-type: none"> - Sorting of the different plastic items by their resin content and color - Processes based on plastic resin or type of plastic product - Plastic recycling using two-step process: <ul style="list-style-type: none"> Step One: Sorting plastics automatically or with a manual sort to make sure all the contaminants are removed from the plastic waste stream. Step Two: Melting down plastics directly into a new shape or shredding into flakes then, cleaning and melting down before being finally processed into granulates.
Week 5:	Module 5: Common recycled plastics and recycling symbol <ul style="list-style-type: none"> - Polyethylene Terephthalate (PET) - High Density Polyethylene (HDPE) - Polyvinyl Chloride (PVC) - Low Density Polyethylene (LDPE)

Week 6:	Module 6: Processes, stages, and benefits of plastic waste recycling
Week 7:	<p>Module 7: Visit to the factory: Students will visit nearby industries and collect information about recycling process.</p> <p>Example of plastic recycling process of recovering waste or scrap plastic and reprocessing it into useful product.</p>
Week 8:	<p>Module 8: : Recycling of thermoplastic polymers</p> <ul style="list-style-type: none"> - Primary Recycling - Secondary Recycling or Mechanical Recycling
Week 9:	<p>Module 9: Factors affecting recycling of plastics</p> <ul style="list-style-type: none"> - Collection method (segregated or mixed materials) - Space for collection and storage of reusables and recyclables - Geographical location, particularly in relation to markets for reprocessing materials - Size of institution and volume of recyclable material - Other important factors include local authority facilities, charging structure and support etc.
Week 10:	<p>Module 10: Applications of recycled thermoplastic polymers</p> <ul style="list-style-type: none"> - Recycled polymers for Food Industry - Recycled polymers for Indoor Applications
Week 11:	Module 11: Energy Recovery or Quaternary Recycling
Week 12:	Module 12: Processing methods (Moulding operations)
Week 13:	Module 13: Burning of plastic waste and unused tires, and environmental pollution
Week 14:	<p>Module 14: Advanced plastics recycling processes</p> <ul style="list-style-type: none"> - Chemical Recycling, pyrolysis, hydrolysis

Week 15:	<p>Module 15: Presentation of seminar topics by students</p> <p>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.</p>

Academic policies and rules of conduct:
<p><i>Set the code of conduct according to the statute of UASF.</i></p> <ul style="list-style-type: none"> • 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.