

Erasmus Mundus Joint Master GREENANO

SYLLABUS

Semester 2

COURSE NAME:	Bioplastic		
HOSTING UNIVERSITY:	Tor Vergata University of Rome		
SEMESTER:	NUMBER OF ECTS:		PILLAR:
2	6		3
DISTRIBUTION OF HOURS			
Lectures	Seminars	Lab work	Individual student work
32	4	24	150 (25 each CFU)
PROFESSOR:	Emanuela Gatto Raffaella Lettieri		
LEARNING AND TEACHING METHODS:	The course includes 32 hours of lectures (4 CFU) and 24 hours of exercises and lab work (2 CFU) for a total of 56 hours of teaching. Both lectures and exercises are carried out in the classroom, lab work is carried out in a laboratory, encouraging the active participation of students in the discussion and problem solving.		
PREREQUISITES:	Basic chemistry Basic Organic Chemistry (functional groups, reactivity) Thermodynamic		
OBJECTIVES OF THE COURSE:	The course aims to provide the theoretical basis of the properties of natural polymers, their supramolecular self-organization, and the structure/function relationship of the final device. The course makes the student think, conceive, design, plan, and develop new environmentally sustainable materials, in line with the new European directives and with the principles of the circular economy.		
CONTENT OF THE COURSE:	Introduction Polymers Biopolymers Plastic and bioplastic definition Plastic from fossil fuel: synthesis, properties and applications Biobased and Biodegradable plastic: from bacterial fermentation (PHA), from biotechnology (PLA) and from natural polymers (polysaccharides, proteins and lipids). Blended polymers. Bio-based or partly bio-based, non-biodegradable plastics: bio-based PE, PP, or PET (so-called drop-ins) and bio-based technical performance polymers such as PTT or TPC-ET. Plastics based on fossil resources and biodegradable: PBAT. Characterization Thermal characterization (DSC, TGA, DMTA), Spectroscopic Characterization (IR), Mechanical Characterization (Dynamometer). Processing Bioplastic processability (injection molding, compression molding, extrusion molding, blow molding, calendering). Biodegradability and compostability. Definition Biodegradability in aerobic and anaerobic conditions		

	Laws and standard legislations Laboratory Bioplastic synthesis using natural polymers and characterization.
INTENDED LEARNING OUTCOMES:	KNOWLEDGE AND UNDERSTANDING: Knowledge of natural polymers, of the chemical-physical and mechanical characterization techniques and of the parameters that influence their supramolecular self-organization properties. The course also aims at developing the ability to synthesize new materials, through experimental procedures aimed at planning and implementing an idea. APPLYING KNOWLEDGE AND UNDERSTANDING: The course aims at providing the tools for understanding the basic chemistry of natural polymers, the weak interactions that lead to the formation of supramolecular structures and the energetic aspects that govern the stability and properties of these structures. The student will acquire the ability to solve problems on new issues, starting from chemistry up to interdisciplinary contexts. MAKING JUDGEMENTS: The course provides the ability to think, conceive, design, plan, and develop new environmentally sustainable materials, in line with the new European directives. At the end of the course, the student must be able to operate independently using the various topics covered in the course. COMMUNICATION SKILLS: Ability to effectively communicate information, ideas, problems and solutions in oral and written form, to both specialist and generic listeners, also using the technologies made available by computer science. Students must learn to communicate, in oral and written form, the content of their studies. This ability is ascertained during the examination and / or ongoing test. LEARNING SKILLS: Learning skills that allow to independently formulate a hypothesis and that in any case make the student able to study and solve problems independently in the field of chemistry of natural polymers, in order to favor a path from university to the world of work. The final exam, oral, is a further verification of the student's autonomous learning and exposure skills.
FORM OF ASSESSMENT:	The aim of the exam is to verify the level of achievement of the previously indicated learning outcomes. The oral exam, which lasts 20-30 minutes, aims to ascertain the acquired knowledge and the student's communication skills. The exam is passed with a grade equal to or higher than 5 points out of 10. Graduation of the grade of the oral exam: 5-6, the student has acquired the basic concepts of the discipline and expresses himself with a sufficiently correct and appropriate language. 7, the student has acquired in depth the basic concepts of the discipline and is adequately able to make the connections between the various subjects. Presents linearity in the structuring of speech. The language is appropriate and correct. 8-9, the student has a complete and well-structured set of knowledge. He is able to independently apply and re-elaborate the acquired knowledge. It highlights a wealth of references and logical-analytical skills with a fluid, appropriate and varied language. 10 and 10 cum laude, the student has a complete and in-depth knowledge base. Is able to apply knowledge to complex cases and problems and extend it to new situations. The cultural references are rich and up-to-date. It expresses itself with brilliance and perfect language properties.