Module title	**Polymers and Applications**
Code	C3
Degree Programme	Master of Science in Life Sciences
Group	Chemistry
Workload	3 ECTS (90 student working hours: 42 lessons contact = 32 h; 58 h self-study)
Module Coordinator	**Name**: Dr. Pierre Brodard **Phone**: +41 (0)26 429 67 19 **Email**: pierre.brodard@hefr.ch **Address**: Haute école d'ingénierie et d'architecture Fribourg, Perolles 80, 1700 Fribourg
Lecturers	• Dr. Pierre Brodard, HEIA-FR • Dr. Roger Marti, HEIA-FR • Dr. Jean-Pascal Bourgeois, HEIA-FR • Dr. Laure Dupuits, HEIA-FR/iRAP Institute of Applied Plastics Research • Dr. Dominik Brühwiler, ZHAW • Guest lecturers (experts from the industry)
Entry requirements	Chemistry at Bachelor of Science level. Knowledge required in: Organic chemistry (reactivity of carbonyl and carboxylic acid derivatives, radical reactions) & Analytical and physical chemistry (spectroscopy, thermal analysis, chromatographic methods). Preparatory reading will be made available, including a self-test on Moodle for students to check their actual understanding of the topic.
Learning outcomes and competences	After completing the module, students will be able to: • design and execute typical synthetic methods for the preparation of polymers • select appropriate analytical and physico-chemical methods to characterize polymers • work with inorganic polymers and biopolymers and use them for applications • explain polymer processing and industrial application of polymers
Module contents	Synthesis of polymers (Chain-growth and step-growth polymerization) Chemical Post-Polymerization Modifications Characterization of polymers Biopolymers (“Bio”-Plastics & Biodegradable Polymers, Polysaccharides, Chemical synthesis of biomacromolecules) Environmental impact of plastics Inorganic & electronic polymers Polymers processing Industrial applications
Teaching / learning methods	• Basic concepts and theoretical backgrounds by lecturers • Inputs by guest lecturers from industry and academia • Exercises and analysis of case studies • Lab visits with hands-on demonstration • Questions & Answers (Q&A) session (individual support)
Assessment of learning outcome	1. Written exam (closed books), final (100%)
Format	Winter school

<table>
<tr><td>Timing of the module</td><td>Autumn semester, CW6

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<tr><th>Day of the block week</th><th><1</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>>5</th></tr>
<tr><td>Contact teaching (lessons)</td><td></td><td>8</td><td>9</td><td>9</td><td>8</td><td>8</td><td></td></tr>
<tr><td>Self-study (hours)</td><td>18</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>30</td></tr>
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<tr><td>Venue</td><td>Fribourg and/or online</td></tr>
<tr><td>Bibliography</td><td>Course based on:
Chada & Roy: "Industrial Polymers, Specialty Polymers, and their Applications" CRC Press 2009
Carraher: "Introduction to Polymer Chemistry” CRC Press 2011
Campbell, Pethrick & White: "Polymer Characterization: physical techniques" CRC Taylor & Francis 2000
Mark, Allcock & West: "Inorganic Polymers" Oxford University Press 2005

Lectures notes (PDF) and additional material (exercises) will be delivered in addition during the module.</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Links to other modules</td><td>Coordination with modules C1 “Materials Science”, C2 “Surface Characterisation”, C4 “Green Chemistry” and C5 “Chemistry and Energy”.</td></tr>
<tr><td>Comments</td><td></td></tr>
<tr><td>Last Update</td><td>25.03.2021</td></tr>
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