

Organic chemistry II and natural materials	
Code	(not yet made available)
Credits (as per ECTS)	9
Attendance time	8 SWS
Course language	German (3 rd Semester), English (4 th Semester)
Duration	2 Semester
Rota	annually
Module coordinator	Prof. Dr. Schips
Assistant professor(s)	Prof. Dr. Schips, Prof. Dr. Ebert
Incorporation in the degree programs	Industrial biotechnology BSc, mandatory module, 3 rd + 4 th Semester
Required knowledge	<ul style="list-style-type: none"> Content: Recommendation: Analytical and organic chemistry module I
Learning outcomes	<p>Students that have successfully completed this module,</p> <ul style="list-style-type: none"> have knowledge of the most important methods of organic preparative chemistry in connection with natural materials are capable of applying basic operations of organic chemistry in the laboratory understand the most important reaction mechanisms of organic chemistry are capable of reconditioning and chemically modifying natural materials
Content	<p>The following technical contents are taught in this module:</p> <p>Lecture + Exercise "Organic chemistry II and natural materials"</p> <ul style="list-style-type: none"> Basic terminology of organic reactions: Reactivity of functional groups as per materials classes, alkane reactions, nucleophile substitution, elimination, addition, electrophile aromate substitution, reaction of carbonyl compounds, enolates and enoles, selected natural materials classes (carbohydrates, fats and oils, terpenes) <p>Practical course "Organic chemistry II and natural materials practical course"</p> <ul style="list-style-type: none"> Teaching of classic separation methods in the laboratory (recrystallization, extraction, suction, distillation) Characterisation of organic compounds via melting point, refraction index, IR spectra, HPLC and GC separation Preparative synthetic methods, base reaction types: Substitution, addition, elimination, CH acid reactions on selected compound classes, creation of a preparation from literature Organic reactions with renewable materials (plant oils, cellulose isolation) <p>Lecture "Biotechnological products"</p> <ul style="list-style-type: none"> Use of fossil and renewable raw materials: Raw materials transition, added-value chains, platform chemicals, biorefinery concept Technical biopolymers: Explanation of terminology,

	<p>structure and formation, manufacturing processes, application possibilities, PLA, strength, PHA, monomer components from renewable materials</p> <ul style="list-style-type: none"> • Important intermediary products: Vitamins, plant protection products, pharmaceuticals, cosmetics, microbiologically created alcohol, organic acids and vitamins • Evaluation of the environmental accounting of products, e-factor, sustainability and bioeconomy, market trends.
Literature	<p>Lecture + Exercise "Organic chemistry II and natural materials"</p> <ul style="list-style-type: none"> • „Grundlagen der Organischen Chemie“ Joachim Buddrus, Walter de Gruyter GmbH (2010), ISBN: 978-11-024894-4. • „Basisbuch Organische Chemie“ Carsten Schmuck, Person Verlag (2013), ISBN: 978-3-86894-061-9. • „Organische Reaktionen“ Ulrich Lünig, Spektrum (2010), ISBN: 978-8274-2478-5 • „Naturstoffchemie" Peter Nuhn, Hirnitz (2006), ISBN: 978-37-7761363-5 <p>Practical course "Organic chemistry II and natural materials practical course"</p> <ul style="list-style-type: none"> • „Organikum“ 23. Auflage (2009), WILEY-VCH Verlag, ISBN: 978-3-527-32451-1 • „Integriertes Organisch-Chemisches Praktikum (I.O.C.-Praktikum)“ Siegfried Hünig, Lehmanns (2012), ISBN: 978-3-86541-149-5 • „Praktikum Präparative Organische Chemie“ R. Brückner, Spektrum (2008), ISBN: 978-3-8274-1505-9. <p>Lecture "Biotechnological products"</p> <ul style="list-style-type: none"> • „Einführung in die Technische Chemie“, Arno Behr, Spektrum Akademischer Verlag (2010), ISBN: 978-3-8274-2073-2 • „Industrielle Mikrobiologie“ Garabed Antranikian, Springer Spektrum Verlag (2012), ISBN: 978-3-8274-3039-7 • "Biorefineries – Industrial Processes and Products" Birgit Kamm, WILEY-VCH (2010), ISBN: 978-3-527-32953-3 • "Catalysis for Renewables" Gabriele Centi, WILEY-VCH Publishing (2007), ISBN: 978-3-527-31788-2.
Forms of teaching and learning	<ul style="list-style-type: none"> • Organic chemistry II and natural materials (V), 2 SWS, 2 LP, 4th Semester • Organic chemistry II and natural materials practical course (P), 4 SWS, 5 LP, 4th Semester • Biotechnological products (V), 2 SWS, 2 LP, 3rd Semester
Workload	<p>Lecture "Organic chemistry II and natural materials" Attendance time: 30 h Individual study: 30 h</p> <p>Practical course "Organic chemistry II and natural materials practical course" Attendance time: 60 h Individual study: 90 h</p>

	<p>Lecture "Biotechnological products" Attendance time: 30 h Individual study: 30 h</p> <p>Total Attendance time: 120 h Individual study: 150 h Total: 270 h</p>
Evaluation method	<p>The examination is a written exam (90 minutes) covering the entire module. Participation in this written exam requires students to have successfully completed the prerequisite of the practical course "Organic chemistry II and natural materials practical course" (written composition, protocols).</p>
Grading	<p>The module grade corresponds to the result of the examination.</p>