



- 8 Päätösasia/Decision item: Master's Programme in Chemical, Biochemical and Materials Engineering – ohjelman seitsemän pääaineen ja pääaineita peilaavien sivuaineiden kurssikorvaavuudet siirtymäajalle 1.8.2024-31.12.2025 / Master's Programme in Chemical, Biochemical and Materials Engineering – course substitutions for the seven majors and minor subjects reflecting the majors for the transition period 1.8.2024-31.12.2025 (Pauliina Ketola)**

Perustelut/Justification

Aalto-yliopiston rehtori päätti 26.06.2023, kemian tekniikan korkeakoulun esityksen pohjalta, korkeakoulun Master's programme in Chemical, Biochemical and Materials Engineering -koulutusohjelman lakkauttamisesta 31.7.2024 neljän uuden maisteriohjelman perustamisen yhteydessä.

Kemian tekniikan akateeminen komitea päätti kokouksessaan 24.10.2023 kemian tekniikan korkeakoulun koulutusneuvoston esityksen pohjalta siirtymäkauden pituudesta ja siirtymisen poluista Master's programme in Chemical, Biochemical and Materials Engineering - ohjelmasta uusiin maisteriohjelmiin. Päätöksessä vahvistettiin siirtymäkaudeksi Chemical, Biochemical and Materials Engineering -maisterikoulutusohjelmalle 1.8.2024- 31.12.2025, ja todettiin, että opiskelijoilla, jotka aloittivat opintonsa Master's programme in Chemical, Biochemical and Materials Engineering -ohjelmassa ennen 1.8.2024, on oikeus jatkaa opintojaan ja valmistua siirtymäkauden ajan tästä lakkautettavasta ohjelmasta. Lisäksi Chemical, Biochemical and Materials Engineering -maisterikoulutusohjelmassa opiskelevat opiskelijat, jotka ovat suorittaneet kaikki opintonsa (mukaan lukien vapaavalintaiset opinnot), lukuun ottamatta 30 op:n laajuista opinnäytetyötä, 31.12.2025 mennessä, voivat suorittaa opinnäytetyönsä ja valmistua lakkautettavasta ohjelmasta 29.5.2026 saakka.

Lisäksi kemian tekniikan akateeminen komitea päätti kokouksessaan 6.2.2024 kemian tekniikan korkeakoulun koulutusneuvoston esityksen pohjalta lakkauttaa Master's programme in Chemical, Biochemical and Materials Engineering -maisterikoulutusohjelman pääaineita vastaavat sivuaineet, toisin sanoen sivuaineet Biomass Refining (CHEM3029), Biotechnology (CHEM3030), Chemistry (CHEM3032), Fibre and Polymer Engineering (CHEM3033), Functional Materials (CHEM3034), Sustainable Metals Processing (CHEM3035) ja Chemical and Process Engineering (CHEM3047) 31.7.2024. Näille sivuaineillekin vahvistettiin siirtymäkaudeksi 1.8.2024 - 31.12.2025.



Tämä päätösehdotus täydentää kahta esiteltyjä pääaineiden ja sivuaineiden lakkauttamista ja siirtymäkautta koskevia päätöksiä. Siirtymäjärjestelyt ajanjaksolle 1.8.2024 - 31.12.2025, eli mahdolliset kurssikorvaavuusjärjestelyt pää- tai sivuaineissa jatkaville opiskelijoille sen jälkeen, kun osaa kursseista ei enää opeteta opetussuunnitelmakauden 2022-2024 jälkeen, on kuvattu liitteissä 5a (pääaineet) ja 5b (sivuaineet).

In connect with establishing four new master programmes, the President of Aalto University decided on 26.06.2023, based on a proposal by the School of Chemical Engineering, to abolish the Master's programme in Chemical, Biochemical and Materials Engineering.

Based on the proposal by Degree Programme Committee, the Academic Committee for Chemical Engineering decided on the length of the transition period and the paths for the transition from Master's programme in Chemical, Biochemical and Materials Engineering to the new master's programmes in its meeting on 24.10.2023. The decision established a transition period for the Master's Programme in Chemical, Biochemical and Materials Engineering from 1.8.2024 to 31.12.2025 and stated that students who started their studies in the Master's programme in Chemical, Biochemical and Materials Engineering before 1.8.2024 have the right to continue their studies and graduate for a transitional period from this discontinued programme. In addition, students studying in the Master's programme in Chemical, Biochemical and Materials Engineering who have completed all their studies (including elective studies), with the exception of Thesis of 30 ECTS, by 31.12.2025, may complete their thesis and graduate from the discontinued programme until 29.5.2026.

In addition, in its meeting on 6.2.2024, based on a proposal by the Degree Programme Committee, the Academic Committee for Chemical Engineering decided to discontinue the minor subjects reflecting the major subjects of the Master's programme in Chemical, Biochemical and Materials Engineering, i.e. minor subjects Biomass Refining (CHEM3029), Biotechnology (CHEM3030), Chemistry (CHEM3032), Fibre and Polymer Engineering (CHEM3033), Functional Materials (CHEM3034), Sustainable Metals Processing (CHEM3035) and Chemical and Process Engineering (CHEM3047) 31.7.2024. A transition period of 1.8.2024 - 31.12.2025 was confirmed also for these minor subjects.

This proposal complements the above-mentioned decisions regarding abolition of majors and minors and transitional period. Arrangements for the transition period 1.8.2024 - 31.12.2025, i.e. possible course substitutions for students continuing in



their major or minor subjects when some of the courses will no longer be taught after the 2022-2024 curriculum period, are described in attachments 5a (majors) and 5b (minors).

Liitteet/Appendices

Liite/attachment 5a: Pääaineiden kurssikorvaavuudet, course substitutions for majors

Liite/attachment 5b: Sivuaineiden kurssikorvaavuudet, course substitutions for minors

Päätösesitys/Decision proposal

Vahvistetaan liitteiden 5a ja 5b mukaiset kurssikorvaavuusjärjestelyt siirtymäkaudelle 1.8.2024 - 31.12.2025 Master's programme in Chemical, Biochemical and Materials Engineering -koulutusohjelman pääaineissa ja Biomass Refining -, Biotechnology-, Chemistry-, Fibre and Polymer Engineering-, Functional Materials-, Sustainable Metals Processing- ja Chemical and Process Engineering- sivuaineissa jatkaville opiskelijoille Koulutusneuvoston esityksen mukaisesti.

Course substitution arrangements, as described in attachments 5a and 5b, will be confirmed for the transition period 1.8.2024 - 31.12.2025 for students continuing in the major subjects of the Master's programme in Chemical, Biochemical and Materials Engineering and in the minor subjects of Biomass Refining -, Biotechnology-, Chemistry-, Fibre and Polymer Engineering-, Functional Materials-, Sustainable Metals Processing- and Chemical and Process Engineering according to the proposal by the Degree Programme Committee.

Kokouskäsittely/Handling of the matter

Esittelijä pyysi valtuutusta tehdä tarvittaessa teknisiä korjauksia esiteltyihin asioihin. / *Presenting official requested a permission to make technical corrections to the matters presented, if needed.*

Päätös/Decision

Päätettiin esityksen mukaisesti. / *The motion was passed as proposed.*

Esittelijä valtuutettiin tekemään tarvittaessa teknisiä korjauksia. / *Presenting official was authorized to make technical corrections, if needed.*

Major: Biomass Refining

Master's Programme in Chemical, Biochemical and Materials Engineering

Course substitution arrangements for students who continue their studies according to the curriculum of 2022-2024 during the transitional period of 1.8.2024 - 31.12.2025, when some of the courses of the curriculum 2022-2024 are no longer taught.

Common compulsory courses (3–5 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>CHEM-E0105</u>	Academic Learning Community	3–5	Please contact the teacher
Compulsory courses (25–30 cr)			
Code	Course name	ECTS credits	Equivalence 1.8.2024 - 31.12.2025
<u>CHEM-E1100</u>	Plant Biomass*	5	CHEM-E1180 Plant Resources
<u>CHEM-E1110</u>	Lignocellulose Chemistry	5	No equivalence. Can be substituted by CHEM-E2121 Surface Chemistry of Bio-based Materials or CHEM-E2123 Characterization of Bio-based Materials
<u>CHEM-E1150</u>	Biomass Pretreatment and Fractionation – in Class D	5	CHEM-E1115 Biomass fractionation I D
<u>CHEM-E1210</u>	Bioproduct Mill Recovery Processes	5	The course continues
<u>CHEM-E1220</u>	Sustainability in Bioproduct Industry D	5	CHEM-E1170 Introduction to Sustainability in the Bioeconomy
<u>CHEM-E7100</u>	Engineering Thermodynamics, Separation Processes, part I D	5	CHEM-E7121 Separation Processes I D
*Compulsory course if not part of bachelor's degree			
Specialization courses in Pulp and Fibre track (30–35 cr)			
Code	Course name	ECTS credits	Equivalence 1.8.2024 - 31.12.2025
<u>CHEM-E0115</u>	Planning and Execution of a Biorefinery Investment Project	5	The course continues
<u>CHEM-E1160</u>	Biomass Pretreatment and Fractionation - in Laboratory	5	CHEM-E1125 Biomass fractionation II
<u>CHEM-E2120</u>	Fibres and Fibre Products	5	CHEM-E2122 Fibre Processes
<u>CHEM-E1105</u>	Advanced Fibreline Processes D	5	No equivalence. Can be substituted by CHEM-E2126 Introduction to the Packaging Value Chain

<u>CHEM-E1120</u>	Thermochemical Processes**	5	No equivalence. Can be substituted by CHEM-E1175 Sustainability Assessment for Bioproducts
<u>CHEM-E2140</u>	Cellulose-Based Fibres D**	5	CHEM-E2129 Nanocellulose Technology
<u>AAE-E2005</u>	Thermochemical Energy Conversion	5	The course continues

**Select one of these if CHEM-E1100 Plant Biomass is part of your compulsory studies

Specialization courses in Fuels and Chemicals track (30-35 cr)***

Code	Course name	ECTS credits	Equivalence 1.8.2024 - 31.12.2025
<u>CHEM-E1120</u>	Thermochemical Processes	5	No equivalence. Can be substituted by CHEM-E1175 Sustainability Assessment for Bioproducts
<u>CHEM-E1130</u>	Catalysis	5	The course continues
<u>CHEM-E2155</u>	Biopolymers D	5	The course continues
<u>CHEM-E2140</u>	Cellulose-Based Fibres D	5	CHEM-E2129 Nanocellulose Technology
<u>CHEM-E3140</u>	Bioprocess Technology II	5	CHEM-E3115 Industrial Biotechnology
<u>CHEM-E3190</u>	Metabolism D	5	The course continues
<u>AAE-E3100</u>	Energy Carriers	5	The course continues

Major: Biotechnology

Master's Programme in Chemical, Biochemical and Materials Engineering

Course substitution arrangements for students who continue their studies according to the curriculum of 2022-2024 during the transitional period of 1.8.2024 - 31.12.2025, when some of the courses of the curriculum 2022-2024 are no longer taught.

Common compulsory courses (3-5 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>CHEM-E0105</u>	Academic Learning Community	3-5	Please contact the teacher in charge of the course
Compulsory courses (45 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>CHEM-E3110</u>	Biolab I	5	Individual arrangements, please contact the teacher in charge of the course
<u>CHEM-E3121</u>	Microbial Physiology D	5	The course continues
<u>CHEM-E3190</u>	Metabolism D	5	The course continues
<u>CHEM-E3130</u>	Biolab II	5	CHEM-E3116 Laboratory Course in Industrial Biotechnology
<u>CHEM-E3140</u>	Bioprocess Technology II D	5	CHEM-E3115 Industrial Biotechnology D
<u>CHEM-E8120</u>	Cell Biology D	5	The course continues
<u>CHEM-E3150</u>	Biophysical Chemistry D	5	The course continues
<u>CHEM-E8115</u>	Cell Factory D	5	CHEM-E3111 Cell Engineering D
<u>CHEM-E3160</u>	Biolab III	5	CHEM-E3112 Laboratory Course in Molecular Biotechnology
Specialisation courses (choose 15 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>CHEM-E3205</u>	Bioprocess Optimization and Simulation D	5	The course continues
<u>AAE-E3100</u>	Energy Carriers D	5	The course continues
<u>CHEM-E4210</u>	Molecular Thermodynamics D	5	The course continues
<u>CHEM-E3170</u>	Systems Biology	5	Self-study material and exam (please contact Paula Jouhten)
<u>CHEM-E8125</u>	Synthetic Biology	5	The course continues
<u>CHEM-E7100</u>	Engineering Thermodynamics, Separation Processes, part 1 D	5	CHEM-E7121 Separation Processes 1 D

Major: Chemical and Process Engineering

Master's Programme in Chemical, Biochemical and Materials Engineering

Course substitution arrangements for students who continue their studies according to the curriculum of 2022-2024 during the transitional period of 1.8.2024 - 31.12.2025, when some of the courses of the curriculum 2022-2024 are no longer taught.

Common compulsory courses (3-5 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
CHEM-E0105	Academic Learning Community	3-5	Please contact the teacher
Compulsory courses (35 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
CHEM-E7100	Engineering Thermodynamics, Separation Processes, part I D	5	CHEM-E7121 Separation Processes 1 D
CHEM-E7120	Laboratory Project in Chemical Engineering	5	The course continues
CHEM-E7130	Process Modeling	5	The course continues
CHEM-E7190	Process Dynamics and Control D	5	The course continues
CHEM-E7150	Reaction Engineering	5	The course continues
CHEM-E7170	Design Project in Chemical Engineering, part A	5	CHEM-E7127 Principles of Plant and Process Design D
CHEM-E7180	Design Project in Chemical Engineering, part B	5	CHEM-E7210 Capstone Project for Plant Design D
Specialisation courses (25 cr), choose five courses.			
Recommended "blocks":			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
Chemical Engineering:			
CHEM-E7110	Engineering Thermodynamics, Separation Processes, part II D	5	CHEM-E7126 Separation Processes 2 D
CHEM-E7115	Experimental Assignments in Chemical Engineering	5	The course continues
CHEM-E7160	Fluid Flow in Process Units	5	The course continues
Reaction Engineering:			
CHEM-E7115	Experimental Assignments in Chemical Engineering	5	The course continues

<u>CHEM-E7135</u>	Reactor Design	5	The course continues
<u>CHEM-E1130</u>	Catalysis	5	The course continues
Polymer Engineering:			
<u>CHEM-E7115</u>	Experimental Assignments in Chemical Engineering	5	The course continues
<u>CHEM-E2130</u>	Polymer Properties D	5	The course continues
<u>CHEM-E2145</u>	Polymer Reaction Engineering D	5	The course continues
Plant Design:			
<u>CHEM-E7105</u>	Process Development	5	The course is discontinued. No replacement course
<u>CHEM-E7175</u>	Process Safety and Sustainability D	5	CHEM-E7220 Process Safety and Risk Management D
<u>CHEM-E7185</u>	Plant/Process Design and Business Management	5	CHEM-E7128 Plant Design Business Game
Process Systems Engineering:			
<u>CHEM-E7151</u>	Production Planning and Optimization	5	The course continues
<u>CHEM-E7225</u>	Advanced Process Control D	5	The course continues
<u>CHEM-E7215</u>	Special Course in Process Systems Engineering D	5	The course continues
For the elective studies to accompany the major, students specializing in process systems engineering are encouraged to select one or more courses from the following list:			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>MS-E2122</u>	Nonlinear Optimization	5	The course continues
<u>CS-EJ3211</u>	Machine Learning with Python	2	CHEM-E0113 Introduction to MATLAB and Python
<u>ENG-A1003</u>	Numerical Methods in Engineering	5	The course continues
<u>MS-C2105</u>	Introduction to Optimization	5	The course continues
<u>MS-A0503*</u>	First course in probability and statistics	5	The course continues
<u>MS-A0504*</u>	Todennäköisyyslaskennan ja tilastotieteen peruskurssi	5	The course continues
<u>CS-E4710</u>	Machine Learning: Supervised Methods	5	CS-E4715 Supervised Machine Learning

Major: Chemistry

Master's Programme in Chemical, Biochemical and Materials Engineering

Course substitution arrangements for students who continue their studies according to the curriculum of 2022-2024 during the transitional period of 1.8.2024 - 31.12.2025, when some of the courses of the curriculum 2022-2024 are no longer taught.

Common compulsory courses (3–5 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>CHEM-E0105</u>	Academic Learning Community	3–5	Please contact the teacher
Compulsory courses (35 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>CHEM-E4101</u>	Laboratory Work in Inorganic Chemistry *	5	The course continues
<u>CHEM-E4102</u>	Laboratory Work in Organic Chemistry *	5	The course continues
<u>CHEM-E4103</u>	Laboratory Work in Physical Chemistry *	5	CHEM-E4119 Laboratory Work in Electrochemistry and Physical Chemistry
<u>CHEM-E4110</u>	Quantum mechanics and Spectroscopy	5	CHEM-C3230 Molecular Quantum Mechanics
<u>CHEM-E4120</u>	Quantitative Instrumental Analysis	5	CHEM-E4112 Research Techniques
<u>CHEM-E4130</u>	Chemistry of the Elements	5	The course continues
<u>CHEM-E4170</u>	Advanced Organic Chemistry	5	The course continues
Specialisation courses (30 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
Analytical Chemistry:			
<u>CHEM-E4135</u>	Advanced Analytical Chemistry	5	Course is discontinued, no direct equivalences. Not a compulsory course. Courses from University of Helsinki could be used as substitute.
<u>CHEM-E4165</u>	Chemical Instrumentation and Electroanalytical Methods	5	Course is discontinued, no direct equivalences. Not a compulsory course. Courses from University of Helsinki could be used as substitute.
Organic Chemistry:			
<u>CHEM-E4116</u>	Synthesis Strategies and Design	5	The course continues
<u>CHEM-E4230</u>	Physical Organic Chemistry	5	The course continues

CHEM-E4206	Organic Chemistry Literature Club	5	The course continues
CHEM-E4108	Modern Methods in Metal Catalysis	5	The course continues
CHEM-E8100	Organic Structural Analysis	5	The course continues
CHEM-E4102	Laboratory Work in Organic Chemistry **	5	The course continues

Inorganic Chemistry:

CHEM-E4105	Nanochemistry and Nanoengineering	5	The course continues
CHEM-E4155	Solid State Chemistry	5	The course continues
CHEM-E4205	Crystallography Basics and Structural Characterization	5	The course continues
CHEM-E4215	Functional Inorganic Materials	5	The course continues
CHEM-E4101	Laboratory Work in Inorganic Chemistry **	5	The course continues

Physical and Computational Chemistry:

CHEM-E4115	Computational Chemistry I D	5	CHEM-E4114 Computational Methods
CHEM-E4106	Electrochemistry D	5	The course continues
CHEM-E4107	Laboratory work in Electrochemistry D	3(-5)	CHEM-E4119 Laboratory Work in Electrochemistry and Physical Chemistry
CHEM-E4210	Molecular Thermodynamics D	5	The course continues
CHEM-E4225	Computational Chemistry II D	5	CHEM-E4126 Atomic-level Modelling Using Computational Chemistry Methods
CHEM-E4235	Transport Processes at Electrodes and Membranes D	5	No replacement
CHEM-E4255	Electrochemical Energy Conversion D	5	The course continues
CHEM-E4103	Laboratory Work in Physical Chemistry **	5	CHEM-E4119 Laboratory Work in Electrochemistry and Physical Chemistry

Common Courses:

CHEM-E4275	Research project in chemistry I	5	CHEM-E4121, Research project in chemistry and materials science I
CHEM-E4285	Research project in chemistry II	5	CHEM-E4122, Research project in chemistry and materials science II

** If not part of your compulsory studies

For specialisation courses you can also choose courses offered by University of Helsinki (more information in wiki)

In addition, students may include MSc-level Chemistry courses from the University of Helsinki, as per the agreement on *Shared Chemistry Studies in the Helsinki Region*. This agreement is between the Aalto University and the University of Helsinki, and the shared courses are confirmed on an annual basis.

Major: Fibre and Polymer Engineering

Master's Programme in Chemical, Biochemical and Materials Engineering

Course substitution arrangements for students who continue their studies according to the curriculum of 2022-2024 during the transitional period of 1.8.2024 - 31.12.2025, when some of the courses of the curriculum 2022-2024 are no longer taught.

Common compulsory courses (3–5 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
CHEM-E0105	Academic Learning Community	3–5	Please contact the teacher
Compulsory courses (40 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
CHEM-E2100	Polymer Synthesis	5	The course continues
CHEM-E2110	Polymer Technology Laboratory Exercises	5	CHEM-E7125 Experimental Assignments in Chemical Engineering
CHEM-E2120	Fibres and Fibre Products	5	CHEM-E2122 Fibre Processes
CHEM-E2130	Polymer Properties	5	The course continues
CHEM-E2140	Cellulose-based Fibres D	5	CHEM-E2129 Nanocellulose Technology
CHEM-E2150	Interfacial Phenomena in Biobased Systems D	5	CHEM-E2121 Surface Chemistry of Bio-based Materials D
CHEM-E2160	Product Development Practices	5	CHEM-E1170 Introduction to Sustainability in the Bioeconomy D *
CHEM-E2200	Polymer Blends and Composites	5	The course offered for the last time in 2024-2025
Specialisation courses (choose 20 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
CHEM-E2225	Wood Material Science	5	The course continues
CHEM-E2235	Wood Products and Processes	5	The course continues
CHEM-E2125	Web-based Natural Fibre Products	5	CHEM-E2236 Board manufacture project course (the first time in autumn 2025). In 2024-2025, a book exam can be arranged.

<u>CHEM-E2135</u>	Converting of Web-based Products	5	CHEM-E2230 Packaging Surface Modification and Coating. Organised for the first time fall 2025. In 2024-2025 book exam can be arranged (please contact Eero Hiltunen).
<u>CHEM-E2145</u>	Polymer Reaction Engineering D	5	The course continues
<u>CHEM-E2155</u>	Biopolymers D	5	The course continues
<u>CHEM-E2165</u>	Computer Aided Visualization and Scientific Presentation D	3-5	The course continues
<u>CHEM-E2170</u>	Advanced Wood Science D	5	The course continues
<u>CHEM-E2195</u>	Interfacial Phenomena in Renewable Materials Research Project D	5-10	Individual assignment can be arranged (please contact Juan Valle Delgado)
<u>CHEM-E2205</u>	Materials for a World in Transition D	5	The course continues
<u>CHEM-E2215</u>	Coatings	5	The course offered for the last time in 2024-2025
<u>CHEM-E2220</u>	Product Development Project Course	5	CHEM-E2236 Board manufacture project course or CHEM-E2230 Packaging Surface Modification and Coating
<u>CHEM-E1220</u>	Sustainability in Bioproduct Industry D	5	CHEM-E1170 Introduction to Sustainability in the Bioeconomy D *
			*If students want a second sustainability course in addition to CHEM-E1170 Introduction to Sustainability in the Bioeconomy D, please select Sustainability Assessments for Bioproducts D

Major: Functional Materials

Master's Programme in Chemical, Biochemical and Materials Engineering

Course substitution arrangements for students who continue their studies according to the curriculum of 2022-2024 during the transitional period of 1.8.2024 - 31.12.2025, when some of the courses of the curriculum 2022-2024 are no longer taught.

Common compulsory courses (3–5 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>CHEM-E0105</u>	Academic Learning Community	3–5	Please contact the teacher
Choose total 60 credits from compulsory core courses (35–40 cr) and Specialisation courses (20–25 cr)			
Compulsory core courses (35–40 cr)			
<i>If CHEM-C3410 Nanomaterials is part of your BSc studies, choose 35 cr, if not choose all the following courses.</i>			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>CHEM-E5140</u>	Materials Characterization, laboratory course	5	The course continues
<u>CHEM-E4155</u>	Solid State Chemistry	5	The course continues
<u>CHEM-E4105</u>	Nanochemistry and Nanoengineering	5	The course continues
<u>CHEM-E5150</u>	Surfaces and Films	5	CHEM-E5170 Surfaces and Films
<u>CHEM-E5160</u>	Functional Soft Materials D	5	The course continues
<u>CHEM-C3410</u>	Nanomaterials*	5	The course continues
<u>CHEM-E5200</u>	Personal Research Assignment in Functional Materials, V	5	CHEM-E4121 Research Project in Chemistry and Materials Science I (+ CHEM-E4122 Research Project in Chemistry and Material Science II 5cr, if student makes 2 x 5 cr project)
<u>CHEM-E5220</u>	Group Research Assignment in Functional Materials, V	5	MEC-E3007 Product Sustainability
*If not part of your bachelor studies.			

Specialisation courses (choose 20–25 cr)

Choose 20–25 cr to fulfil the requirement of 60 cr of master studies.

The tracks are only recommendation, you may choose any combination of the courses below

Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
MEMS and microsensors:			
CHEM-E5125	Thin Film Technology D	5	CHEM-E5175 Materials Engineering by Thin Films
ELEC-E8715	Design and Analysis of MEMS P	5	The course continues
ELEC-E3220	Semiconductor Devices	5	The course continues
CHEM-E5115	Microfabrication D	5	The course continues
CHEM-E5230	Advanced Micro- and Nanotechnology D	8	Discontinued. No replacement
ELEC-E8713	Materials and Microsystems Integration	5	ELEC-E8716 Heterogeneous Integration D
ELEC-E3140	Semiconductor Physics	5	The course continues
ELEC-E8726	Biosensing	5	The course continues
CHEM-E8135	Microfluidics and BioMEMS D	5	The course continues
CHEM-E5240	Advanced Materials Characterization D	5	Discontinued. No replacement
NBE-E4150	DNA Nanotechnology	5	The course continues
ELEC-E9210	Organic Electronics: Materials and Devices P	5	The course continues
Solid state and nanoscience track:			
CHEM-E4205	Crystallography Basics and Structural Characterization	5	The course continues
CHEM-E5240	Advanced Materials Characterization D	5	Discontinued. No replacement
CHEM-E4215	Functional Inorganic Materials	5	The course continues
MEC-E6001	Engineering Metals and Alloys D	5	The course continues
CHEM-E5105	Powder Metallurgy and Composites D	5	The course continues
PHYS-E0421	Solid-State Physics	5	Discontinued. No replacement
ELEC-E3140	Semiconductor Physics	5	The course continues
PHYS-E0525	Microscopy of Nanomaterials	5	The course continues
PHYS-E0526	Microscopy of Nanomaterials, laboratory course	5	The course continues
ELEC-E4810	Metamaterials and Nanophotonics D	5	Discontinued. No replacement

Polymers, soft matter and bio track:

<u>CHEM-E2200</u>	Polymer Blends and Composites	5	The course continues for the academic year 2024-2025 only
<u>CHEM-E2130</u>	Polymer Properties	5	The course continues
<u>CHEM-E8135</u>	Microfluidics and BioMEMS D	5	The course continues
<u>ELEC-E8726</u>	Biosensing	5	The course continues
<u>CHEM-E4210</u>	Molecular Thermodynamics D	5	The course continues
<u>CHEM-E2100</u>	Polymer Synthesis	5	The course continues
<u>CHEM-E2155</u>	Biopolymers D	5	The course continues
<u>ELEC-E8724</u>	Biomaterials science	5	ELEC-E8729 Biomaterial Interfaces D
<u>ELEC-E8729</u>	Biomaterial Interfaces D	5	The course continues
<u>PHYS-E0422</u>	Soft Condensed Matter Physics	5	The course continues
<u>MEC-E7006</u>	Advanced Manufacturing D	5	The course continues
<u>NBE-E4150</u>	DNA Nanotechnology	5	The course continues
<u>ELEC-E9210</u>	Organic Electronics: Materials and Devices P	5	The course continues

Major: Sustainable Metals Processing

Master's Programme in Chemical, Biochemical and Materials Engineering

Course substitution arrangements for students who continue their studies according to the curriculum of 2022-2024 during the transitional period of 1.8.2024 - 31.12.2025, when some of the courses of the curriculum 2022-2024 are no longer taught.

Common compulsory courses (3–5 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
CHEM-E0105	Academic Learning Community	3–5	Please contact the teacher
Compulsory core courses (40 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
CHEM-E6100	Fundamentals of Chemical Thermodynamics	5	The course continues
CHEM-E6130	Metal Recycling Technologies	5	CHEM-E6230 Recycling Technologies D
CHEM-E6140	Fundamentals of Minerals Engineering and Recycling	5	The course continues
CHEM-E6160	Fundamentals of Pyrometallurgy	5	The course continues
CHEM-E6180	Fundamentals of Hydrometallurgy	5	The course continues
CHEM-E7130	Process Modeling	5	The course continues
CHEM-E6225	Technical Innovation Project D	10	The course continues
Specialisation courses (choose a total of 20 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
Thermodynamics of Materials:			
CHEM-E6105	Thermodynamics of Solutions D	5	The course continues
CHEM-E6115	Thermodynamics of Modeling and Simulation D	5	CHEM-L2180 Thermodynamics of Modeling and Simulation
Sustainability of Metals:			
CHEM-E6215	Circular Economy Design Forum D	5	The course continues
CHEM-E6235	Circular Economy for Materials Processing	5	The course continues

Ore Dressing and Recycling:			
<u>CHEM-E6145</u>	Unit Operations in Mineral Processing and Recycling	5	The course continues
<u>CHEM-E7170*</u>	Design Project in Chemical Engineering, part A	5	CHEM-E7127 Principles of Plant and Process Design D**
<u>CHEM-E7180*</u>	Design Project in Chemical Engineering, part B	5	CHEM-E7210 Capstone Project for Plant Design D**
*Students completing <i>CHEM-E7170 Design Project in Chemical Engineering, part A</i> also need to complete <i>CHEM-E7180 Design project in Chemical Engineering, part B</i>			
**Students completing CHEM-E7127 Principles of Plant and Process Design D also need to complete CHEM-E7210 Capstone Project for Plant Design D			
Pyrometallurgy:			
<u>CHEM-E6165</u>	Unit Processes in Pyrometallurgy	5	The course continues
<u>CHEM-E7170*</u>	Design Project in Chemical Engineering, part A	5	CHEM-E7127 Principles of Plant and Process Design D**
<u>CHEM-E7180*</u>	Design Project in Chemical Engineering, part B	5	CHEM-E7210 Capstone Project for Plant Design D**
*Students completing <i>CHEM-E7170 Design Project in Chemical Engineering, part A</i> also need to complete <i>CHEM-E7180 Design project in Chemical Engineering, part B</i>			
**Students completing CHEM-E7127 Principles of Plant and Process Design D also need to complete CHEM-E7210 Capstone Project for Plant Design D			
Hydrometallurgy:			
<u>CHEM-E6185</u>	Applied Electrochemistry and Corrosion	5	The course continues
<u>CHEM-E7170*</u>	Design Project in Chemical Engineering, part A	5	CHEM-E7127 Principles of Plant and Process Design D**
<u>CHEM-E7180*</u>	Design Project in Chemical Engineering, part B	5	CHEM-E7210 Capstone Project for Plant Design D**
*Students completing <i>CHEM-E7170 Design Project in Chemical Engineering, part A</i> also need to complete <i>CHEM-E7180 Design project in Chemical Engineering, part B</i>			
**Students completing CHEM-E7127 Principles of Plant and Process Design D also need to complete CHEM-E7210 Capstone Project for Plant Design D			
Chemical Engineering:			
<u>CHEM-E7150</u>	Reaction Engineering	5	The course continues
<u>CHEM-E7120</u>	Laboratory Project in Chemical Engineering	5	The course continues
For the elective studies to accompany the major, students can choose an individual research project related to their specialization studies:			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>CHEM-E6210</u>	Individual Research Project V D	5 or 10	The course continues

Minor: Biomass Refining

Course substitution arrangements for students who continue their studies according to the curriculum of 2022-2024 during the transitional period of 1.8.2024 - 31.12.2025, when some of the courses of the curriculum 2022-2024 are no longer taught.

Compulsory course (5 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
CHEM-E1100	Plant Biomass	5	CHEM-E1180 Plant Resources
Elective courses			
CHEM-E1110	Lignocellulose Chemistry	5	No equivalence. Can be substituted by CHEM-E2121 Surface Chemistry of Bio-based Materials or CHEM-E2123 Characterization of Bio-based Materials
CHEM-E0115	Planning and Execution of a Biorefinery Investment Project	5	The course continues
CHEM-E7100	Engineering Thermodynamics, Separation Processes, part I D	5	CHEM-E7121 Separation Processes 1 D
CHEM-E1210	Bioproduct Mill Recovery Processes	5	The course continues
CHEM-E1120	Thermochemical Processes	5	No equivalence. Can be substituted by CHEM-E1175 Sustainability Assessment for Bioproducts
CHEM-E1130	Catalysis	5	The course continues
CHEM-E1220	Sustainability in Bioproduct Industry D	5	CHEM-E1170 Introduction to Sustainability in the Bioeconomy
CHEM-E3140	Bioprocess Technology II	5	CHEM-E3115 Industrial Biotechnology
CHEM-E1150	Biomass Pretreatment and Fractionation – in Class D	5	CHEM-E1115 Biomass fractionation I D
CHEM-E1160	Biomass Pretreatment and Fractionation - in Laboratory	5	CHEM-E1125 Biomass fractionation II
CHEM-E1105	Advanced Fibreline Processes D	5	No equivalence. Can be substituted by CHEM-E2126 Introduction to the Packaging Value Chain
CHEM-E2120	Fibres and Fibre Products	5	CHEM-E2122 Fibre Processes
CHEM-E2140	Cellulose-Based Fibres D	5	CHEM-E2129 Nanocellulose Technology
CHEM-E2155	Biopolymers D	5	The course continues
AAE-E2005	Thermochemical Energy Conversion	5	The course continues
AAE-E3100	Energy Carriers	5	The course continues

Minor: Biotechnology

Course substitution arrangements for students who continue their studies according to the curriculum of 2022-2024 during the transitional period of 1.8.2024 - 31.12.2025, when some of the courses of the curriculum 2022-2024 are no longer taught.

Compulsory courses (15 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>CHEM-E3190</u>	Metabolism D	5	The course continues
<u>CHEM-E3121</u>	Microbial Physiology D	5	The course continues
<u>CHEM-E3140</u>	Bioprocess Technology II D	5	CHEM-E3115 Industrial Biotechnology D
Elective courses			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>CHEM-E3150</u>	Biophysical Chemistry D	5	The course continues
<u>CHEM-E3170</u>	Systems Biology	5	Self-study material and exam (please contact Paula Jouhten)
<u>CHEM-E3205</u>	Bioprocess Optimization and Simulation D	5	The course continues
<u>CHEM-E8115</u>	Cell Factory D	5	CHEM-E3111 Cell Engineering D
<u>CHEM-E8120</u>	Cell Biology D	5	The course continues
<u>CHEM-E8125</u>	Synthetic Biology	5	The course continues

Minor: Chemical and Process Engineering

Course substitution arrangements for students who continue their studies according to the curriculum of 2022-2024 during the transitional period of 1.8.2024 - 31.12.2025, when some of the courses of the curriculum 2022-2024 are no longer taught.

Mandatory courses (15-20 credits)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>CHEM-E7100</u>	Engineering Thermodynamics, Separation Processes, part I D	5	CHEM-E7121 Separation Processes 1 D
<u>CHEM-E7130</u>	Process Modeling	5	The course continues
<u>CHEM-E7190</u>	Process Dynamics and Control D	5	The course continues
<u>CHEM-E7150</u>	Reaction Engineering	5	The course continues
Elective courses (0-10 credits)			
Choose so many courses from the list below that the minor will be at least 20 cr.			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>CHEM-E7105</u>	Process Development	5	The course is discontinued. No replacement course
<u>CHEM-E7110</u>	Engineering Thermodynamics, Separation Processes, part II D	5	CHEM-E7126 Separation Processes 2 D
<u>CHEM-E7115</u>	Experimental Assignments in Chemical Engineering	5	The course continues
<u>CHEM-E7135</u>	Reactor Design	5	The course continues
<u>CHEM-E7151</u>	Production Planning and Optimization	5	The course continues
<u>CHEM-E7160</u>	Fluid Flow in Process Units	5	The course continues
<u>CHEM-E7225</u>	Advanced Process Control D	5	The course continues
<u>CHEM-E1130</u>	Catalysis	5	The course continues
<u>CHEM-E2145</u>	Polymer Reaction Engineering D	5	The course continues

Minor: Chemistry

Course substitution arrangements for students who continue their studies according to the curriculum of 2022-2024 during the transitional period of 1.8.2024 - 31.12.2025, when some of the courses of the curriculum 2022-2024 are no longer taught.

Compulsory courses (20 credits)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
CHEM-E4110	Quantum Mechanics and Spectroscopy	5	CHEM-C3230 Molecular Quantum Mechanics
CHEM-E4120	Quantitative Instrumental Analysis	5	CHEM-E4112 Research Techniques
CHEM-E4130	Chemistry of the Elements	5	The course continues
CHEM-E4170	Advanced Organic Chemistry	5	The course continues
Elective course (0-5 credits)			
Select 0-1 courses below so that the minor will be 20-25 cr.			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
Analytical Chemistry:			
CHEM-E4135	Advanced Analytical Chemistry	5	Course is discontinued, no direct equivalences. Not a compulsory course. Courses from University of Helsinki could be used as substitute.
CHEM-E4165	Chemical Instrumentation and Electroanalytical Methods	5	Course is discontinued, no direct equivalences. Not a compulsory course. Courses from University of Helsinki could be used as substitute.
Organic Chemistry:			
CHEM-E4116	Synthesis Strategies and Design	5	The course continues
CHEM-E4230	Physical Organic Chemistry	5	The course continues
CHEM-E4206	Organic Chemistry Literature Club	5	The course continues
CHEM-E4108	Modern Methods in Metal Catalysis D	5	The course continues
CHEM-E8100	Organic Structural Analysis	5	The course continues
Inorganic Chemistry:			
CHEM-E4105	Nanochemistry and Nanoengineering	5	The course continues
CHEM-E4155	Solid State Chemistry	5	The course continues
CHEM-E4205	Crystallography Basics and Structural Characterization	5	The course continues
CHEM-E4215	Functional Inorganic Materials	5	The course continues

Physical and Computational Chemistry:			
<u>CHEM-E4115</u>	Computational Chemistry I D	5	CHEM-E4114 Computational Methods
<u>CHEM-E4106</u>	Electrochemistry D	5	The course continues
<u>CHEM-E4210</u>	Molecular Thermodynamics L	5	The course continues
<u>CHEM-E4225</u>	Computational Chemistry II D	5	CHEM-E4126 Atomic-level Modelling Using Computational Chemistry Methods
<u>CHEM-E4235</u>	Transport Processes at Electrodes and Membranes	5	Discontinued. No replacement course.
<u>CHEM-E4255</u>	Electrochemical Energy Conversion	5	The course continues

Minor: Fibre and Polymer Engineering

Course substitution arrangements for students who continue their studies according to the curriculum of 2022-2024 during the transitional period of 1.8.2024 - 31.12.2025, when some of the courses of the curriculum 2022-2024 are no longer taught.

Elective courses (20-25 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>CHEM-E2100</u>	Polymer Synthesis	5	The course continues
<u>CHEM-E2120</u>	Fibres and Fibre Products	5	CHEM-E2122 Fibre Processes
<u>CHEM-E2130</u>	Polymer Properties	5	The course continues
<u>CHEM-E2140</u>	Cellulose-based Fibres D	5	CHEM-E2129 Nanocellulose Technology
<u>CHEM-E2150</u>	Interfacial Phenomena in Biobased Systems D	5	CHEM-E2121 Surface Chemistry of Bio-based Materials D
<u>CHEM-E2160</u>	Product Development Practices	5	CHEM-E1170 Introduction to Sustainability in the Bioeconomy D
<u>CHEM-E2225</u>	Wood Material Science	5	The course continues
<u>CHEM-E2235</u>	Wood Products and Processes	5	The course continues
<u>CHEM-E2125</u>	Web-based Natural Fibre Products	5	CHEM-E2236 Board manufacture project course (the first time in autumn 2025). In 2024-2025, a book exam can be arranged.
<u>CHEM-E2135</u>	Converting of Web-based Products	5	CHEM-E2230 Packaging Surface Modification and Coating. Organised for the first time fall 2025. In 2024-2025, a book exam can be arranged (please contact Eero Hiltunen).
<u>CHEM-E2145</u>	Polymer Reaction Engineering D	5	The course continues
<u>CHEM-E2155</u>	Biopolymers D	5	The course continues
<u>CHEM-E2200</u>	Polymer Blends and Composites	5	The course offered for the last time in 2024-2025
<u>CHEM-E2220</u>	Product Development Project Course	5	CHEM-E2236 Board manufacture project course or CHEM-E2230 Packaging Surface Modification and Coating

Minor: Functional Materials

Course substitution arrangements for students who continue their studies according to the curriculum of 2022-2024 during the transitional period of 1.8.2024 - 31.12.2025, when some of the courses of the curriculum 2022-2024 are no longer taught.

Elective courses (20-25 cr)			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>CHEM-E5160</u>	Functional Soft Materials D	5	The course continues
<u>CHEM-C3410</u>	Nanomaterials	5	The course continues
<u>CHEM-E5140</u>	Materials Characterization, laboratory course	5	The course continues
<u>CHEM-E5150</u>	Surfaces and Films	5	CHEM-E5170 Surfaces and Films
<u>CHEM-E4155</u>	Solid State Chemistry	5	The course continues
<u>CHEM-E4105</u>	Nanochemistry and Nanoengineering	5	The course continues

Minor: Sustainable Metals Processing

Course substitution arrangements for students who continue their studies according to the curriculum of 2022-2024 during the transitional period of 1.8.2024 - 31.12.2025, when some of the courses of the curriculum 2022-2024 are no longer taught.

Elective courses (20-25 credits)			
Choose courses from the list below so that the minor will be at least 20 cr			
Code	Course name	ECTS credits	Equivalence in 1.8.2024 - 31.12.2025
<u>CHEM-E6100</u>	Fundamentals of Chemical Thermodynamics	5	The course continues
<u>CHEM-E6130</u>	Metal Recycling Technologies	5	CHEM-E6230 Recycling Technologies D
<u>CHEM-E6140</u>	Fundamentals of Minerals Engineering and Recycling	5	The course continues
<u>CHEM-E6160</u>	Fundamentals of Pyrometallurgy	5	The course continues
<u>CHEM-E6180</u>	Fundamentals of Hydrometallurgy	5	The course continues
<u>CHEM-E7130</u>	Process Modeling	5	The course continues
<u>CHEM-E6225</u>	Technical Innovation Project D	10	The course continues
<u>CHEM-E6105</u>	Thermodynamics of Solutions D	5	The course continues
<u>CHEM-E6115</u>	Thermodynamics of Modeling and Simulation D	5	CHEM-L2180 Thermodynamics of Modeling and Simulation
<u>CHEM-E6215</u>	Circular Economy Design Forum D	5	The course continues
<u>CHEM-E6235</u>	Circular Economy for Materials Processing	5	The course continues
<u>CHEM-E6145</u>	Unit Operations in Mineral Processing and Recycling	5	The course continues
<u>CHEM-E6165</u>	Unit Processes in Pyrometallurgy	5	The course continues
<u>CHEM-E6185</u>	Applied Electrochemistry and Corrosion	5	The course continues
<u>CHEM-E7150</u>	Reaction Engineering	5	The course continues
<u>CHEM-E6210</u>	Individual Research Project V D	5	The course continues