Programme review

2022

18.8.2022

Aalto University
School of Chemical
Engineering

Programme for today

klo 11.30-12 Lunch

klo 12-12.30 Summary and review of the academic year 2021-2022

- **Overview of the strategy implementation**
- **KPI targets**
- **Admissions**

12.30-14.15 Working with our education portfolio

14.15-14.50 Presenting the workshop results

klo 14.50-15 Ending the session

Review of the academic year

- Overview of the strategy implementation
- KPI targets
- Admissions

Strategy implementation

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Curriculum 2022-2024 finalized with many milestones achieved

CHEM Sustainability in Education-project:

- Baseline of sustainability knowledge defined for all students (2022-2024 curriculum period)
- Sustainability goals defined, marked and used in programmes majors and courses (2022-2024 curriculum period)
- Sustainability will be logically included in programmes and will be visible for students and applicants (2022)
- Securing sustainability knowledge for teachers (2022-2024 curriculum period)

Included in the CHEM curriculum work, e.g. BSc programme changes

- High workload courses and bottleneck courses are recognized. Corrective actions created. (2021-2024)
- Entrepreneurial and business elements connected to selected courses in BSc and MSc programmes (2022)
- Learning results in centre. Revision of assessment principles for curriculum period 2022-2024.

Aalto level projects:

- Effective utilisation of student feedback on good practices in teaching and learning (2022-2024)
- Continuous learning needs evaluated and contents defined (2022) -> current focus on portfolio renewal and links to lwl will be defined
- Criteria for creating and discontinuing programmes and majors is decided (2021) - discontinuation guidelines still wait for development

Other education milestones

Work ongoing

- Teachers' workload will be made more even (2021-2022)
- Clarifying roles and responsibilities of professors and lecturers. Create system of substituting in teaching. (2021-2022)

Teacher workload and responsibilities work ongoing especially in the departments

- Defining target level of teacher's digipedagogical knowledge (2021) Target level reached with continuous education (2024)
- Using lessons learned from remote teaching in spring 2020 to develop digital learning for curriculum (2022-2024).
- 100 % of courses utilize digital learning content and methods, at least MyCourses. (2022)

Project ongoing for developing digipedagogical competences

- Resourcing for "growth with quality" is solved by 2022.
- Resourcing for continuous learning is secured (2022)
- Continuing support for CHEMARTS and other multidisciplinary actions. (2021-2024)
- Students are more involved in planning and developing programmes and courses (2021-2024)

Aalto development as part of CHEM strategy implementation:

- Programme management clear (2022)
- User-centric development of support services. (2021-2024)

As part of yearly planning and ongoing operations

Education KPIs

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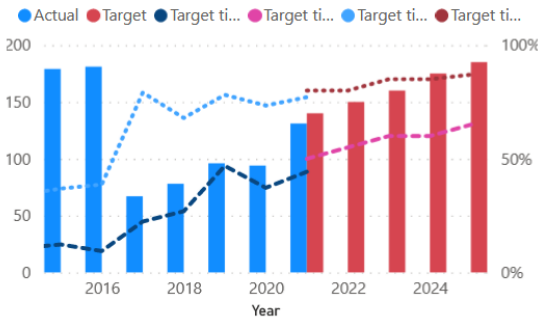
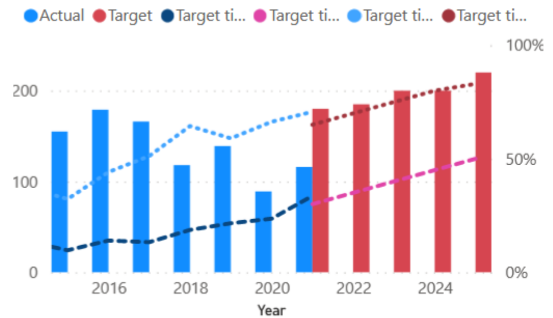
Education KPIs

Bachelor's degrees, number of. Target times, share of.

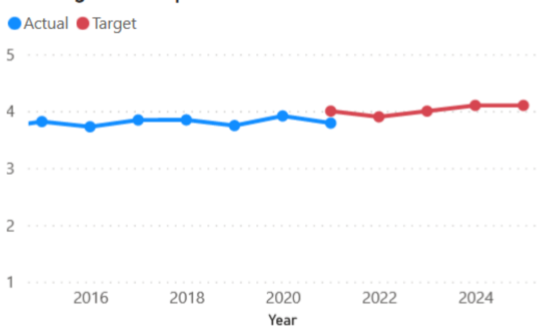


Master's degrees, number of. Target times, share of.

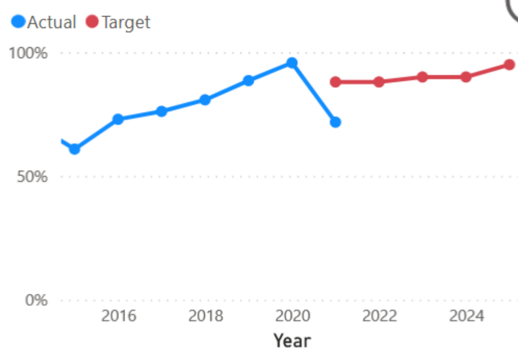


Doctoral degrees, number of

Bachelor's feedback, average assessment for funding model questions



Bachelor's feedback, response rate



Continuous learning, number of credits

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Degrees in target time

:ompletion

21.7%
Share of degrees completed in target time

55.2%
Share of degrees completed in target time plus one year

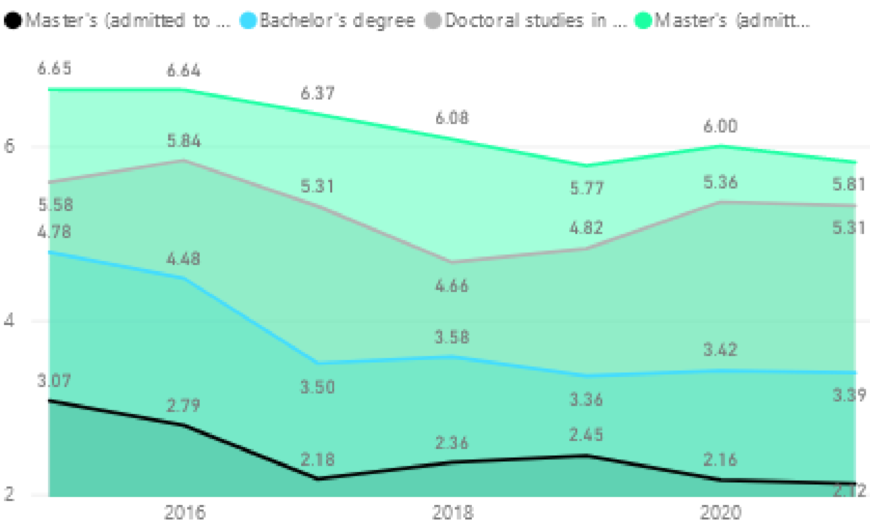
3.82
Median duration of bachelor's studies

6.25
Median duration of master's studies (target time 5 years)

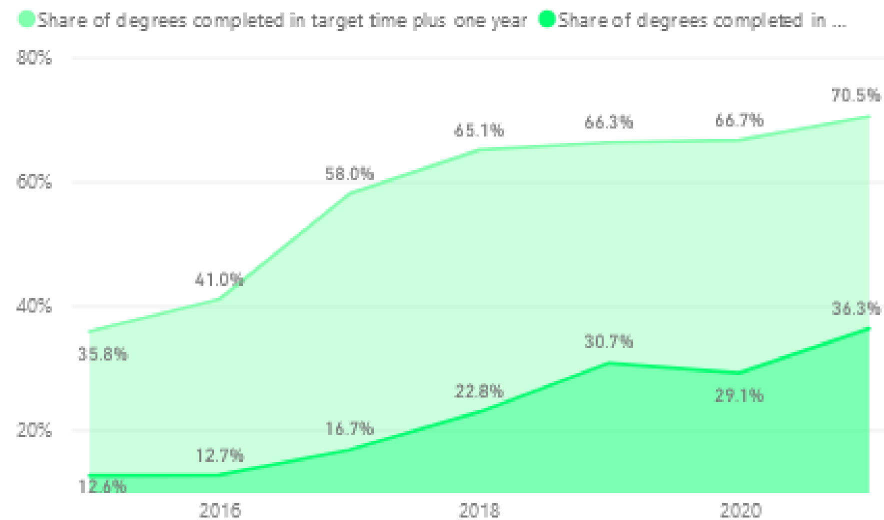
2.34
Median duration of master's studies (target time 2 years)

5.13
Median duration of doctoral studies

Median duration of studies in years by Degree year



Share of degrees completed in target time by Degree year



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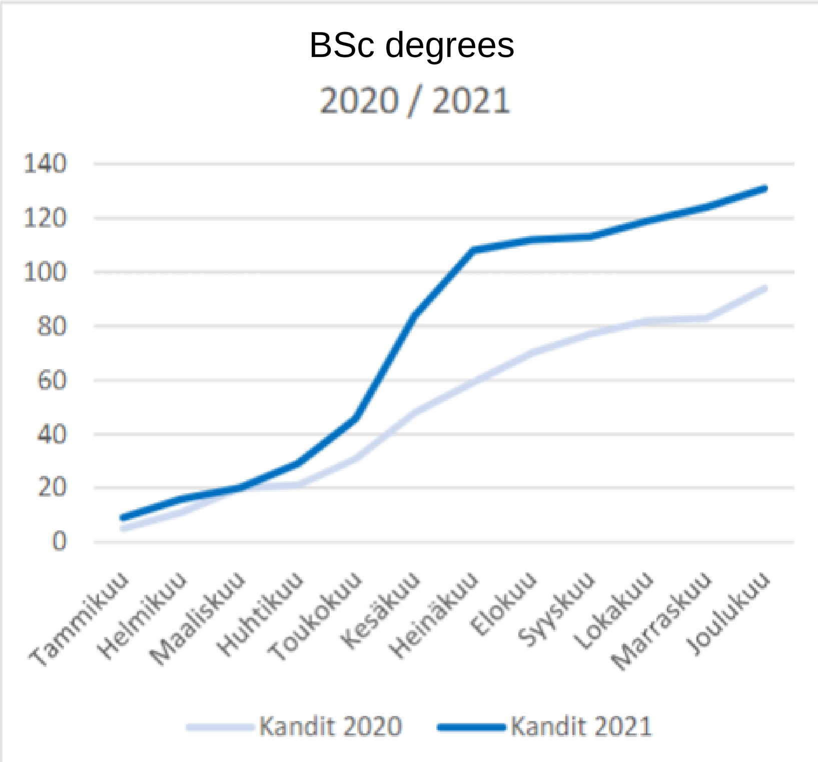
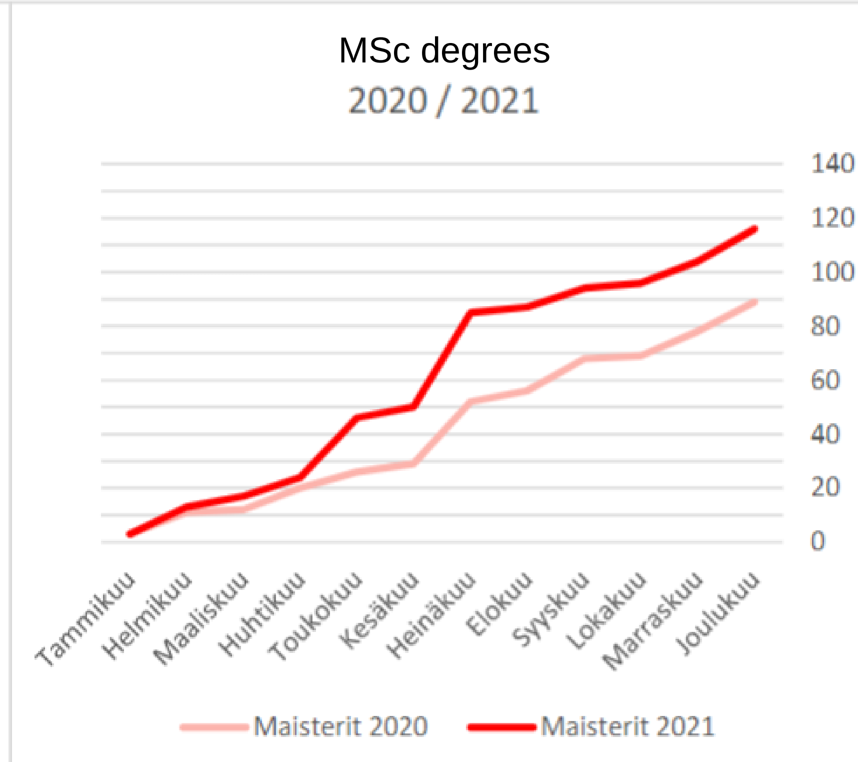

BSc degrees
2020 / 2021
140
120
100
80
60
40
20
0
Tammikuu
Helmikuu
Maaliskuu
Huhtikuu
Toukokuu
Kesäkuu
Heinäkuu
Elokuu
Syyskuu
Lokakuu
Marraskuu
Joulukuu
Kandit 2020
Kandit 2021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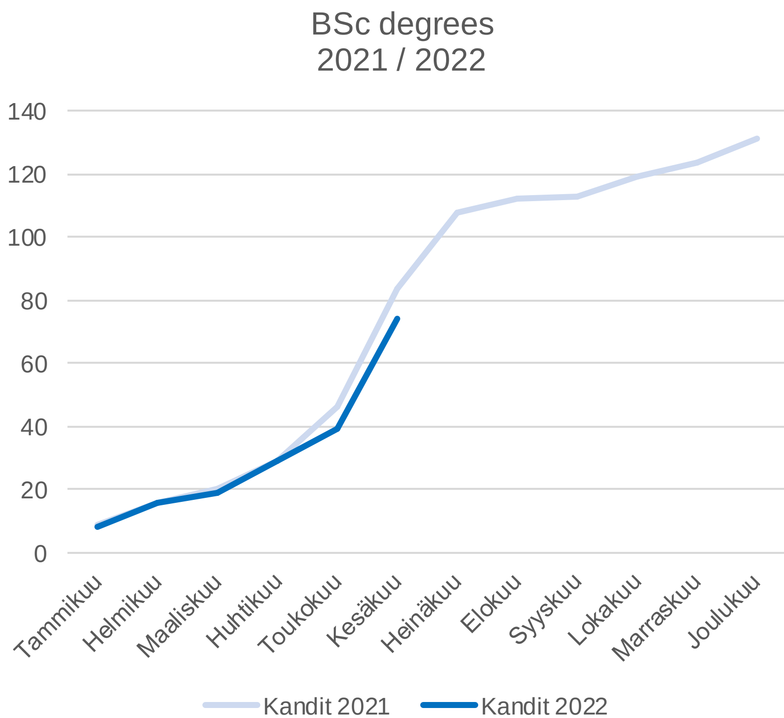
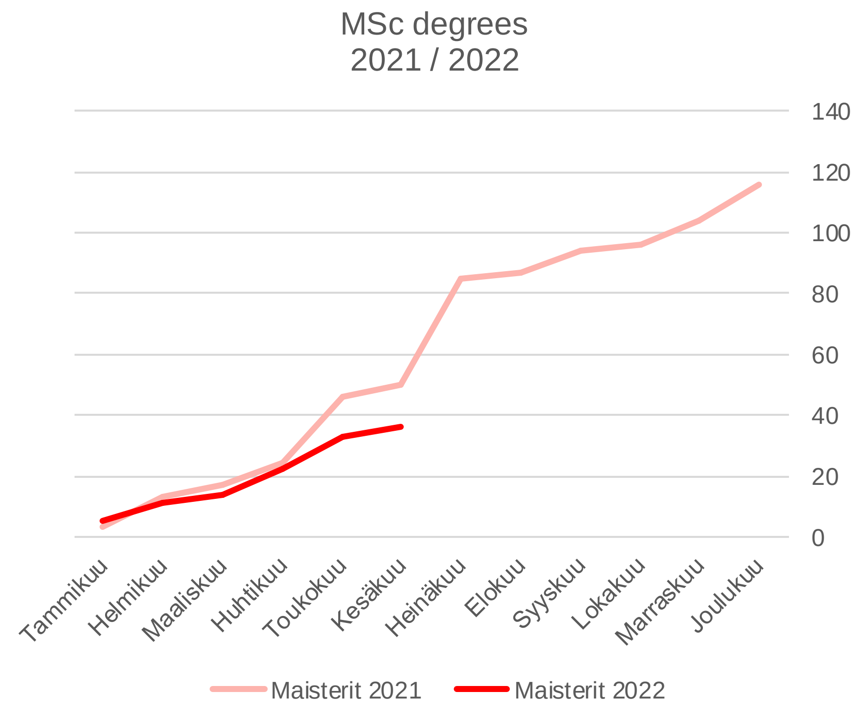
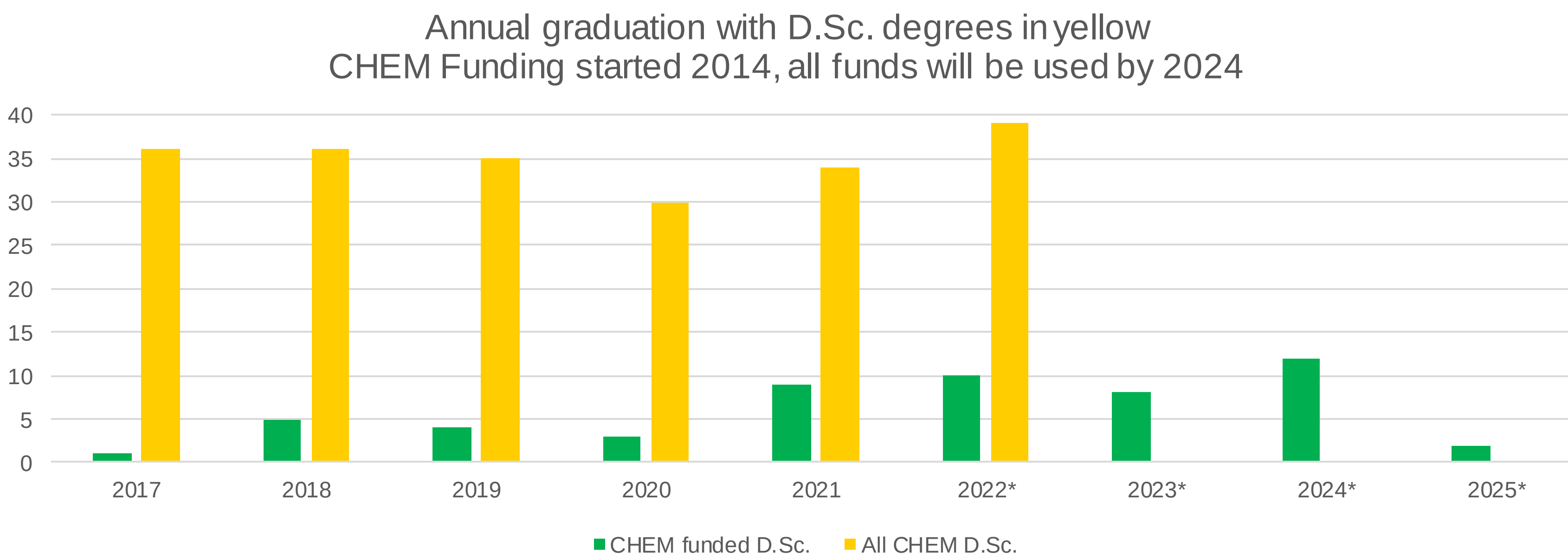
Elokuu
Syyskuu
Lokakuu
Marraskuu
Joulukuu
Maisterit 2020
Maisterit 2021





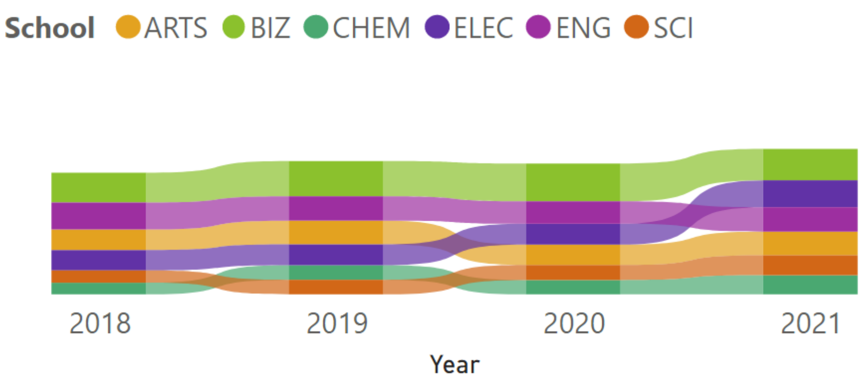
Note: There are 39 MSc thesis to be accepted (KN 23.8.2022) for the previous academic year. Not yet seen in the graph above.

CHEM D.Sc. degrees for each year, and in green those with school funded positions

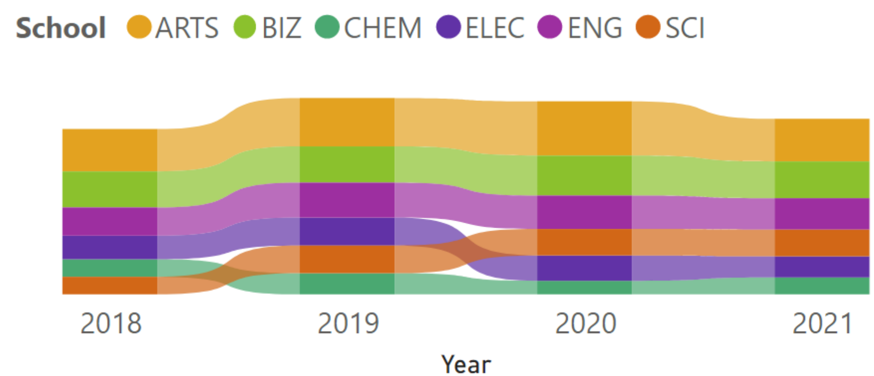


Degree comparison by tenure track slots

Bachelor's degrees by tenure track slots



Master's degrees by tenure track slots



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Admissions 2022

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DIA-kandivalinta / BSc admissions DIA

Hakukohde / Application target	2020 kaikki hakijat/ all applicants	2021 kaikki hakijat/ all applicants	2022 kaikki hakijat/ all applicants	2020 ensisijaiset / first priority	2021 ensisijaiset / first priority	2022 ensisijaiset / first priority	Valinnan aloituspaikat 2022/ quota
Aalto-yliopisto							
Arkkitehtuuri, Aalto-yliopisto, Taiteiden ja suunnittelun korkeakoulu	722	732	663	452	451	416	54
Automaatio- ja informaatioteknologia, Aalto-yliopisto, Sähkötekniikan korkeakoulu	810	906		141	152		
Automaatio ja robotiikka, Aalto-yliopisto, Sähkötekniikan korkeakoulu			748			146	85
Bioinformaatioteknologia, Aalto-yliopisto, Sähkötekniikan korkeakoulu	838	765	82	208	217	217	85
Elektroniikka ja sähkötekniikka, Aalto-yliopisto, Sähkötekniikan korkeakoulu	662	846	717	137	140	133	110
Energia- ja konetekniikka, Aalto-yliopisto, Insinööritieteiden korkeakoulu			1022			226	195
Energia- ja ympäristötekniikka, Aalto-yliopisto, Insinööritieteiden korkeakoulu	820	795		148	155		
Informaatioteknologia, Aalto-yliopisto, Sähkötekniikan korkeakoulu			511			57	53
Kemian tekniikka, Aalto-yliopisto, Kemian tekniikan korkeakoulu	805	715	893	164	148	181	200
Kestävät yhdyskunnat, Aalto-yliopisto, Insinööritieteiden korkeakoulu			382			73	70
Kiinteistötalous ja geoinformatiikka, Aalto-yliopisto, Insinööritieteiden korkeakoulu			320			74	55
Kone- ja rakennustekniikka, Aalto-yliopisto, Insinööritieteiden korkeakoulu	921	1044		219	274		
Maisema-arkkitehtuuri, Aalto-yliopisto, Taiteiden ja suunnittelun korkeakoulu	235	228	220	66	62	39	36
Rakennettu ympäristö, Aalto-yliopisto, Insinööritieteiden korkeakoulu	377	406		61	91		
Rakennustekniikka, Aalto-yliopisto, Insinööritieteiden korkeakoulu			599			120	100
Teknillinen fysiikka ja matematiikka, Aalto-yliopisto, Perustieteiden korkeakoulu	643	584	567	257	256	237	90
Teknillinen psykologia, Aalto-yliopisto, Perustieteiden korkeakoulu			737			231	30
Tietotekniikka, Aalto-yliopisto, Perustieteiden korkeakoulu	1200	1138	1160	401	432	389	130
Tuotantotalous, Aalto-yliopisto, Perustieteiden korkeakoulu	975	1020	994	551	564	554	60
	9008	**9179**	**9615**	**2805**	**2942**	**3093**	**1353**
			4,75 %			5,13 %	

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Tilastoja CHEM kandivalinta 2022
Statistics CHEM BSc admissions 2022 /Kemian tekniikka

Hakukohde	Hakijat yht. Applicants	Hakijoista ensisijaisia/ First priority	Hakijoista ensikertalaisia/ First time applicants	Hyväksytyt yht. Accepted	Paikan vastaanottaneet yht. Registered
Haku avoimen yliopiston väylän kautta, Kemiantekniikka, tekniikan kandidaatti ja diplomi-insinööri (3 v + 2 v) Kemian tekniikan korkeakoulu	20	5	13	2	2
Kilpailumenestysvalinta, Kemiantekniikka, tekniikan kandidaatti ja diplomi-insinööri (3 v + 2 v) Kemian tekniikan korkeakoulu	2	0	2	2	0
Kemian tekniikka, tekniikan kandidaatti ja diplomi-insinööri (3 v + 2 v) Kemian tekniikan korkeakoulu DIA-valinta	893	181	737	234	187
Siirtohaku	7	4	0	4	3

Statistics for BSc majors 2019-2022

Students choose their BSc major after the first year of studies.

Year	Total	Bioproducts		Chemistry and Materials Science		Chemical Engineering and Processes	
		N	%	N	%	N	%
2019*	174	78	**45 %**	45	**26 %**	51	**29 %**
2020	134	62	**46 %**	34	**25 %**	38	**28 %**
2021	143	67	**47 %**	51	**36 %**	25	**17 %**
2022	168	65	**39 %**	75	**45 %**	28	**17 %**

* In 2019, many students changed from old majors to the new ones.

Aalto Bachelor's Programme in Science and Technology 2022

Hakukohde	Applicants Hakijat yht.	First priority Hakijoista ensisijasia	Accepted Hyväksytyt yht.[2]	Admissions group 1 Valintaryhmä 1 (valitut/kiintiö)	Admissions group 2 Valintaryhmä 2 (valitut/kiintiö)	New students	Quota
Chemical Engineering, Bachelor of Science (Technology), Master of Science (Technology) (3+2 yrs): Aalto-yliopisto, Kemian tekniikan korkeakoulu	593	276	120	10/14	41/21	51	35
Computational Engineering, Bachelor of Science (Technology), Master of Science (Technology) (3+2 yrs): Aalto-yliopisto, Insinööritieteiden korkeakoulu	986	308	120	11/16	21/24	32	40
Data Science, Bachelor of Science (Technology), Master of Science (Technology) (3+2 yrs): Aalto-yliopisto, Perustieteiden korkeakoulu	1218	480	73	7/12	23/18	30	30
Digital Systems and Design, Bachelor of Science (Technology), Master of Science (Technology) (3+2 yrs): Aalto-yliopisto, Sähkötekniikan korkeakoulu	785	139	93	10/14	21/21	34	35
Quantum Technology, Bachelor of Science (Technology), Master of Science (Technology) (3+2 yrs): Aalto-yliopisto, Perustieteiden korkeakoulu	608	196	67	14/14	21/21	35	35
Yhteensä	4190	1399	473			182	175

Master’s admissions 2022

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Statistics

Maisterivalinnat 2022

Tilastoja

Minna Marin

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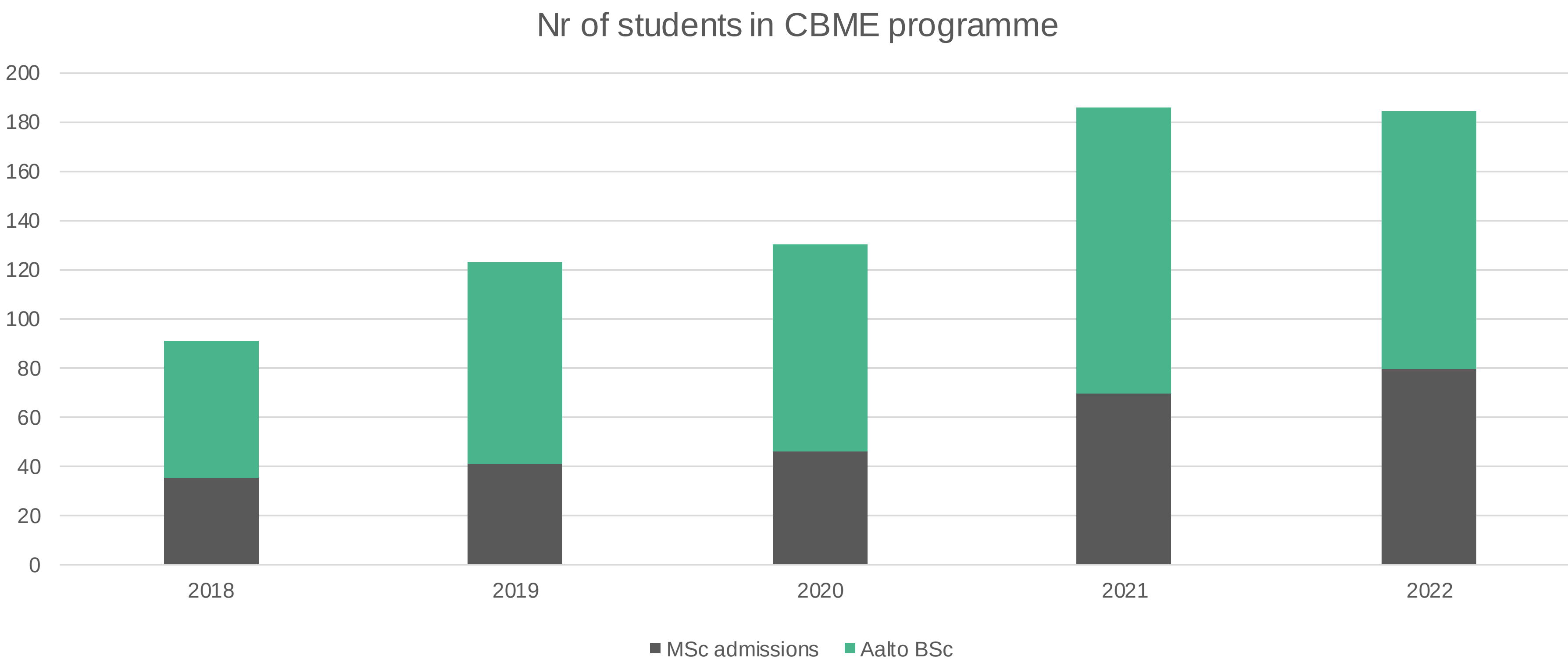
Master's Programme in Chemical, Biochemical and Materials Engineering



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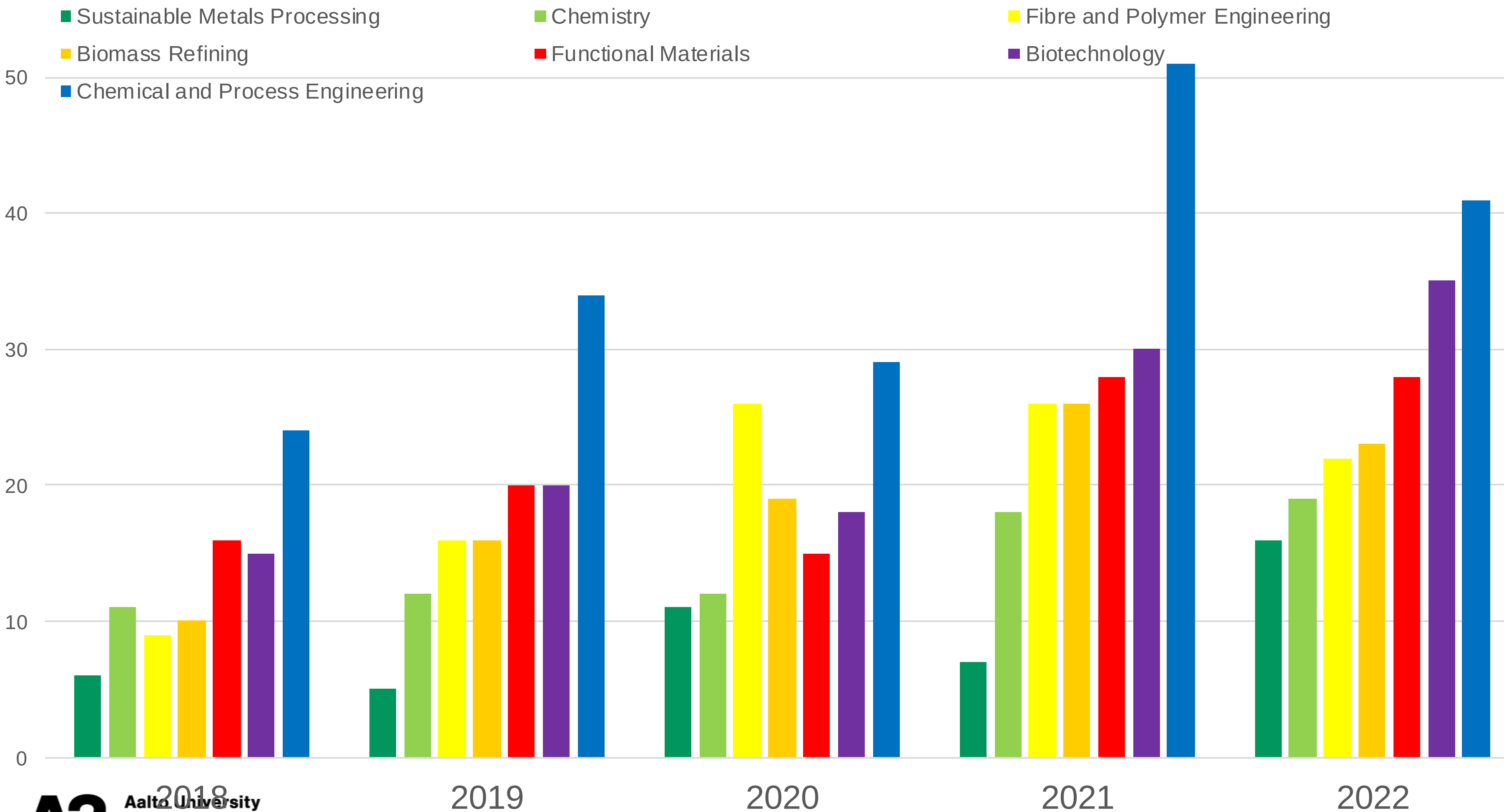
CBME majors: Total number of students



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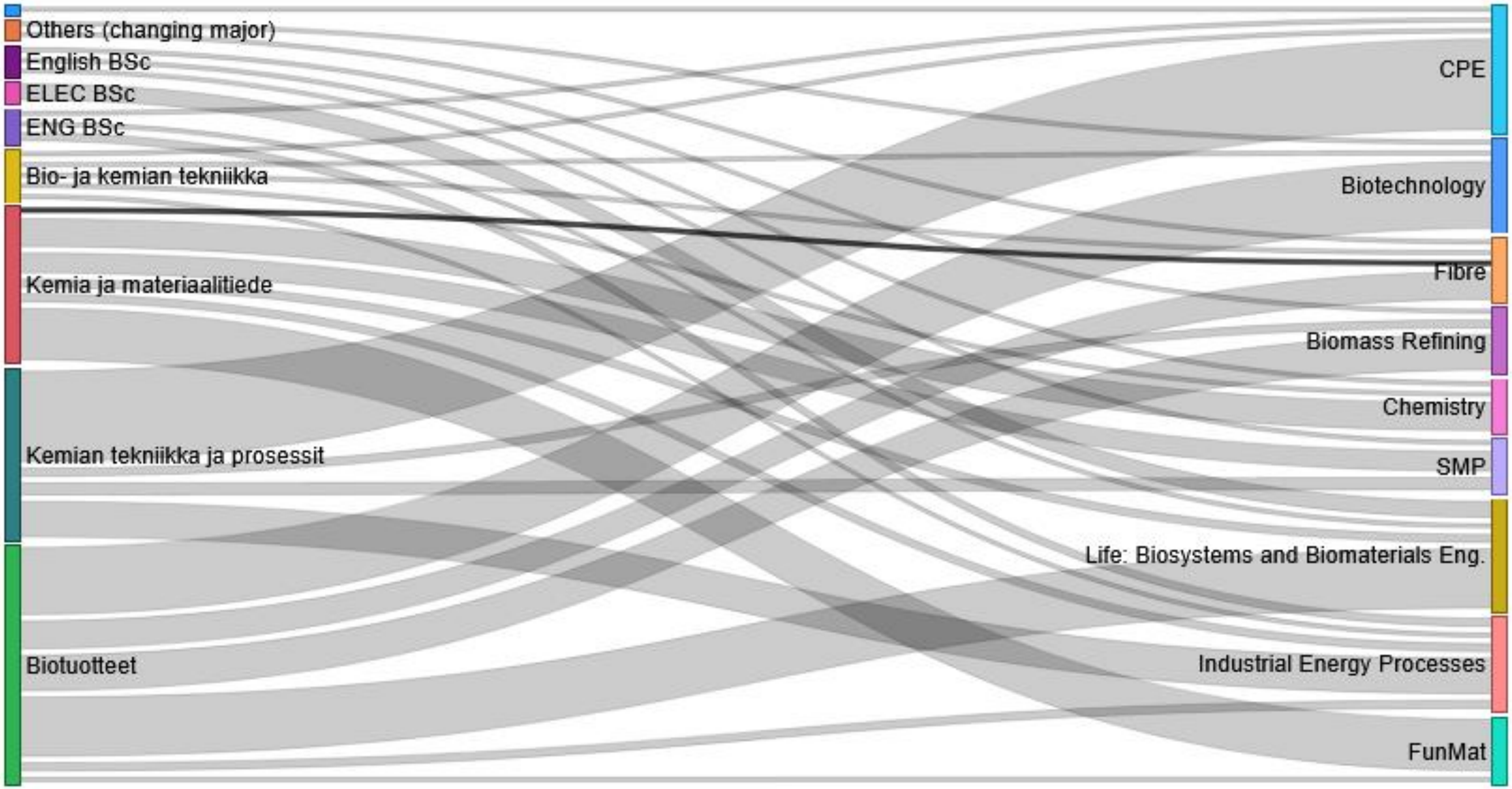
Student flow from bachelor to master 2022:



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Data based on Jan 2022 applications, small changes since
More details: https://app.powerbi.com/links/pCB4gZxF7a?ctid=ae1a7724-4041-4462-a6dc-538cb199707e&pbi_source=linkShare

Joint Programmes at Aalto

	2020		2021		2022	
	Aalto BSc	Master's admissions	Aalto BSc	Master's admissions	Aalto BSc	Master's admissions
AAE-IEP	**7**	**3**	**12**	**4**	**17**	**4**
LifeTech: Biosystems and Biomaterials Engineering	**21**	**2**	**22**	**4**	**21**	**?**
Creative Sustainability	**-**	**4**	**-**	**9**	**-**	**10**
IDBM-CHEM	**-**	**5**	**-**	**6**	**-**	**1**

AAE-IEP = Advanced Energy Solutions - Industrial Energy Processes (CHEM)

IDBM-CHEM = International Design Business Management, CHEM students

International joint programmes

	2020	2021	2022
N5T Polymer technology	**1+2**	**2**	**2**
AMIS	**-**	**5+17**	**7+15**
Bioceb	**-**	**6**	**7**

Nordic Master's Programme in Polymer Technology

AMIS - Advanced Materials for Innovation and Sustainability (EIT Raw Materials)

Master's Programme in Biological and Chemical Engineering for a Sustainable Bioeconomy (Bioceb)

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Working with our programme portfolio

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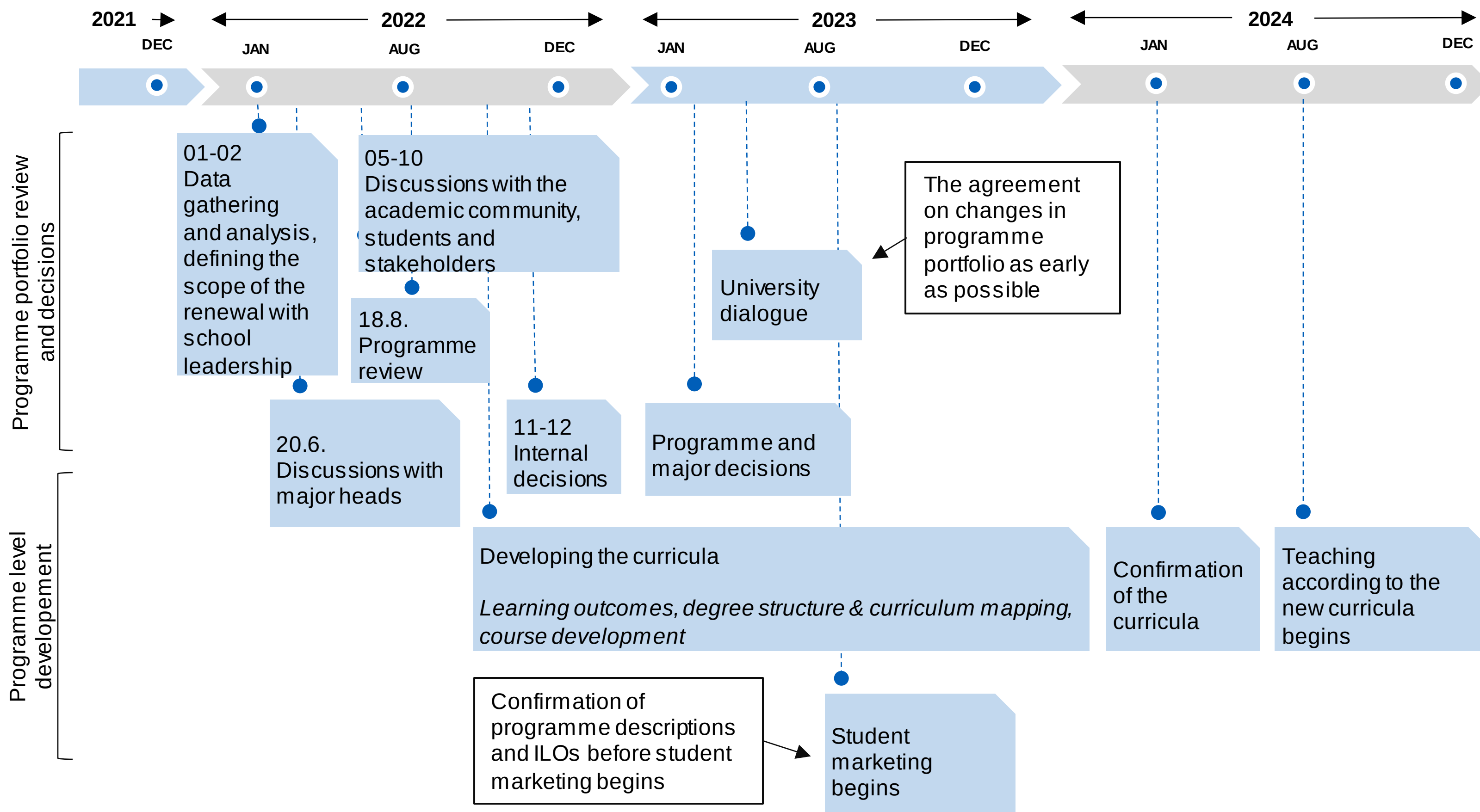
Where are we now?

Roadmap draft



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Timeline for Autumn

18.8. CHEM Programme review	• Working with our education portfolio
Early September	• Pre-material to stakeholders for the meetings on 23.9 and 30.9.
23.9. Meeting Stakeholders, group 1	• Presenting the draft of the new curriculum structure, discussion and getting feedback from stakeholders. Pre-material will be sent in early Sept to stakeholders. Student representatives will have a separate invite.
30.9. Meeting Stakeholders, group 2	• Presenting the draft of the new curriculum structure, discussion and getting feedback from stakeholders. Pre-material will be sent in early Sept to stakeholders. Student representatives will have a separate invite.
21.10. Internal curriculum workshop	• Developing the curriculum structure further (profs, lecturers, students)
4.11. Internal curriculum workshop	• Developing the curriculum structure further (profs, lecturers, students)
18.11. New curriculum: Programme directors and major heads meeting	• Confirming and agreeing the final programme structure
16.12. New curriculum: Programme directors and major heads meeting	• Decision on the final programme structure

Framework for discussions agreed in June

MSc study offerings:
CHEM own offerings
AALTO Joint offerings
International offerings

Biomass refining and advanced lignocellulosic materials	• Biomass refining • Fiber and Polymer Engineering • N5P in Polymer Technology (discontinuing) • Biological and Chemical Engineering for a Sustainable Bioeconomy (Bioceb)
Molecular bioscience and Industrial biotechnology	• Biotechnology • Biosystems and Biomaterials engineering
Chemical engineering and circular processes	• Chemical and Process Engineering • Sustainable Metals Processing • Industrial Energy Processes (Advanced Energy solutions) • European Mining, Minerals and Environmental Programme (EMMEP)
Chemistry for renewable energy and functional materials	• Chemistry • Functional Materials • Advanced Materials for Innovation and Sustainability (AMIS) • Master's Programme in Energy Storage

- International Design Business Management (IDBM) -> (includes compulsory CHEM minor)
- Creative Sustainability CHEM (connects to research focus area 1 & 3)
- Environomical Pathways for Sustainable Energy Systems (SELECT) -> selected courses from all study fields (discontinuing)

Framework for discussion – students and resources

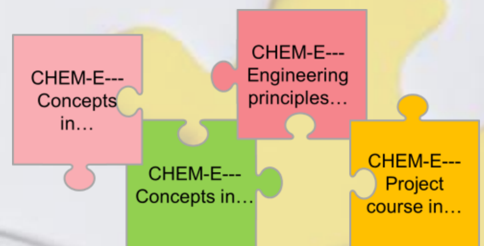
	MSc thesis / field	Professors	Lecturers	Students starting 2022
Biomass refining and advanced lignocellulosic materials	134	15	5	54
Molecular bioscience and Industrial biotechnology	92	7	2	56
Chemical engineering and circular processes	180	13	10	78
Chemistry for renewable energy and functional materials	75	12	7	69

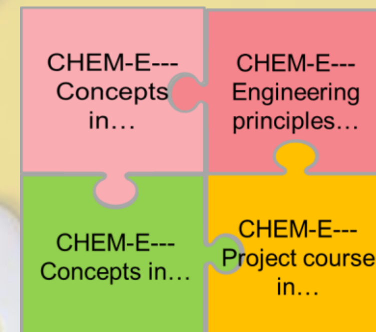
MSc thesis / field:
2016-2021

Phase 1: Identifying the operating environment of our graduates

Knowledge & skills for addressing our most urgent challenges

Our current challenges are complex, and no simple solutions exist





Think in terms of larger entities when planning the future learning

https://sustainabledevelopment.un.org/sdgs

Anticipating the future working life

Today 8/22 → **Students start 8/24** → **1. Students graduate 8/26** → **Best before date 8/32 - 8/34**
Life span 8 to 10 years

Anticipate the changes to prepare students for a time in the future

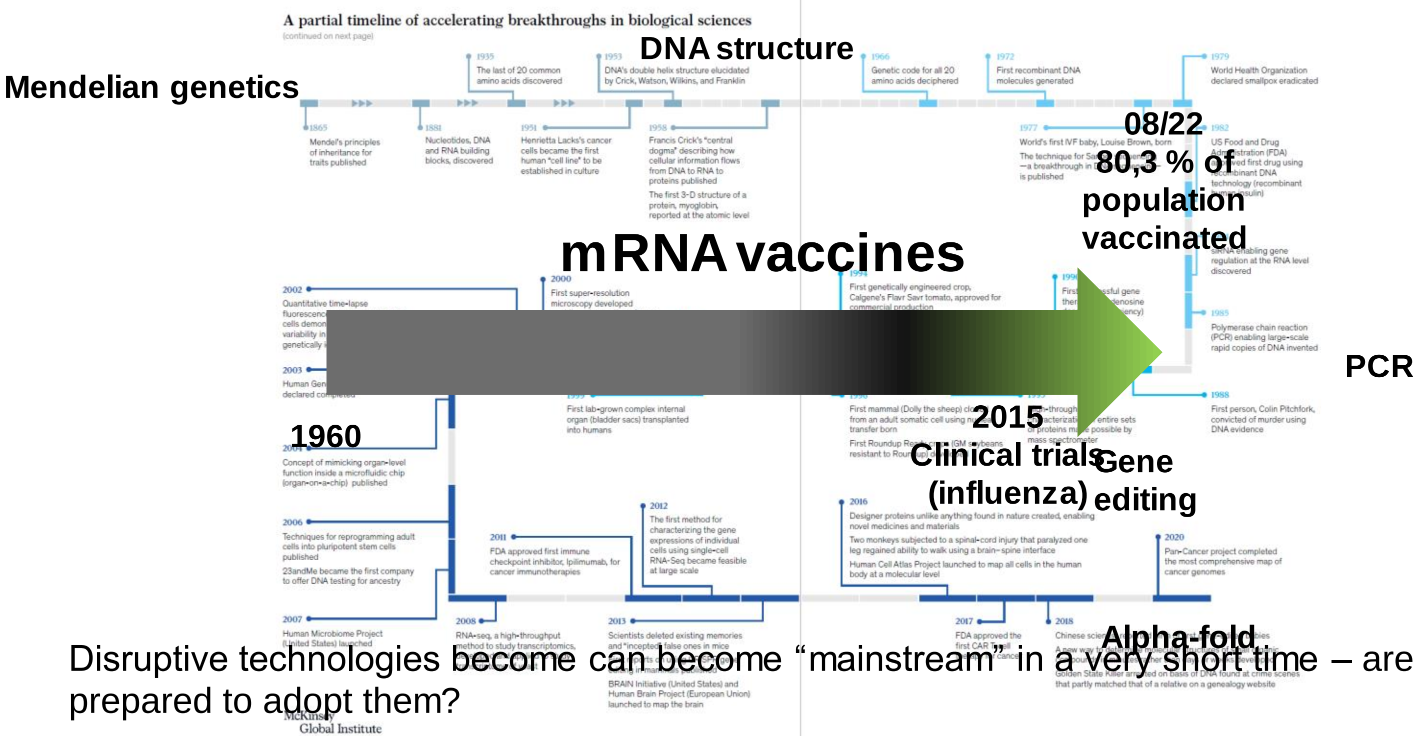
- New jobs with new skills & knowledge profiles?
  - *What will be relevant?*
  - *What will be obsolete?*
- *Status quo maintained – no changes anticipated?*

Megatrends – how do they affect future working life?

e.g. reading materials here:

Megatrends - Sitra

Recognize the developments in the past



Disruptive technologies become can become "mainstream" in a very short time – are graduates prepared to adopt them?

What guides & drives developments?

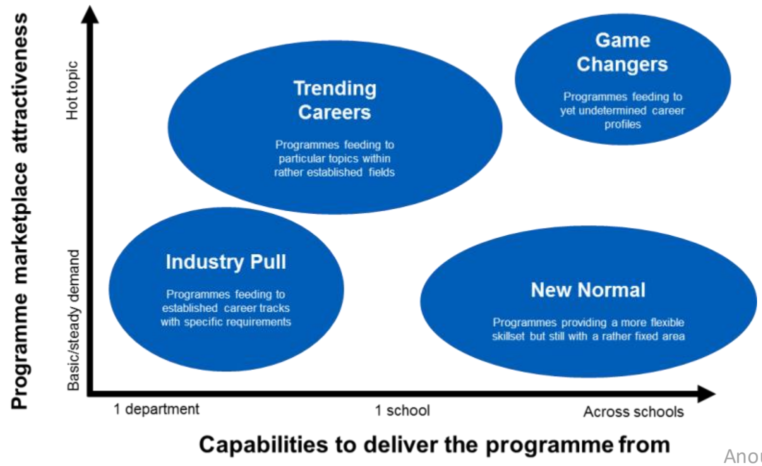
New science & engineering solutions
- Emerging & disruptive technologies

Political framework & legislation
- Transition to CO_2 neutral economy
- Protection of environment

Societal needs
- Well prepared graduates for working life
  - Short-term vs. Long-term

Can we properly balance these three drivers?

Diversification in MSc teaching portfolio?



Anouar Belahcen, Katri Kauppi, Andres Lucero, Pedro Vilaça

- "Industry pull". The purpose is to prepare students for the short-term industry and employers' needs.
- "Game changers". The program feeds to yet underdetermined career profiles (inter- and multidisciplinary -> radical creativity/entrepreneurship)

Identifying the operating environment of our graduates

- Intro by Alex: How is the operating environment changing?
- Task: Think about the changes that are likely to happen within (your field of) chemical engineering within the next 10 years/by 2035. Discuss in groups of three and write 2 most significant changes in Presemo
  If someone has already posted your idea, you can add something else. We will vote at the end.
- Presemo address: https://presemo.aalto.fi/chempr22/
- Discussion will continue with the stakeholders in September

Phase 2: Identifying purposes

Work in four clusters

Our goal is to identify the purpose for each cluster. Remember also the Phase 1 operating environment.

Work together and provide three slides:

1. **Key purpose**
2. **Write more about the purpose:**
   Purpose, objectives and societal relevance (e.g. employability/addressing key societal grand challenges etc.) of the programme.
   How does the programme distinct itself from other educational offering within Aalto and domestically/internationally?
3. **Open comments, concerns, what is left outside of the clusters.**

Prepare to present your main point in max 5 minutes.

GET BACK TO KE 1 AT 14.20, Remember to take some coffee!

Find your room:

(Framework for discussions agreed in June)

Biomass refining and advanced lignocellulosic materials
- KE 3
- Chair: Jouni Paltakari
- Notes: Jukka Välimäki

- Biomass refining
- Fiber and Polymer Engineering
- N5P in Polymer Technology (discontinuing)
- Biological and Chemical Engineering for a Sustainable Bioeconomy (Bioceb)

Molecular bioscience and Industrial biotechnology
- KE 4
- Chair: Alex Frey
- Notes: Pauliina Ketola

- Biotechnology
- Biosystems and Biomaterials engineering

Chemical engineering and circular processes
- KE 5
- Ville Alopaeus
- Notes: Anni Rintala

- Chemical and Process Engineering
- Sustainable Metals Processing
- Industrial Energy Processes (Advanced Energy solutions)
- European Mining, Minerals and Environmental Programme (EMMEP)

Chemistry for renewable energy and functional materials
- A303
- Chair: Antti Karttunen
- Notes: Kari Lehti

- Chemistry
- Functional Materials
- Advanced Materials for Innovation and Sustainability (AMIS)
- Master's Programme in Energy Storage

MSc study offerings:
CHEM own offerings
AALTO Joint offerings
International offerings

- International Design Business Management (IDBM) -> (includes compulsory CHEM minor)
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Biomass refining and advanced lignocellulosic materials

Key purpose:

Give ability to apply knowledge how to use and process plant biomass and lignocellulose in a sustainable way into today's and future products

Biomass refining and advanced lignocellulosic materials: Mapping the context

- **Sustainable way of usage (plant biomass, lignocellulosics, biowaste, recycling etc.) ("Sustainable raw materials")**
- **Raw-material --> fractionation, processing --> converting it (processing) ("processing")**
- **Systemic thinking, life-cycle, value chain ("big picture")**
- **Innovations (how do companies innovate?)**
- **Context:**
  - Replacing oil-based polymeric materials with biobased (biogradable) substitutes
  - Climate change related challenges (new products, raw-materials)
  - Working together with other schools/programs, not doing everything by ourselves
  - Current processes have to be understood in order to develop them. Interdisciplinarity – specialists from different fields have to be able to share their knowledge, understand
  - Recycling technology will continue growing
  - Some are already covered and there is no need to replace things that work already
  - What is offered elsewhere, in other universities? Where are we strong now & what are we completely missing, who should we collaborate with?
  - Where do our graduates work? Alumni stories --> where have they ended up
- **Why are we here?**
  - Resourcing, making the offering more easy to find and understand, more clear tracks for our students, to consider central (and cross-cutting) themes in our teaching, how do we see the future, what is the future role of chemistry

Biomass refining and advanced lignocellulosic materials: Open comments

- **Open comments, concerns, what is left outside of the cluster:**
- **What to exclude?**
- **All majors do not necessarily have that much in common**
- **Too long for a major name (the word "and" is also a challenge)**
  - The title: Should the "advanced" be removed?
  - Now it is our research area
- **Writing out the name esp. for students**
  - Now difficult to choose a major (so many of them), names may sound quite similar, good names and descriptions wanted.
- **Teach also current ways to process and produce products --> starting point for future development**
- **What offering would be suitable for LWL**
- **Do we really need majors or would programme(s) be enough?**
  - Application targets

Molecular bioscience and industrial biotechnology

Key purpose:

Equipping students with an ability to engage with a wide range of technologies and keep up with an increasingly fast-paced changing world in order to contribute biotechnology-based solutions

Molecular bioscience and industrial biotechnology: Mapping the context

- Needs: biological means for production will be essential for very varied industries (e.g. Future food production, chemical & pharmaceutical industries, forest products industry) to become more sustainable
- Technology is flexible: equip students with many 'tools' (skills and knowledge) & problem-solving attitude/way of thinking
- Identity: covering the whole development chain - from developing new concepts all the way to implementations -> Engineering biology

On the left, please describe/ identify in a few bullet points:

- Objectives
- Needs and challenges (societal, employability, etc) that the cluster addresses?
- The operating environment of the cluster, incl. in future?
- Does the cluster have a distinctive identity nationally/internationally?

Molecular bioscience and industrial biotechnology: Open comments

- Open comments, concerns, what is left outside of the cluster:
- Intimately linked with data sciences, not only add-on.
- Biotechnology follows a clear development chain thinking, from ideation to process -> strengthening engineering
- Biosystems has a multidisciplinary approach with strong connections to data science, chemistry and biomaterials but leaving away traditional engineering

➢ Currently missing/weak: Mammalian systems, analytical methods, enzymes

➢ Teaching infrastructure: modernization needed & capacity is limiting

Chemical engineering and circular processes

Key purpose:

Sustainable process development and design

Chemical engineering and circular processes: Mapping the context

- Generic within chemical process industry. Students have a broad understanding on scale of process industry and global context of energy and material resources.
- Raw materials to chemicals, fuels, energy and materials considering environmental and economical sustainability as well as process safety.
- Reuse of varied recycled materials
- Industrial/sustainable/innovative energy solutions
- Carbon neutrality
- Process system engineering, digitalization and AI

On the left, please describe/identify in a few bullet points:

- Objectives
- Needs and challenges (societal, employability, etc) that the cluster addresses?
- The operating environment of the cluster, incl. in future?
- Does the cluster have a distinctive identity nationally/internationally?

Chemical engineering and circular processes: Open comments

- Open comments, concerns, what is left outside of the cluster:

- Voisiko olla fokusalueena myös vaikka: Chemistry + Process engineering

~~Chemistry for renewable energy and functional materials~~

Chemistry and materials science

Key purpose:

Design, synthesis, analysis and application of molecules and materials.

Understanding the functions of materials from the atomic and molecular scales upwards.

Chemistry and materials science: Mapping the context

- Educate people in topics of structure and property relationships: Hard and soft materials, electrochemistry, semiconductors, catalysis, nanomaterials, thin films, sustainable synthesis, modelling and data science
- Need and challenge: laboratory education, hands-on-skills and sustainable competencies
- Selected applications of materials: energy storage and conversion, limited natural resources, human well-being, micro- and nanodevices
- Drawing in and keeping international talent in Finland
- Including startups and SMEs

Chemistry and materials science: Open comments

- **Game changing is a mindset; changing the way of thinking**

Final words for today – Jouni Paltakari

For your information: Admissions of new doctoral students at CHEM

The next call for doctoral study right will be open 1-20 September 2022

Year 2023 will bring four seasons for submitting doctoral study right application with all appendices at CHEM

DL Thu 26 Jan. 2023

DL Thu 4 May 2023

DL Thu 14 Sep. 2023

DL Thu 2 Nov. 2023

Feedback

Thoughts / ideas / feelings / other feedback:

https://presemo.aalto.fi/chempr22/

Anonymous posts, visible only to the organizers.