Portfolio renewal: Progress review & discussion

Jouni Paltakari, Anni Rintala, Pauliina Ketola
16.12.2022

Aalto University
School of Chemical
Engineering

Agenda for today

12:30 – 12:45 Welcome & Introduction to questions of the day

12:45 – 13:00 Recap of progress & forthcoming milestones

13:00 – 13:30 Brief presentations of programme-level ILOs, followed by discussion

13:30 – 13:45 Coffee break

13:45 – 14:00 New programme structure: weighing up options (*major* vs. *tracks*) – presentation, followed by discussion

14:45 – 15:00 Conclusions

15:00 – 15:15 Closing the event & next steps

Questions for today's session

- What would be most suitable programme structure?
- How many credits of common studies should there be?
- Should there be school-wide ILO's or Master's courses?

Different points of view to bear in mind:

applicants, students, teachers, stakeholders.

You can share your thoughts at presemo.aalto.fi/chemportfolio16dec throughout the session

Recap of progress in 2022

- Mapping requirements of future working life
- Developing new programmes in ‘clusters’; work led by cluster leaders
- Identifying ‘purpose’ for each programme
- Mapping programme-level ILOs for each programme
- Decision: Programme (and not major) = application target
- Decision: School-level programme structure
- Communicating about renewal: website & Teams site

Decisions from recent past

Programme = application target

- **Aiming for clarity for applicants (TEE 2020 evaluation) and doing away with invisible programme structures**
- **Next slide has programme structure example where the names of the programmes will be updated**

Programme = application target

Draft of the plan for the new structure change from current one big programme to four programmes. Position of international and Aalto joint programmes not included in this. Needs to be decided

Programme "Biomass refining and advanced lignocellulosic materials"

Programme "Molecular bioscience and Industrial biotechnology"

Programme "Chemical and metallurgical engineering"

Programme "Chemistry and materials science"

School-level programme structure

- **Proposed: Shared structure across Master's programmes in CHEM:**
  - **Studies towards the major: 60-65 credits**
  - **Thesis, including a maturity essay: 30 credits**
  - **Elective studies: 25-30 credits**

Slide terminology corrected on basis of feedback given in 29 Nov 2022 meeting of KTAK

Communicating about renewal

Portfolio Renewal website

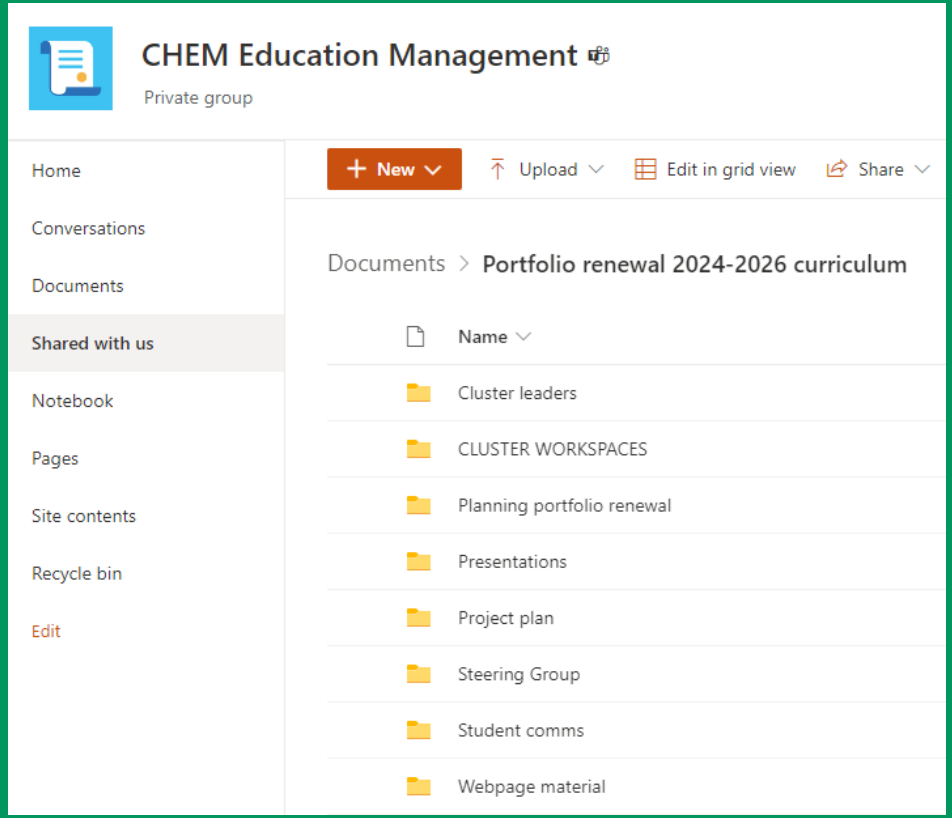
- Focal point of information about project and guidelines
- Also document repository

www.aalto.fi/school-of-chemical-engineering/masters-portfolio-renewal

Aalto University
School of Chemical Engineering

Portfolio Renewal Teams folders

- Space for collaborative work in clusters
- Repository for your cluster documentation
- Restricted to CHEM staff only
- For link and/or access rights, please contact Pauliina Ketola



Aalto University
School of Chemical
Engineering

Milestones for spring 2023

- **Programme names, descriptions and programme-level ILOs (inc. any specialisation tracks) discussed and finalised in Jan-Feb 23 DPC & KTAK**
- **Programme proposal by Dean to President in Feb-Mar 23**

- **Also, work and discussions begin on:**
    - Student intake numbers
    - Courses for new programmes

Presentations: Programme-level intended learning outcomes (ILO’s)

Cluster ‘identity’: Biomass refining and advanced lignocellulosic materials OR Bioproducts engineering

- **Concept of ‘biomass’ in title problematic. Alternative name: *Bioproducts engineering* with/without reference to *biorefinery* (?)**
- **<u>Essence</u> of cluster = conversion of of biomass to product, i.e. Value chain from raw material to end product**
    - Incl. characterisation and materials science of raw material. Strong link with sustainability
- **Tracks could include: “wood & wood products”, “packaging & composites”, “textiles” and “biorefinery” (note: “textiles” and “biorefinery” need further discussion)**
    - Student movement between tracks should be allowed

Bioproducts engineering: ILO’s

A graduate is able to:

- **Describe the value chain in modern bioeconomy: from raw materials to end products and further to recycling/biodegradation**
- **Apply basic models on processes relevant to the forest products and broader bio-based industries**
- **Select and apply analytical techniques for characterizing biomass, fibers, polymers and other relevant raw materials and end products**
- **Master the hierarchical structure of plant cells and understand its relevance in bio-based raw material processing and application**
- **Apply sustainable development tools, such as LCA, in the engineering of bioeconomy value chain products and processes**
- **Design, execute, and report a small-scale scientific project**

Cluster ‘identity’: Molecular bioscience and Industrial biotechnology

Equipping students with an ability to contribute biotechnology-based solutions to a range of different industries while keeping up with an increasingly fast-paced changing world

Molecular bioscience and Industrial biotechnology: ILO’s 1/2

Core science and engineering

- Can evaluate and explain the impact and potential of biotechnology for society and industry
- Can describe the molecular basis of living systems in the context of biotechnology
- Can apply experimental and computational methods to analyze problems in a systematic manner and devise (biotechnology-based) solutions that support sustainable development
- Can devise genetic engineering strategies to modify proteins, metabolic pathways and cellular functions leading to improved productivity or to novel or improved products
- Can describe the bioreactor environment and explain how it influences cells or enzymes and thereby the bioprocess outcome

Molecular bioscience and Industrial biotechnology: ILO’s 2/2

- **Industrial Biotech-track:** can differentiate the suitability of different raw materials and recommend the most suitable bioprocessing approach
- **Bioscience track:** can apply mechanistic and data-driven modelling approaches to predict biological and biophysical phenomena

Soft skills

- can work alone and in teams on multi-dimensional problems
- is able to follow development of the field and acquire and process new scientific and technological information
- can engage in scientific discussions and communicate the findings in oral and written form
- can design radically creative solutions to support sustainable development

Core identity / unique features of Chemical and metallurgical engineering

- General principles of process design, holistic processing
- Sustainable process design, decreasing environmental footprint
- Skills - industry respects
- Responsible use of natural resources

- Chemical engineering processes, and unit operations
- Process design, operations and control

- Whole value chain of metals processing
- Energy metals and recycling

Chemical and Metallurgical Engineering

Tracks/majors:

- **Chemical and process engineering**
- **Sustainable metals processing**

Chemical and Metallurgical Engineering

A graduate is able to:

- **Apply engineering, natural science, and mathematics to solve complex problems**
- **Design sustainable chemical and metallurgical processes**
- **Select and design unit operations and processes for industrial applications**
- **Develop transition towards renewable and recyclable resources**
- **Make decisions based on the limitations and criticality of potential raw materials**
- **Act as an expert in multidisciplinary groups designing economically feasible, safe and environmentally friendly industrial processes**
- **Apply modern computer-aided tools**

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.

Tentative tracks (1) Chemistry; (2) Materials Science.
Many courses would be shared between tracks.

Chemistry and materials science:

ILO’s 1/2

1. **You will gain hands-on research experience and develop your problem-solving skills. You will be able to design, synthesize, analyze and apply molecules and materials to address academic, industrial, and societal problems.**
2. **After graduating you'll excel as an expert in chemical sciences and engineering fields.**

Chemistry and materials science: ILOS's 2/2

A graduate is able to:

3. **Describe chemical structure and properties of molecules and materials using fundamental principles across different length-scales: atoms → molecules → nano → surfaces → bulk**
4. **Participate in solving global issues through identifying sustainability possibilities/needs (w/ the materials and molecules you specialize on)**
5. **Fluently communicate in written and oral form. You can present your team results to cross disciplinary groups and justify your decision making.**

For discussion

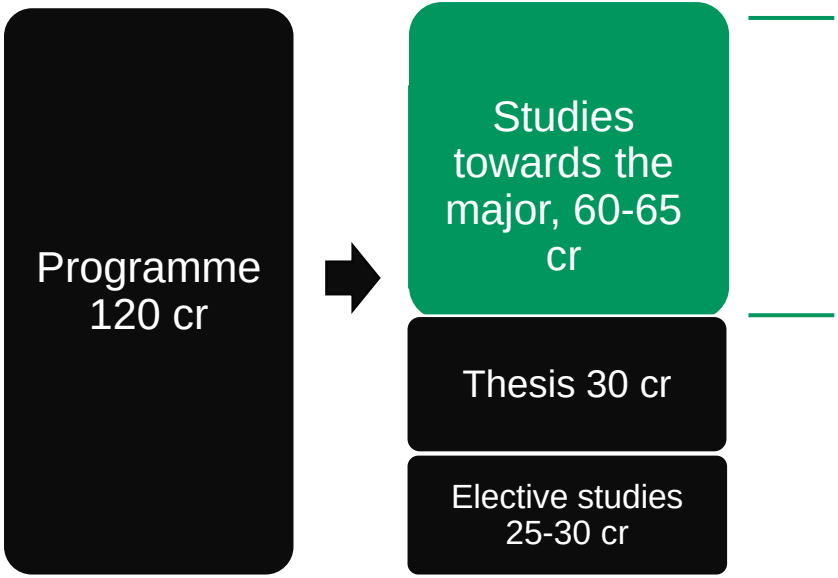
1. **Soft skills' ILO's – could/should they be shared between CHEM Master's programmes?**
2. **Could other CHEM-wide ILO's be identified? If so, should we introduce common CHEM school-level studies?**
3. **Are Aalto cross cutting themes (*radical creativity, an entrepreneurial mindset* and *sustainability solutions*) reflected in them?**

Discuss in pairs and share your thoughts at
presemo.aalto.fi/chemportfolio16dec

Time for coffee, served outside the lecture hall.
Please return by 13:55.

Programme structure/ Weighing up options

Make-up of new programmes



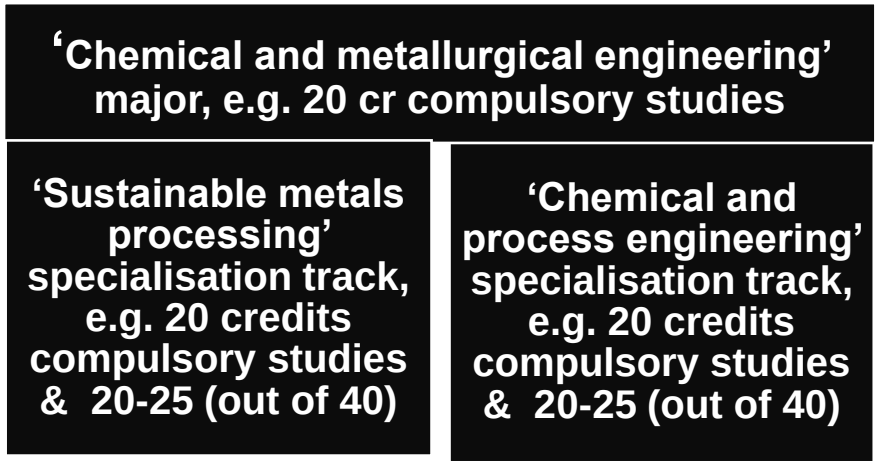
- Studies towards the major are only section of degree that we can 'populate' in programme structure
- This includes:
  - Compulsory and optional programme studies and major studies;
  - Specialisation tracks;
  - Possible CHEM-wide Master's course(s)

- Includes a maturity essay
- Credit load fixed by Degree Regulations

- Location of elective studies or minor in student's degree
- Aalto want to ensure that elective studies are elective: we can recommend e.g. minor but cannot demand students take them

Chemical and metallurgical engineering programme – ‘track’ version

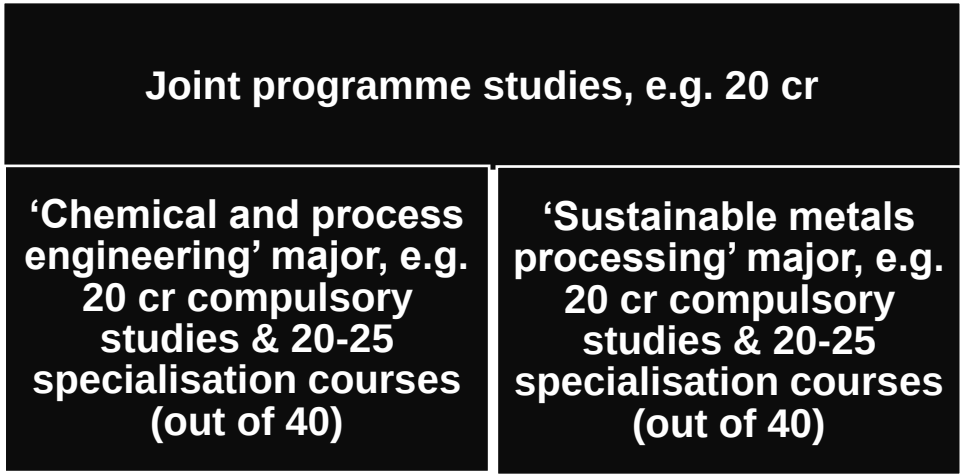
“Master’s programme in Chemical and metallurgical engineering, with Chemical and metallurgical engineering as the major”



Example; for demonstration purposes only!

Chemical and metallurgical engineering programme – ‘major’ version

“Master’s programme in Chemical and metallurgical engineering, with Chemical and process engineering OR Sustainable metals processing as the major”



Example; for demonstration purposes only!

Specialisation in programme

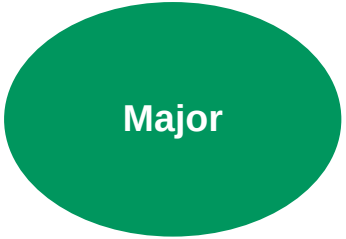
Specialisation tracks

- Clearly defined paths with distinctive identities
- E.g. choose 30-35 cr out of 35 (in addition to compulsory studies of major)
- Structures are built in and recognised by Sisu

Specialisation recommendations

- Pure recommendations to help student choose courses
- By ‘theme’, perhaps in numerical order. E.g. choose 25 cr from recommended "blocks“
- Non-binding: “only recommendation, you may choose any combination of the courses”

1-major model vs. 2-major model

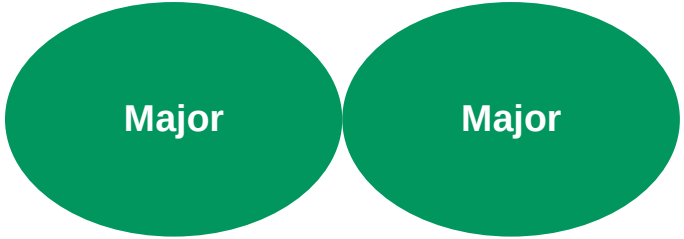


If one major in programme, likely to contain:

- **compulsory studies, e.g. 20-30 cr;**

and optional courses, arranged in:

- **Specialisation tracks; or**
- **Specialisation recommendations; and/or**
- **Lists of optional courses that do not form any specialisation entities**



If two majors in programme, programme may only consist of:

- **Joint programme studies, minimum 20 cr;**
- **Compulsory major studies;**
- **Limited number of specialisation courses, which may include specialisation recommendations (‘blocks’)**

Programme structure/ Discussions

Plan for discussions

14:00 – 14:15 discussion in pairs (15 min)

14:15 – 14:30 discussion in groups of 4 (15 min)

14:30 – 14:45 facilitated discussion (15 min)

Presemo at presemo.aalto.fi/chemportfolio16dec

Items for discussion

1. **Should there be a shared structure across CHEM Master's programmes?**
2. **How many credits should common studies in each programme consist of?**
3. **Pros and cons of different structures from a student point of view?**

Presemo at presemo.aalto.fi/chemportfolio16dec

Closing remarks

- **Presemo will remain open until 21st December: presemo.aalto.fi/chemportfolio16dec**
- **Please provide feedback on this *event* (as well as on portfolio renewal work this far)**
- **Next year, we will hold:**
  - portfolio renewal progress review & discussion every other, starting from February; and
  - brief portfolio coffee session for every other month, from March

Thank you for participating!
Have a good weekend!

aalto.fi

Aalto University
School of Chemical
Engineering