The CEICDH Chemical Product Engineering stream in the 3707 Bachelor of Engineering (Honours) program at UNSW trains graduate engineers with specialist discipline knowledge and who have developed the Engineers Australia Stage 1 Competencies.

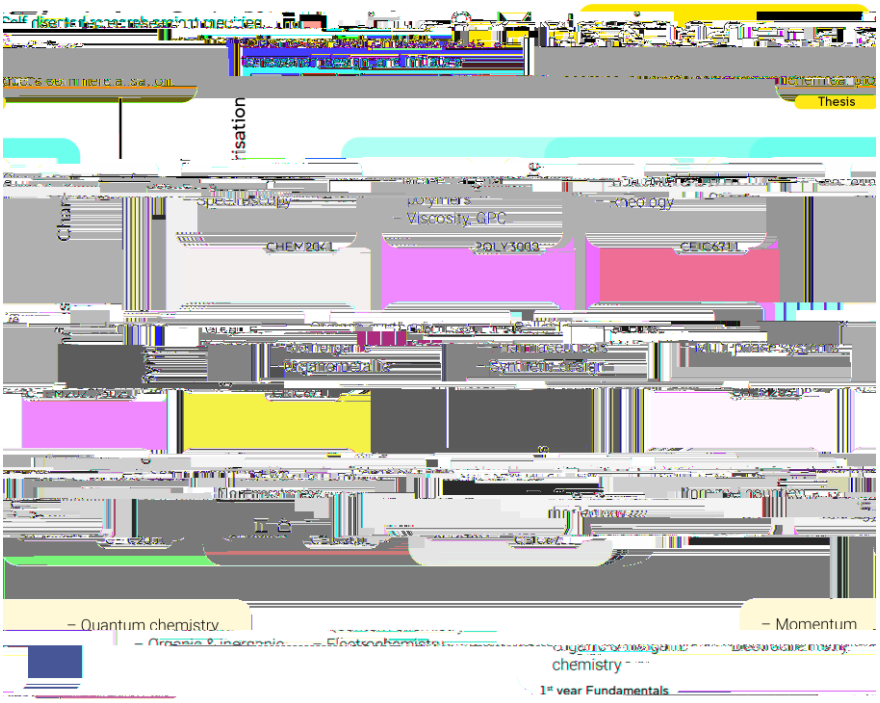
In this integrated graduate specification, we describe the aims of the stream, what sets chemical product engineering apart from other engineering streams, the stream learning outcomes, and the overall curriculum. Detailed mappings between courses, stream learning outcomes and EA Stage 1 Competencies are included.

Chemical Product Engineering involves researching, developing and improving the properties of the products that we use every day through the selection and design of the materials that are used. Product engineers work on the fluids that you use in your everyday life, including chemicals (cosmetics, pharmaceuticals, shampoos, paints, glues), foods, and drinks. Product engineers take consumer needs and turn them into technical requirements, finding the right combinations of chemicals to deliver those properties and then developing the product and strategies for commercialisation and manufacture. At UNSW, Chemical Product Engineers learn how to apply knowledge of engineering and chemistry to design complex chemical products for the pharmaceutical, consumer products and food industries. Chemical Product Engineers master the entire development process, testing out ideas for products and extrapolating small scale, laboratory chemistry into large, industrial scale production. In the final year Product Design Project, students work with industry partners to develop new consumer products up to the point where they could be patented and commercialised. To get work ready, graduates apply these skills through 60 days of approved industry training.

Our Chemical Product Engineering alumni work in a broad range of industries, covering everything from the everytyuET.7.0g everct

summarised in the following diagrams, that help explain to our students and staff how the individual courses are designed to fit with each other, developing a graduate engineer at the successful conclusion of the studies.


Thesis
hcustria context
CE-CIDM
Reactor design
+ Intro to polymy
Chemical Engineering


Thesis
Polymers
- Viscosity, GPC
Rheology
CHEM 2041
POLY3003
CHEG471L
- Quantum chemistry
- Momentum
chemistry
1st year Fundamentals

The standard plan is shown below for the Chemical Product Engineering stream. It is noted that students may approach the stream in different sequences for a range of reasons, including: Co-op Scholarship placements, international exchange, enrolment in a double degree, part-time study, commencing the degree in Term 1(enr)a4(m)4(eAp;ap)3(la)4(3mm)4(ic)-5(2)4(1(enr)a4(m)4(eAp;ap)3(la)4(3mm)4(ic)

mechanics, particulate flow, chemical reaction engineering, transport phenomena, economic analysis, and safety analysis.

3. Demonstrate engineering design expertise to create socially aware chemical product concepts and prototypes for solutions, enabling technically and economically viable products that are sustainable, safe, appropriate, and standards-compliant.
4. Use systems thinking to guide engineering practice, including articulating financial and technical constraints on product design, analysing competitive intellectual property to identify opportunities in markets and technologies, providing a basis for formulated product scale-up and manufacturing, and liaising with process engineers to judge when optimal to develop manufacturing capability or use contract manufacturers.
5. Use appropriate resources, including research data, to analyse microstructured product performance characteristics, create quantifiable product benchmarks, develop sustainable, holistic approaches while dealing with uncertainty and solving complex product engineering problems with actual social and environmental contexts.
6. Effectively manage product, material, and equipment development projects, with multidisciplinary teams of scientists, engineers and marketers with robust project planning and project management approaches that are adaptable, responsive, and appropriate in benefiting from the capabilities of diverse teams.
7. Communicate complex ideas effectively and professionally through a range of media to diverse audiences within and outside of chemical product engineering, including describing project outputs, pitching product concepts to management, technologists, and marketing, effectively incorporating, and being responsive to, feedback.
8. Conduct themselves professionally, ethically, respectfully and with integrity, being accountable as an individual, as members of teams, and as a leader of teams, while recognising the social and environmental obligations of chemical product engineers.

To develop an initial draft of the SLOs, a working group was formed that included members of the school with relevant industry experience, specialists in education and curriculum design, and the stream coordinators of each stream. The group was selected to ensure diversity in professional background, industry experience, cultural background, and gender, gathering a representative set of views. Over the course of six weeks, the group progressed through a sequence of divergent then convergent phases of identifying important topics to be included in the /F3 11 Tf1 044(he /F3 11 Tf1 044/F3 11 Tf1 0 0

The weightings displayed in the latter two mappings are derived from a cognitive scale that takes each assessment weighting and the assessment to CLO mapping for each course to derive an overall contribution to the course and stream.

The recommended first year elective of CEIC1000 Sustainable Product Engineering and Design is included in the mappings. A representative set of four 3rd/4th year discipline electives are also included; these courses were chosen as they represent a popular cross-section of the courses taken by recent cohorts: overall


EM1811
70.0
30.0
0.0
0.0
0.0
0.0
0.0
0.0
CH
50.0
50.0
ENGG1811
91.2
8.8
0.0
0.0
CHFM2041
25.5
51.0
DESN2000
50.0
0.0
0.0
0.0
0.0
0.0
0.0
MATH2018
50.0
CHFM3021
7.8
48.9
25.6
7.8
10.0
0.0
0.0
0.0
POLY3000
0.0
0.0
10.8
5.3
16.1
0.0
35.8
31.9
CEIC4000
25.9
9.8
CEIC4008
0.0
0.0
9.8
4.8
32.0
17.7
22.2
22.2
11.1
0.0
27.8
0.0
CEIC6711
0.0
16.7
CEIC8105
6.9
CEIC8204
10.0
0.0
8.1
5.6
44.3
15.8
0.0


MATH2018
CEIC3001
CEIC4008

Even with the

rubrics are also reviewed along with the measures proposed by the exam setter to check for academic integrity.
- Reports are normally submitted via Turn-It-In where appropriate. Final year theses may also be checked via Turn-It-In if there are any concerns from either marker.
- Worked solutions with detailed marking guides or marking rubrics are created for all assessment items and used by markers.
- Final year theses are double marked to ensure consistency; if the markers are not in reasonable agreement on the final mark, a third marker is appointed.

As exams have moved online due to COVID-19, the following standard practices have been adopted as part of the exam setting and marking procedures:

- Fixed times for the start and end of the examination are maintained to prevent groups working in sequence.
- Long duration exams (for example 24 h exams) are discouraged as it makes it too easy for groups to work together; short duration examinations remain normal (2 h).
- Randomisation of questions is undertaken either using technologies like STACK (with random numbers included in the questions for each student) or by creating multiple variants of questions.
- Web searches are conducted before and after the exam is held, initially to see if there are sites that would give the answers to the students easily, and then after the exam to see if students have received assistance on “homework help” sites.
- The combination of question randomisation, question watermarking, and answer similarity checking permits many forms of exam misconduct to be trivially identified.

It is reasonable to assume that assessment practices will continue to evolve, with arguments unresolved about the best approaches to assess student learning, the impact of high stakes assessments on student welfare, and the efficacy of various assessment practices in maintaining academic integrity.

The Chemical Product Engineering stream in the BE(Hons) has strengths in its staged development of discipline knowledge across the 4 years, and the integration of content learning with application of knowledge. Chemical product engineering as a profession is in a growth phase as the roles of the specialist formulator and product developer become better established in industry; the School will need to continue to track industry trends such as the greater emphasis on sustainability, circular economy, and digitalisation. Industry consultation the scope of product engineering within the stream is also feasible – the current focus on carbon-based materials via the organic and polymer chemistry courses could be broadened to permit inorganic materials or food materials, for instance. Revision of CLOs to more explicitly highlight the professional skills learning that is already within those courses will be undertaken. Changes to assessment types to ensure that both team work and individual competence are thoroughly captured by the assessment scheme are likely.