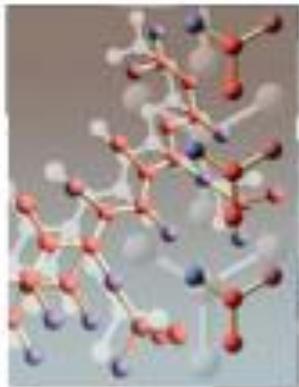
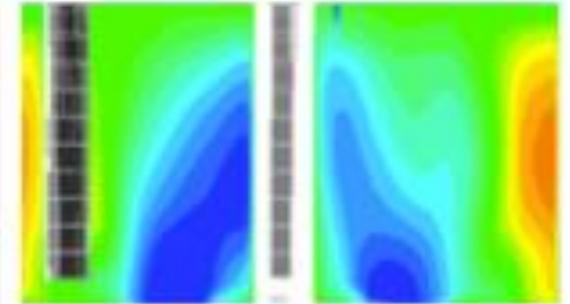


UCD Chemical & Bioprocess Engineering



BE/ME & Minor – Stage 2 Information Session – Sept. 2023

Minor & Non-Minor Pathways



Traffic Jam by Earl Mayan, Saturday Evening Post cover, April 28, 1956

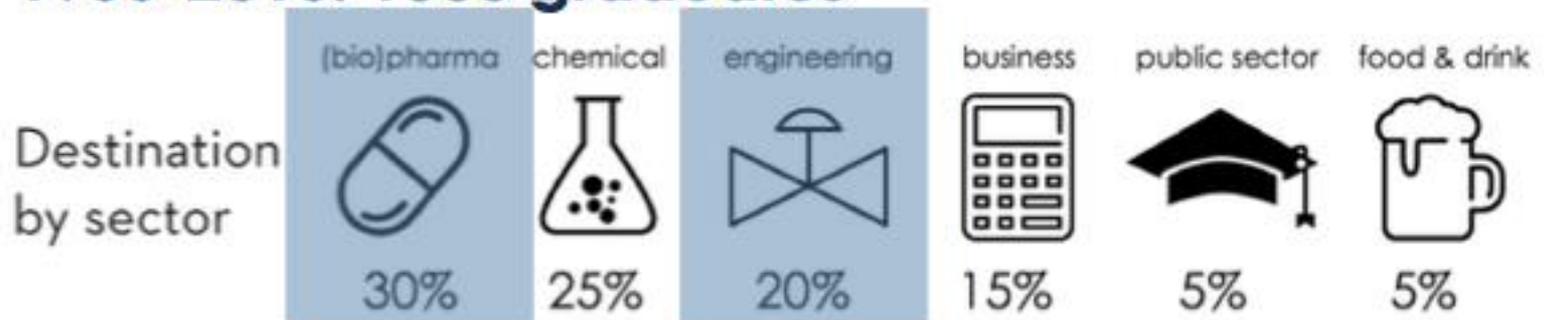
If I had only ONE slide....

- A degree in Chemical & Bioprocess Engineering can lead to a wide range of career opportunities spanning almost every sector of society (Energy, Environment, Health, Policy, etc).
- Whether you choose the Minor or non-Minor pathway, this does restrict you in ANY way.
- Make the decision in line with your interests & plans.
- If you select the Minor pathway, you cannot avail of the Study Abroad Programme in Stage 3.
- **If you wish to choose the Minor pathway, you must select CHEN20090 (Biotechnology Principles) as your Spring, Stage 2, Elective/Option.**

UCD Chemical & Bioprocess Engineering



1956-2016: 1500 graduates



Bio/Pharmaceutical Industry in Ireland

- 19 of the worlds top 20 Pharma & Biotechnology companies
- Annual exports exceeding €80+ billion (39% of exports)
- Employment over 23,000 50% graduates

abbvie

AMGEN®

BAUSCH + LOMB



Engineering Firms Supporting the Bio/Pharma Sector



www.approcess.com

JE JACOBS

PM
GROUP

 DPS

Biopharmaceutical Facilities in Ireland

existing/in development

ALEXION

BIOMARIN



Bristol-Myers Squibb



Lilly



REGENERON
science to medicine[®]

Shire

UCD Chemical & Bioprocess Engineering

TWO MAJOR CURRICULUM DEVELOPMENTS IN 2017!

- **ME CHEMICAL & BIOPROCESS ENGINEERING**

- Available from Sept 2017
- To incoming Stage 4 students

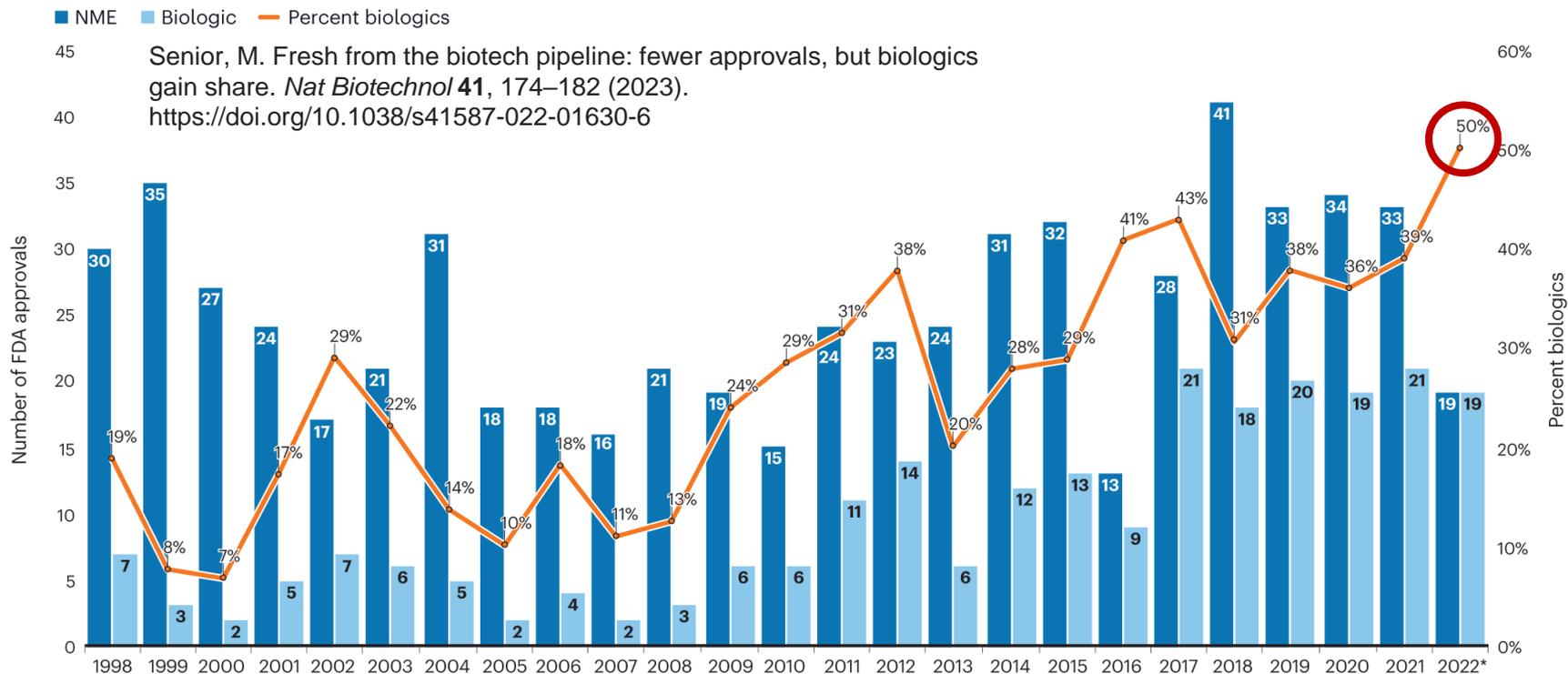
- **BE CHEMICAL ENGINEERING WITH BIOCHEMICAL ENGINEERING MINOR**

- Available from Sept 2017
- To incoming Stage 2 students

BE CHEMICAL ENGINEERING WITH BIOCHEMICAL ENGINEERING MINOR

WHY?

1. Increasing importance of biopharmaceuticals (biologic)*



* Def: “Biomedical product/biologic pharmaceutical manufactured in, extracted from or semi-synthesised from biological sources.”

* Def: NME = small-molecule new molecular entities

▪ BE CHEMICAL ENGINEERING WITH BIOCHEMICAL ENGINEERING MINOR

WHY?

2. Biopharmaceuticals have additional, specialist topics of importance

Theory

Design, modelling & simulation

Standards, Protocols & Practices

Regulation

“Preparedness”

3. Recognising concentrated sub-field of study (**MINOR**)

NEW! BE ChemE with Biochemical Engineering Minor

'MINOR': UCD REQUIREMENTS

- **40 credits** in the 'minor' subject, in Stages 3 & 4, i.e.

Stage 3 Minor	Sem 1 - 10 credits	Sem 2 - 20 credits
Stage 4 Minor	BE path Sem 1 - 5 credits	Sem 2 - 5 credits
	ME path Sem 1 - 10 credits	

HOW IS THIS ACHIEVED?

- Some core ChemE modules substituted with BiochemE
- ****Use of Stage 3 & Stage 4 elective credits****
- **CHEN20090** (Biotechnology Principles)
 - Pre-requisite for Minor, for Stage 2 students, since Sept 2017
 - Available to all Stage 2 CBE students, as Semester 2 Option **or** In-Programme Elective

ME programme in Chemical & Bioprocess Engineering

Which degrees are accredited? And to what level?

BE CHEMICAL & BIOPROCESS ENGINEERING

BE CHEMICAL ENGINEERING W/ BIOCHEMICAL ENGINEERING MINOR

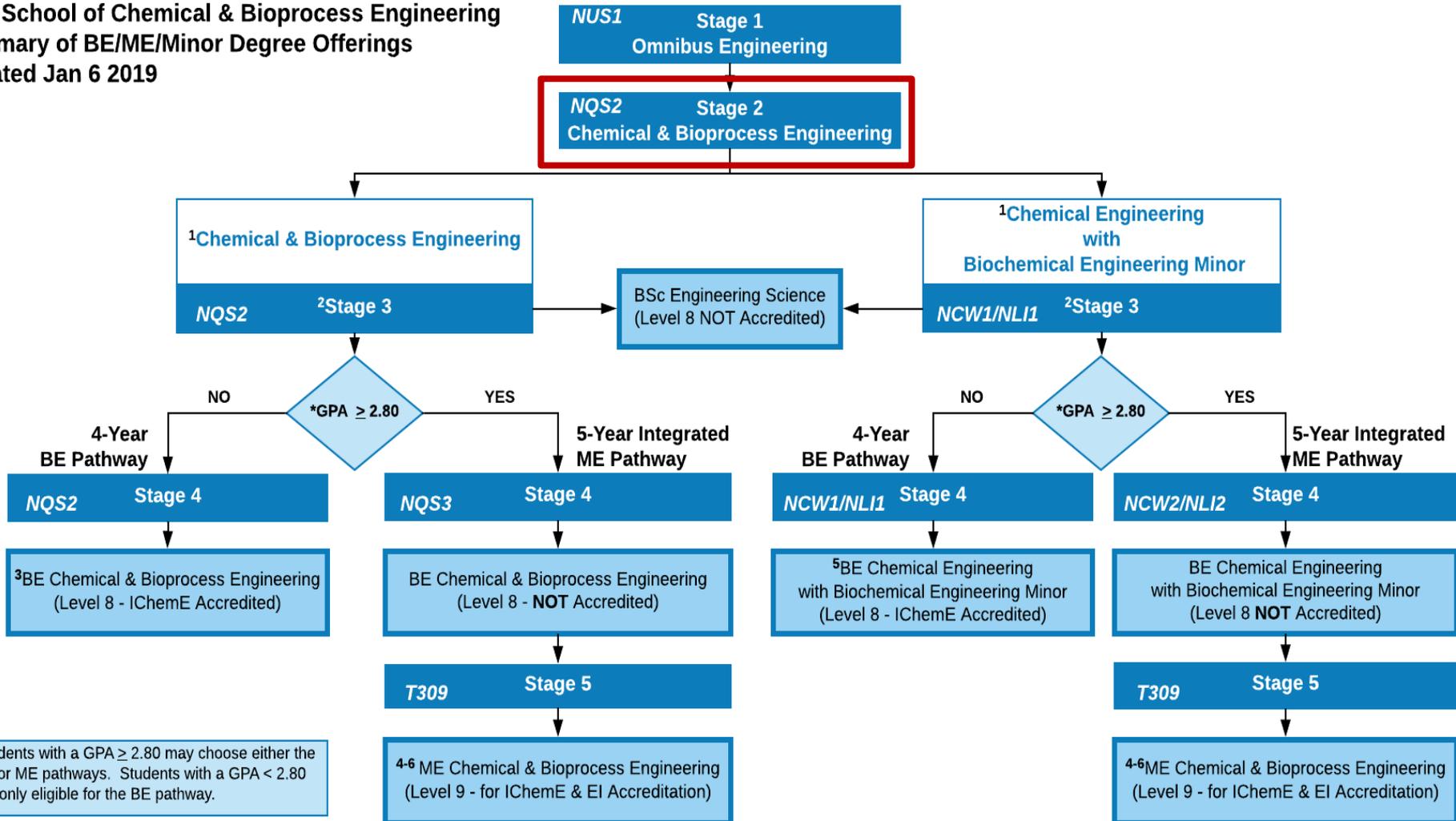
- accredited by IChemE to **Master level**

5-YEAR INTEGRATED ME CHEMICAL & BIOPROCESS ENGINEERING

- Accredited by
 - IChemE to **Master level**
 - Engineers Ireland to **Master level**

Handout: Degree Offerings & Programme Codes

UCD School of Chemical & Bioprocess Engineering
 Summary of BE/ME/Minor Degree Offerings
 Updated Jan 6 2019



* Students with a $GPA \geq 2.80$ may choose either the BE or ME pathways. Students with a $GPA < 2.80$ are only eligible for the BE pathway.

Handout: Detailed Programme Structures

BE Chemical & Bioprocess Engineering, BE Chemical Engineering with Biochemical Engineering Minor & Integrated ME Chemical & Bioprocess Engineering

from 2020/21 onwards - updated Feb. 17 2020

	NQS2	NQS2	NCW1/NL11	NCW1/NL11	NQS2	NQS3	NCW2/NL12	T309		
	BE CBE Stage 2	BE CBE Stage 3	BE Bio Stage 3	BE Bio Stage 4	BE CBE Stage 4	ME CBE Stage 4	ME Bio Stage 4	ME CBE Stage 5		
	KEY CHEN20030 (1/5): Level 2, Sem 1, 5-credit module CHEN40200 (2/10): Level 4, Sem 2, 10-credit module AO: Additional Option (previously, In-Programme Elective) Study Abroad: refers to students who spend one/both semesters of Stage 3 on Study Abroad.	Modules associated with Biochemical Engineering Minor (NL11/NL12) (total of 40 credits between Stages 3 & 4).						CHEN40760 (3/10) Res. Methods in CBE CHEN40750 (3/10) CBE Work Place. II CHEN40700 (3/10) Adv. CBE Knowledge	TRIMESTER 3 (SUMMER)	
TRIMESTER 1	CHEN20020 (1/5) CBE Measurement CHEN20030 (1/5) CBE Thermo, Kinetics CHEN20050 (1/5) Bioprocess Eng Principles CHEN20080 (1/10) CBE Lab I MATH20290 (1/5) Multi. Calc. for Eng. I	ACM30030 (1/5) Multi. Calc. for Eng. II CHEN30010 (1/5) CBE Reaction Eng. CHEN30020 (1/5) Unit Operations CHEN30030 (1/5) CBE Thermo. CHEN30040 (1/5) Comm. Pharma. (1/5) Elective	ACM30030 (1/5) Multi. Calc. for Eng. II CHEN30010 (1/5) CBE Reaction Eng. CHEN30020 (1/5) Unit Operations CHEN30030 (1/5) CBE Thermo. CHEN30040 (1/5) Comm. Pharma. CHEN40040 (1/5) Animal Cell Culture Tech.	CHEN40150 (1/5) Adv. Sep. Processes CHEN40160 (1/5) Adv. Heat Trans./Fluids CHEN40620 (1/10) Adv. Process Design CHEN40210 (1/5) Adv. Exp. Design CHEN40570 (1/5) CB Sys. Eng.	CHEN40150 (1/5) Adv. Sep. Processes CHEN40160 (1/5) Adv. Heat Trans./Fluids CHEN40620 (1/10) Adv. Process Design CHEN40210 (1/5) Adv. Exp. Design (1/5) Option	CHEN40150 (1/5) Adv. Sep. Processes CHEN40160 (1/5) Adv. Heat Trans./Fluids CHEN40620 (1/10) Adv. Process Design (1/5) Elective (1/5) Option	CHEN40150 (1/5) Adv. Sep. Processes CHEN40160 (1/5) Adv. Heat Trans./Fluids CHEN40620 (1/10) Adv. Process Design CHEN40110 (1/5) Facility Design CHEN40570 (1/5) CB Systems Eng.	CHEN40590 (1/30) ME CBE Research Proj.	TRIMESTER 1 (AUTUMN)	
TRIMESTER 2	CHEM20060 (2/5) Organic Chem. for Eng. CHEN20060 (2/5) Transport Phenomena CHEN20070 (2/5) Computers in CBE (2/5) Option (2/5) Elective (2/5) Elective	CHEN30130 (2/5) Heat Trans. & Fluid Mech. ^{3,5} CHEN30200 (2/10) CBE Design ¹ CHEN30210 (2/10) CBE Lab. 2 MEEN30140 (2/5) Prof. Eng. (Finance)	CHEN30130 (2/5) Heat Trans. & Fluid Mech. CHEN30150 (2/5) ³ CE Design (Mech) CHEN40530 (2/5) Bioprocess Design ¹ CHEN30240 (2/5) Biochemical Eng. Lab. 1 ² CHEN30250 (2/5) Biochemical Eng. Lab. 2 CHEN40460 (2/5) DSP & Sterile Fill-Finish	CHEN40010 (2/5) Environ. Eng. CHEN40610 (2/5) Applied Chemistry CHEN40200 (2/10) CBE Research Proj. CHEN40560 (2/5) Process Control CHEN40130 (2/5) Bio. Scale-Up & Tech. T.	CHEN40010 (2/5) Environ. Eng. CHEN40200 (2/10) CBE Research Proj. CHEN40560 (2/5) Process Control (2/10) Option	CHEN40740 (2/10) CBE Work Place. I CHEN40680 (2/10) CBE Work Place. Log Book CHEN40690 (2/10) CBE Work Place. Knowledge	CHEN40740 (2/10) CBE Work Place. I CHEN40680 (2/10) CBE Work Place. Log Book CHEN40690 (2/10) CBE Work Place. Knowledge	CHEN40010 (2/5) Environ. Eng. CHEN40560 (2/5) Process Control CHEN40610 (2/5) Applied Chemistry (2/15) Option	TRIMESTER 2 (SPRING)	
	Stage 2 Options CHEM20070 (2/5) Inorg. & Phy. Chem. Eng. ¹ CHEN20090 (2/5) Biotechnology Principles Stage 2 Sem. 2 AO CHEM20070 (2/5) Inorg/Phy Chem. for Eng. ⁷ CHEN10010 (2/5) ChemE Proc. Princip. ⁵ CHEN20090 (2/5) Biotechnology Principles	Stage 3 Sem. 1 AO CHEN40480 (1/5) Lean Sigma Bioph. Proc.		BE CBE Stage 4 Sem. 2 AO CHEN40130 (2/5) Bio. Scale-Up & Tech. T. CHEN40460 (2/5) DSP & Ster. Fill/Finish	BE CBE Stage 4 Sem. 2 10 Credit Option Standard CHEN40610 (2/5) Applied Chemistry (2/5) Elective 1	BE CBE Stage 4 Sem. 2 10 Credit Option Study Abroad Students ^{3,5} CHEN30200 (2/10) CBE Design	ME CBE Stage 4 Sem. 1 AO CHEN40110 (1/5) Facility Design CHEN40480 (1/5) Lean Sigma Bioph. Proc. for returning JYA students, if required.	ME CBE Stage 5 Sem. 2 Options ^{8,9} MEEN30140 (2/5) Prof. Eng. (Finance) ^{3,5} CHEN30200 (2/10) CBE Design CHEN40130 (2/5) Bio. Scale-Up & Tech. T. CHEN40440 (2/5) Chem Proc. Sus Ren. En.	CHEN40460 (2/5) DSP & Ster. Fill/Finish CHEN40470 (2/5) Cell & Tissue Eng. ¹⁰ CHEN40510 (2/5) Adv. Charact. Techniq. CHEN40510 (2/5) Adv. Charact. Techniq. CHEN40660 (2/5) CBE Business Plan	

- CHEN30240 & CHEN30210 timetabled together.
- CHEN30250 is delivered by National Institute for Bioprocessing Research & Training (NIBRT); timetabled with CHEN30240.
- CHEN30150 (Mech) timetabled as part of CHEN30200 during weeks 1-7.
- CHEN30010 must be available to returning Study Abroad students in Stage 4 Sem. 1
- CHEN30200 must be available to returning Study Abroad students, Stages 4 and 5 (Sem. 2).
- CHEN20090 is available to all Stage 2 CBE students, as either an Elective or Option. It is required for the BiochemE Minor.
- CHEN10010 must be available to Stage 2 CBE students who did not take it in Stage 1. This is an accreditation requirement.
- MEEN30140 must be available to Stage 3 BE CBE & Stage 5 ME CBE students.
- MEEN30140 is required for students who have not taken this module or equivalent as part of their BE studies.
- CHEN40470 cannot be taken by students who have already taken CHEN40040.

BE CBE/BE ChemE with Minor: **Stage 3 - Semester 1**

BE Chemical & Bioprocess Engineering

Stage 3 Semester 1

- ACM30030 Multi. Calc.
- CHEN30010 Reaction Eng.
- CHEN30020 Unit Ops
- CHEN30030 Thermo.
- CHEN30040 Comm Bio/Pharma.
- ELECTIVE

In-programme Elective

CHEN40480 Lean Sigma Biopharma

BE Chemical Engineering with Biochemical Engineering Minor

Stage 3 Semester 1

- ACM30030 Multi. Calc.
- CHEN30010 Reaction Eng.
- CHEN30020 Unit Ops
- CHEN30030 Thermo.
- CHEN30040 Comm Bio/Pharma.
- CHEN40040 Animal Cell Cul Tech.

BE CBE/BE ChemE with Minor: Stage 3 - Semester 2

BE Chemical & Bioprocess Engineering

Stage 3 Semester 2

- CHEN30130 Heat & Fluids (5)
- CHEN30200 CBE Design (10)
- CHEN30210 CBE Lab. 2 (10)
- MEEN30140 Finance (5)

BE Chemical Engineering with Biochemical Engineering Minor

Stage 3 Semester 2

- CHEN30130 Heat & Fluids (5)
- CHEN30150 ChemE Design (5)
- CHEN40530 Bioprocess Design (5)
- CHEN30240 BioChemE Lab 1 (5)
- CHEN30250 BioChemE Lab 2 (5)
- CHEN40460 DSP & Ster. FF (5)

BE CBE/BE ChemE with Minor: **Stage 4 - Semester 1**

For students intending to graduate with a 4-Year BE degree (Level 8)

BE Chemical & Bioprocess Engineering

Stage 4 Semester 1

- CHEN40150 Adv Sep Proc
- CHEN40160 Adv Heat & Fluids
- CHEN40210 Adv Exp Methods
- CHEN40260 Adv Proc Design (10)
- CHEN40570 CB Sys Eng

BE Chemical Engineering with Biochemical Engineering Minor

Stage 4 Semester 1

- CHEN40150 Adv Sep Proc
- CHEN40160 Adv Heat & Fluids
- CHEN40210 Adv Exp Methods
- CHEN40260 Adv Proc Design (10)
- CHEN40570 CB Sys Eng

BE CBE or BE ChemE with Minor: **Stage 4 – Semester 2**

For students intending to graduate with a 4-Year BE degree (Level 8)

BE Chemical & Bioprocess Engineering Stage 4 Semester 2

- CHEN40010 Env Eng
- CHEN40200 Research Proj (10)
- CHEN40560 Process Control
- CHEN40610 Appl Chem ¹
- ELECTIVE*

* **Stage 4 Sem 2 In-Programme Electives**

CHEN40130 Bio. Scale-Up & Tech Trans

CHEN40460 DSP & Sterile Fill Finish

CHEN40470 Cell & Tissue Eng

CHEN40510 Adv. Charact. Techniq.

BE Chemical Engineering with Biochemical Engineering Minor Stage 4 Semester 2

- CHEN40010 Env Eng
- CHEN40200 Research Proj (10)
- CHEN40560 Process Control
- CHEN40610 Appl Chem
- CHEN40130 Bio. Scale-Up & Tech. Trans.

¹ **Note: returning Study Abroad students who have not taken Design, take CHEN30200 CBE Design (10) as an Option**

ME CBE : Stage 4 - Sem 2 & Stage 5 – Sems 3, 1, 2

For students intending to graduate with a 5-Year ME degree (Level 9)

BE CBE or BE ChemE with **Bio Minor**

Stage 4 Spring

- CHEN40740 CBE Work Place. I (10)
- CHEN40680 CBE WP Logbook (10)
- CHEN40690 CBE WP Know. (10)

————— **BE complete**
STAGE 5

ME Chemical & Bioprocess Eng.

Stage 5 Summer

- CHEN40760 Res. Meth. in CBE (10)
- CHEN40750 CBE Work Place. II (10)
- CHEN40700 Adv. CBE Know. (10)

ME Chemical & Bioprocess Eng.

Stage 5 Autumn

- CHEN40590 CBE Res. Project (30) [in industry, in UCD, or on Study Abroad]

Stage 5 Spring

- CHEN40010 Env Eng
- CHEN40560 Process Control
- CHEN40610 Appl Chem
- Option (15)*

————— **ME complete**

*CHEN30200 CBE Design (available to Study Abroad students who did not take Stage 3 Design)

ME Internships – Jan 2023 (BE Stage 4 2022/23)

- 30 students enrolled in ME – 10 students enrolled in BE
- Almost all 12-month placements, incl. 30-credit Project
- 1-3 projects on Study Abroad at University of Maryland (UMD)

Company	Company
Alexion (Athlone) [1]	Ipsen (Dublin) [1]
Amgen (Dublin) [3]	MSD (Ballydine) [1]
APC (Dublin) [7]	MSD (Dublin) Biotech [1]
ARUP (Dublin) [1]	MSD (Dunboyne) [1]
BMS (Cruiserath) [4]	PM Group (Dublin) [1]
DPS (Dublin) [1]	SK Biotek [2]
Eli Lilly (Cork) [1]	Takeda (Bray) [1]
FDT (Dublin) [2]	Takeda (Grange C.) [1]
Helsinn (Cork) [1]	

Q&A

Q&A from BE/ME Information Sessions

Q.o: When do I have to decide if I want to take the Biochemical Engineering Minor?

A: Stage 2 students will be asked, during Semester 2* – via email from the Programme Office – to indicate which of the following 2 routes they can/wish to take:

- (i) BE Chemical & Bioprocess Engineering,
- (ii) BE Chemical Engineering with Biochemical Engineering Minor.

From 2017/18 onwards CHEN20090 is required for the Minor. Students choosing the Minor will be registered to the Minor by the Programme Office for the start of Stage 3

*** Survey Released in March 2024. Deadline: early April 2024**

Q&A from MINOR Information Sessions

Q.1: Do I have to take the Biochemical Engineering Minor?

A: NO! This optional Minor is designed to facilitate students with a particular interest in biochemical engineering and/or preparing for careers in the biopharma sector. It involves the substitution of a small number of core ChemE modules with core BioChemE modules. Additionally, to meet the Minor requirements, students must use their Stage 3 & 4 elective credits. Students wishing to take the Minor must take CHEN20090 (as either an Option or an Elective) during Stage 2.

Q.2: When do I have to decide if I want to take the Biochemical Engineering Minor?

A: In Semester 2, Stage 2 students will be asked, via email from the Programme Office, to indicate if they wish to take the Minor. From 2017/18 onwards CHEN20090 is required for the Minor. Students choosing the Minor will be registered to the Minor by the Programme Office for the start of Stage 3.

Q&A from MINOR Information Sessions

Q.3: Can I take the Biochemical Engineering Minor if I'm going on Study Abroad in Stage 3?

A: At present, the 40-credits which make up the Minor cannot be accessed by Stage 3 students in any of UCD's Study Abroad partner institutions.

If you take the Minor and progress to the ME path, you may apply to undertake your 30-credit ME Research Project on Study Abroad during Sem 1 of Stage 5 (pending availability).

If you don't take the Minor, but progress to the ME, you will be able to take some of the Minor modules as Options during Semester 2 of Stage 5, but they would not contribute to a Minor.

Q.4: If I'm taking the Minor, does this mean that I can't take MEEN30140 (Finance)?

A: MEEN30140 is a core Stage 3 module for the BE in Chemical & Bioprocess Engineering. Students who take the Minor can currently only access MEEN30140 if they take the ME route; it is available as a Stage 5, Semester 2 Option.

Q&A from MINOR Information Sessions

Q.5: Is the Biochemical Engineering Minor an 'add-on' that gives you an advantage in the bio/pharmaceutical industry or is it a specialisation that limits you?

A: The Biochemical Minor does not involve additional credits (i.e. both the BE in Chemical & Bioprocess Engineering and the BE in Chemical Engineering with Biochemical Engineering Minor require 240 credits), so It is *not* an 'add-on'. In UCD, a 'Minor' is a specialisation in a particular topic (i.e. Biochemical Engineering) within the framework of the relevant degree programme (the 'Major', i.e. Chemical Engineering). But it is *not* an entirely separate discipline. The Minor is not intended to restrict graduates! It is a route, unique in Ireland, to better preparing for Chemical Engineering careers in the biopharma sector, without diluting the underpinning core Chemical Engineering content.

Q&A from MINOR Information Sessions

Q.6: If I take the Biochemical Engineering Minor and then progress to the ME, am I guaranteed an ME Internship in the biopharma sector?

A: No!

Internships are not guaranteed, but all ME students are actively supported by the UCD Engineering Internship Managers in securing an ME Internship. All available positions in are advertised to all ME students at the start of the academic year. Assuming that they meet the employer requirements, students choose which positions to apply for and submit role- & company-specific applications for vacancies of interest, either in the biopharma sector or another sector. There is no guarantee, from year to year, of the nature of available positions. Of 26 ME Internships for Jan 2018, 10 were in biopharma companies/roles; in Jan 2019, of 29 Internships, 11 were in biopharma companies/roles.

Q&A from MINOR Information Sessions

Q.7: If I take the Biochemical Engineering Minor and then progress to the ME, do I have to take an ME Internship in the biopharma sector?

A: No!

Please refer to answers to Q.4, Q.5 & Q. 18.

The Minor is a 40-credit subset of a student's BE studies, independent of the ME Internship. A student who has taken the Minor and who progresses to the ME is under no obligation to seek an ME Internship in a bio-related area.

Of 26 ME Internships for Jan 2018, 10 were in biopharma companies/roles; in Jan 2019, of 29 Internships, 11 were in biopharma companies/roles. Of the first cohort of ME students who had enrolled in the Minor, some chose to target bio-related roles/companies, some targeted non-bio-related roles/companies, some applied to a range of companies, across bio- and non-bio- sectors.

QUESTIONS?

contact: damian.mooney@ucd.ie