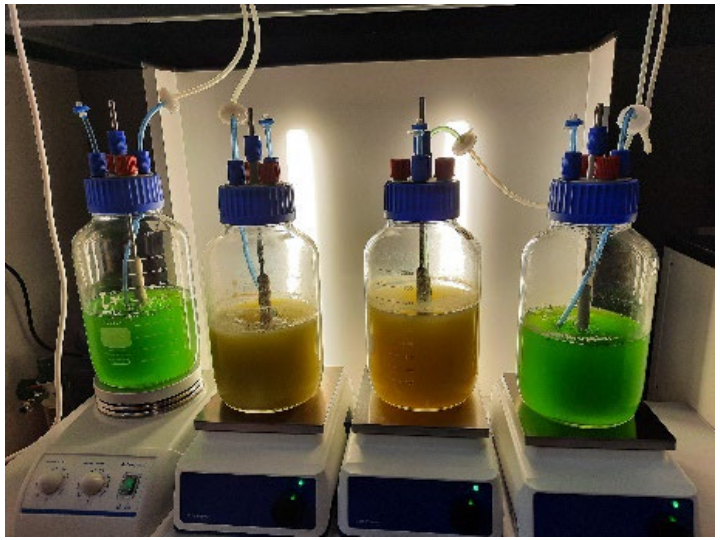
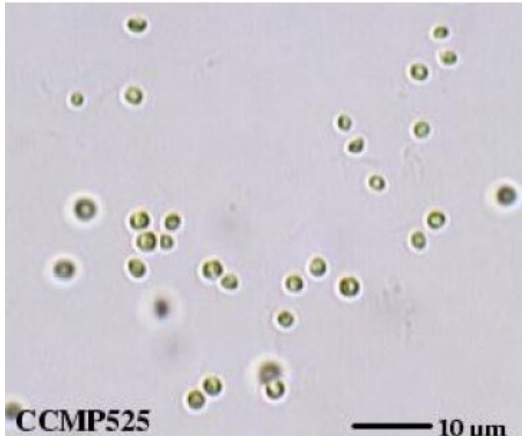
Stage 1 Talks:
Introduction to Biosystems and Food Engineering

03/2025
Dr. Ronald Halim
Assistant Professor
School of Biosystems and Food Engineering

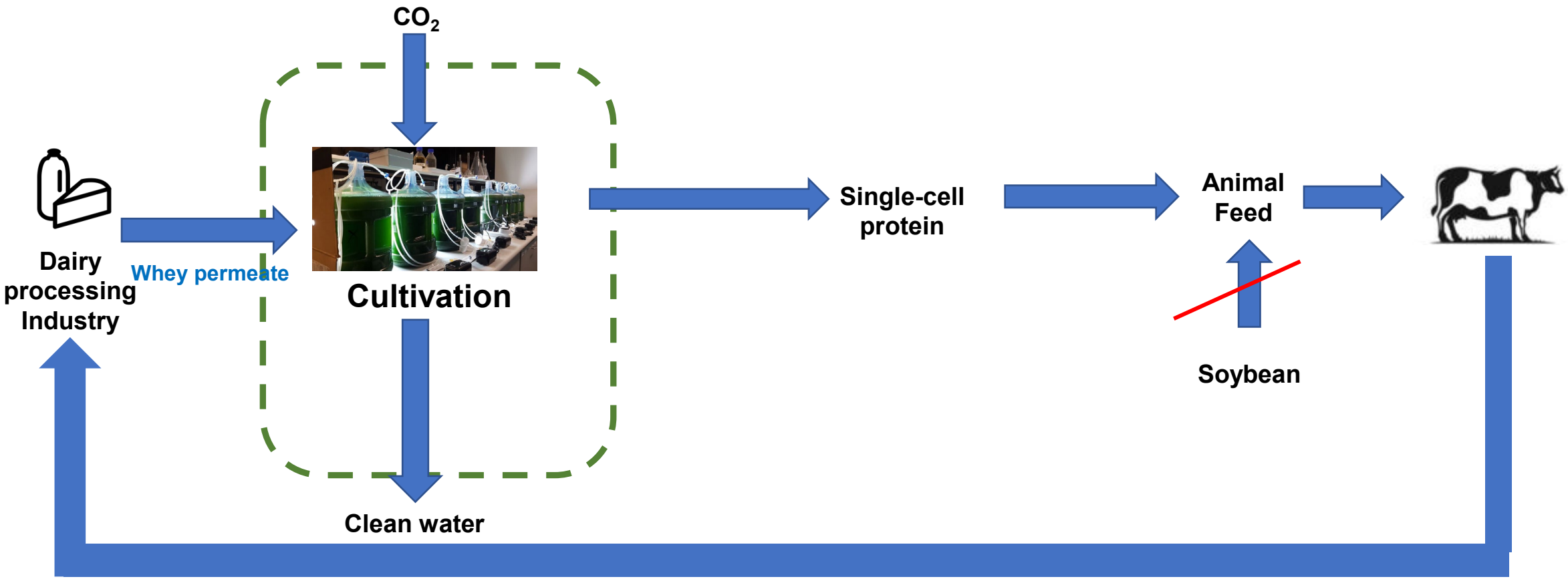
What are microalgae?





Nannochloropsis sp.
(rich in lipid, protein, ω3 lipid)

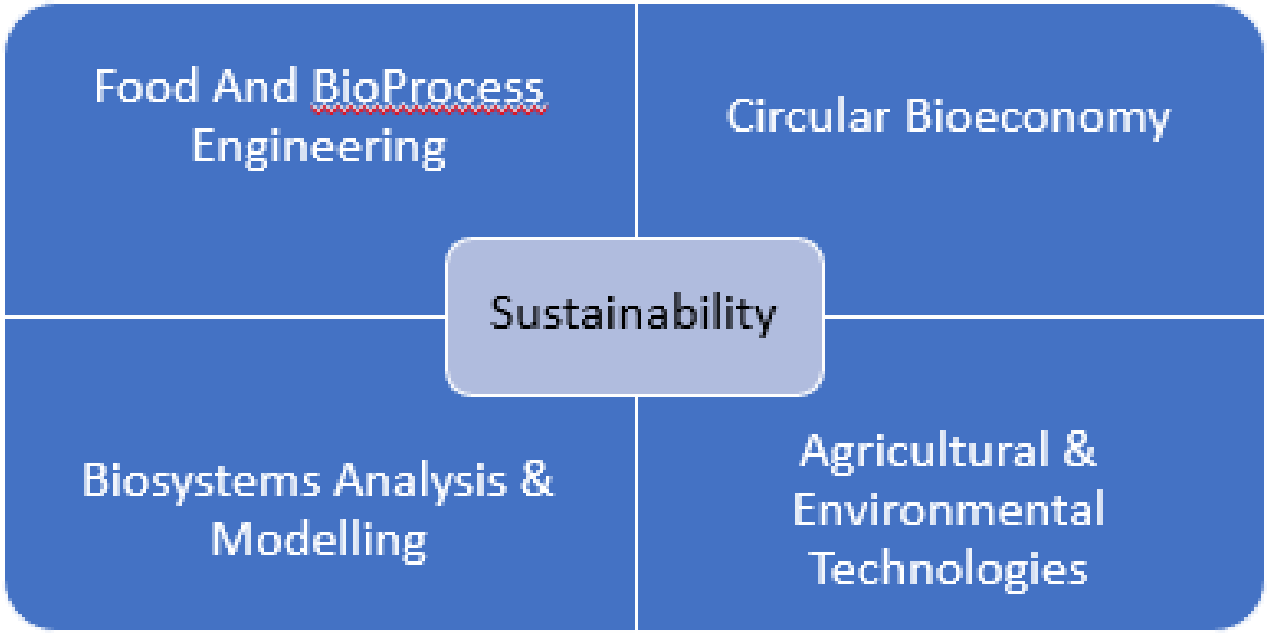
What roles can microalgae play in our society?



Adding value to waste
Carbon capture

Sustainable food/feed system
Circular bioeconomy

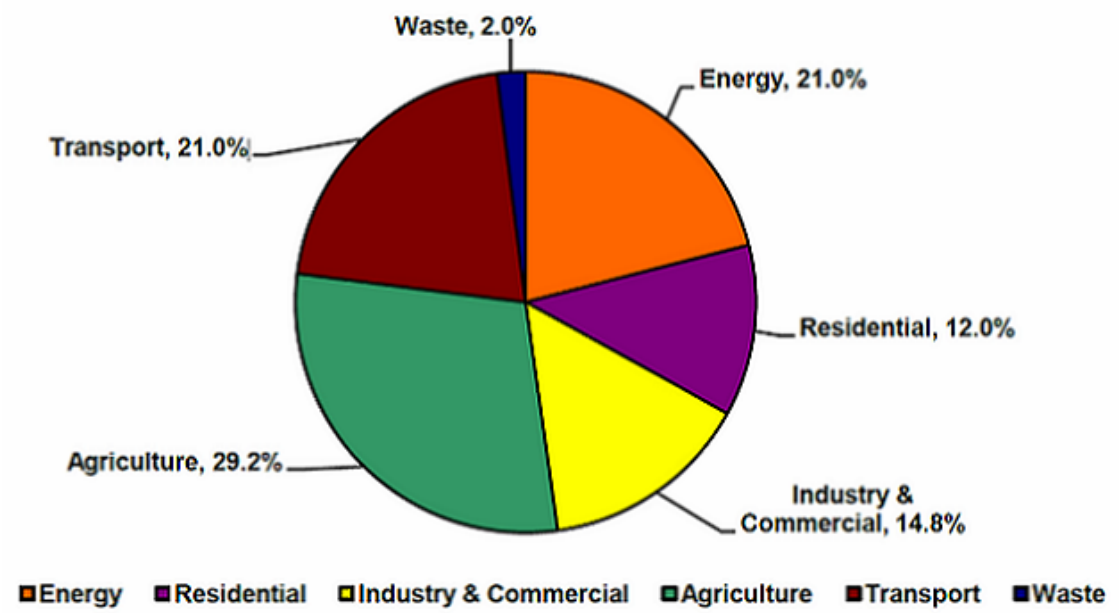
What is Biosystems and Food Engineering?



What is Biosystems and Food Engineering?

Finding Solutions for Life on a Small Planet

- World population in 2050 will be 9.6 billion people
- Growing world population requires more food, water, energy, goods
- Limited resources demand we do more with less, without degrading our natural environment
- Climate change, with a local emphasis



Ireland's Greenhouse Gas emission by sectors

School of Biosystems and Food Engineering

At a glance:

- **20** Faculty
- Total of **300** Full-time equivalent students including 67 research/PhD students
- Circa €5 million research funding awarded annually
- Highly Cited Researchers in our School: Prof Paula Bourke (our Head of School) and Prof Da Wen Sun.

Prof. Paula Bourke
Head of School
paula.bourke@ucd.ie

School of Biosystems and Food Engineering

UCD Conway Institute

UCD Science Centre

UCD Agriculture and Food Science Centre (Primary Location)

Research Projects in Our School

Sustainable and carbon-neutral farming

Through renewable energy, diets and fertiliser reduction

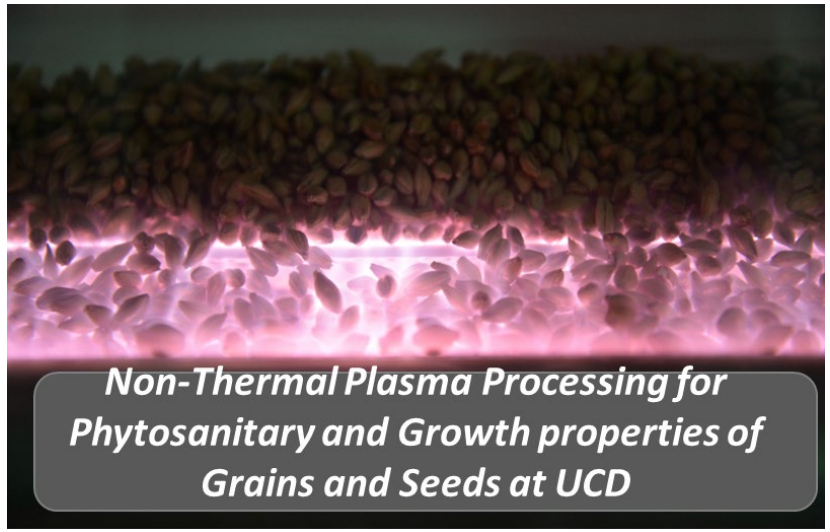
Proveye Secures €1 million in Seed Funding

Pictured at NovaUCD are Proveye founders, Jerome O'Connell and Professor Nick Holden, UCD School of Biosystems and Food Engineering.

Remote sensing coupled with AI for sustainable agriculture

Research Infrastructure

- Food and Bioprocess Engineering Suite
- Biosystems Analysis and Modelling Suite
- Digital Agriculture and Environmental Technology



CN-analyser

ICP

Spectral Imaging Research Group (SIRG)

ME Biosystems and Food Engineering

Two-Year Full Time (120 ECTS)

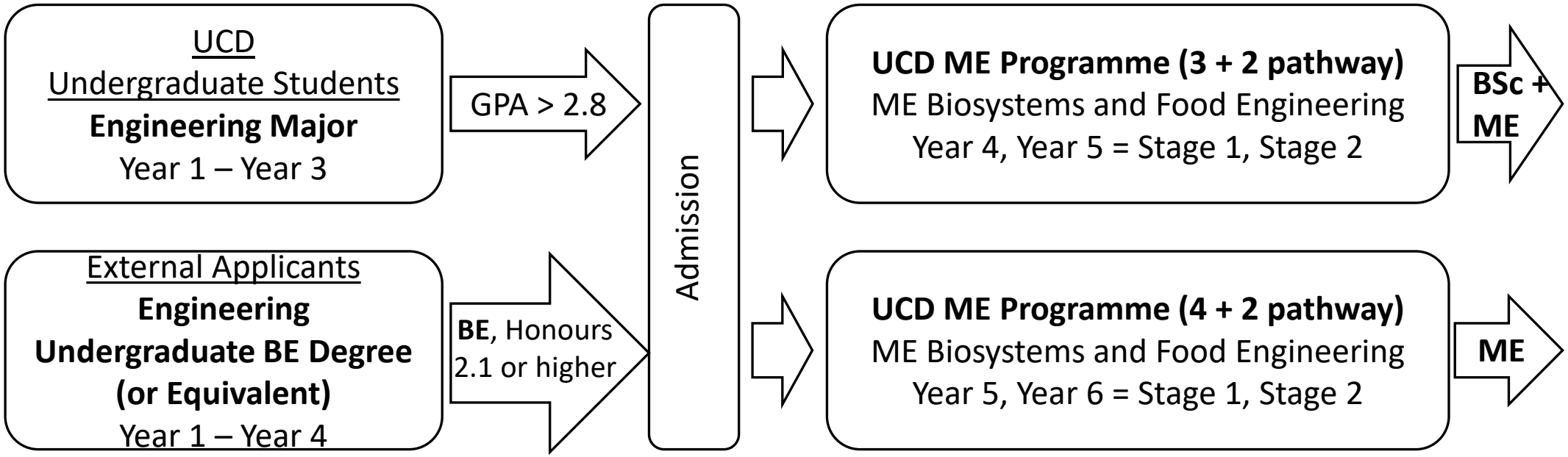
- Provides engineering graduates with the opportunity to deepen their knowledge in the design and application of **sustainable** **biological systems** in novel food process engineering, waste and wastewater management, and bioenergy.

- 6 - 8 months **professional work experience** with one of UCD's industry partners.

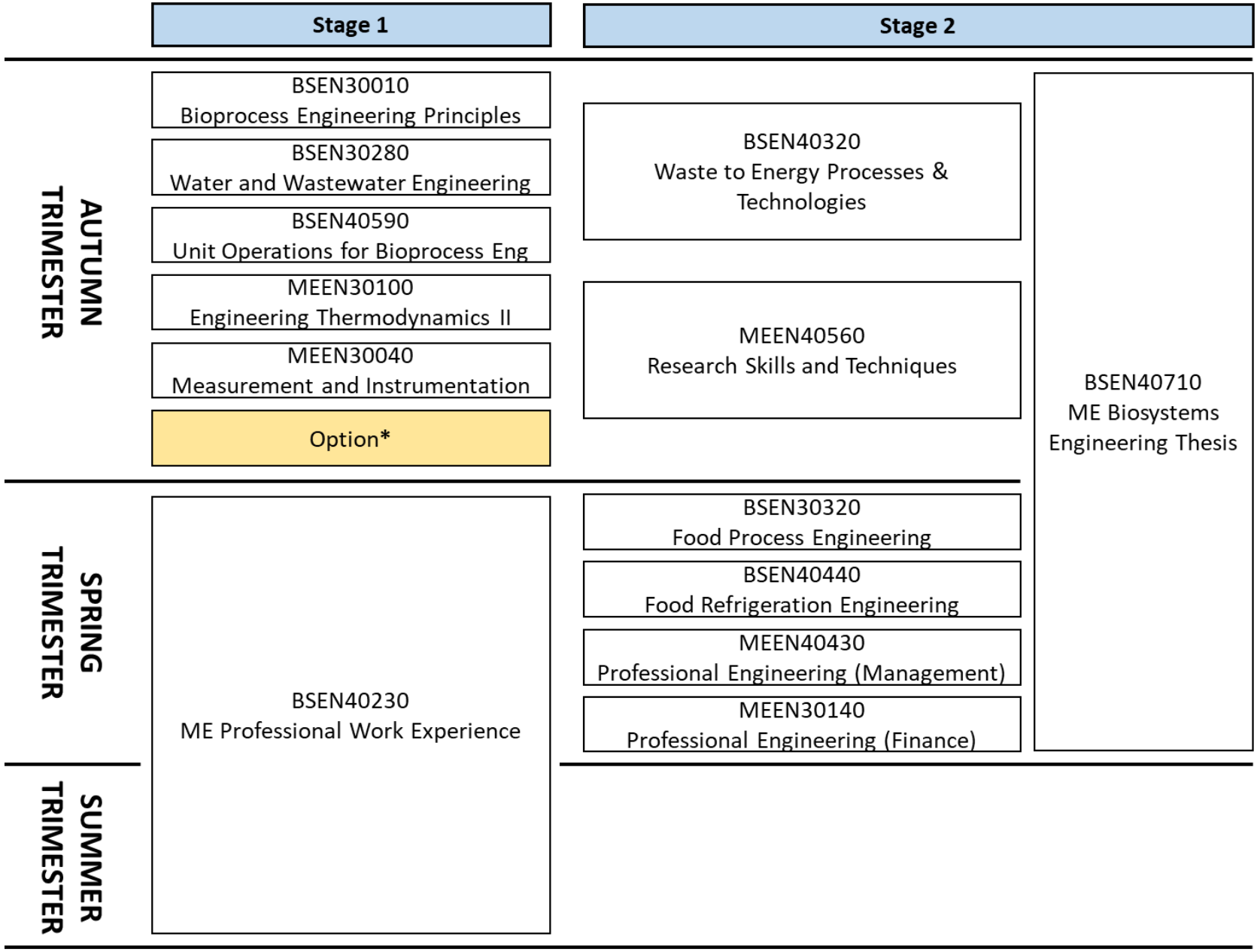
- https://hub.ucd.ie/usis/!W_HU_MENU.P_PUBLISH?p_tag=PROG&MAJR=T299

Entry Standards and Pathways

- For UCD engineering undergraduate students, 3 + 2 pathway available.
- To graduate with both BE and ME after 5 years.



Programme Structure



Biosystems Engineering Thesis (BSEN40710)

- 8 months of research in autumn and spring trimesters of Stage 2 (part-time, 25 ECTS).
- Embedment of critical thinking and specialized research skills in biosystems/food engineering.
- Students choose a project from al list of nominated projects by faculty members.
- Based at UCD Belfield, UCD Lyons Farm or Teagasc Food Research Centre
- Open pathways for PhD

Biosystems Engineering Thesis (BSEN40710)

2022/2023

- Effects of Fermentation Time and Point of Grass Silage Bale on Grass Quality
- Economic and Feasibility Analysis of Renewable Energy Installation in Medium-Scale Distilleries
- Bioremediation of Brewery Wastewater by Cultivation of Microalgae *Nannochloropsis Limnetica*

Biosystems Engineering Thesis (BSEN40710)

Yuchen

- ME graduate (2018 – 2020)
- Research Project: Ultrasound and enzyme assisted agar extraction from macroalgae *Gelidium sesquipedale*
- Awarded a China Scholarship Scheme (CSC) Scholarship and an Irish Research Council (IRC) Scholarship to pursue a PhD
- Current PhD Student at UCD (2020 – now)

Food Hydrocolloids 120 (2021) 106905

Contents lists available at ScienceDirect

Food Hydrocolloids

journal homepage: www.elsevier.com/locate/foodhyd

Investigation of enzyme-assisted methods combined with ultrasonication under a controlled alkali pretreatment for agar extraction from *Gelidium sesquipedale*

Yuchen Li [b], Ming Zhao [a, b, *], Laura P. Gomez [a], Ramsankar Senthamaraikannan [c], Ramesh Babu Padamati [c], Colm P. O'Donnell [b], Brijesh K. Tiwari [a]

[a] Department of Food Chemistry and Technology, Teagasc Food Research Centre, Ashtown, Dublin 15, Ireland
[b] School of Biosystems and Food Engineering, University College Dublin, Belfield, Dublin 4, Ireland
[c] School of Chemistry, AMBER Centre, Trinity College Dublin, Dublin 2, Ireland

Professional Work Experience (BSEN40230)

- 30 weeks of professional work experience (full-time, 30 ECTS, Stage 1).
- Provides students with hands-on experience to apply knowledge in science and mathematics to real-world engineering problems and develop communication and teamwork skills.
- Generally paid.
- Students secure national/overseas placement with the support dedicated internship managers.
- Module coordinator and industry sponsor design work plan.

Professional Work Experience (BSEN40230)

Eoin
Current ME student (3 + 2 pathway)
Placement: Sanofi Genzyme (Co, Waterford)
Role: Quality data analysis for an existing production process

Bhuwana
Current ME student
Placement: Royal Oak Distillery (Co. Carlow)
Role: Support facility maintenance and process improvement.

Career Opportunities

- Students from Biosystems and Food Eng have secured graduate employment in relevant agri-food and bioenergy industries.
  - Food and beverage (Diageo, Glanbia, Kerry)
  - Environmental protection and waste recycling (Irish Water, Rowan)
  - Bioenergy and green technology (Teagasc)
  - Medical and Pharmaceuticals (Abbotts, Takeda)
- Many have also continued on their academic journeys (PhD at UCD, Mississippi State University).

Ireland

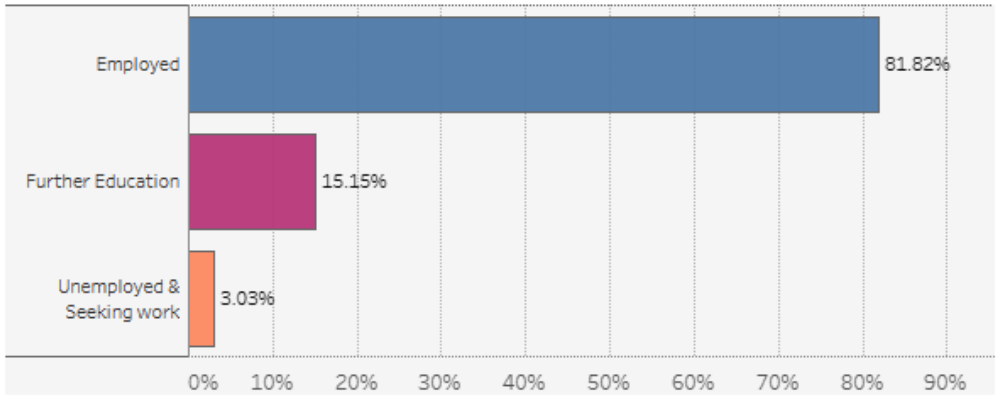
Royal Oak Distillery, Co. Carlow, Ireland
Diageo
Glanbia
Kerry
Est. 1885 Jacob's
Rowan
Uisce Éireann : Irish Water
Teagasc Agriculture and Food Development Authority
Abbott
Takeda
UCD Dublin

International

Ornua Ingredients Europe
State

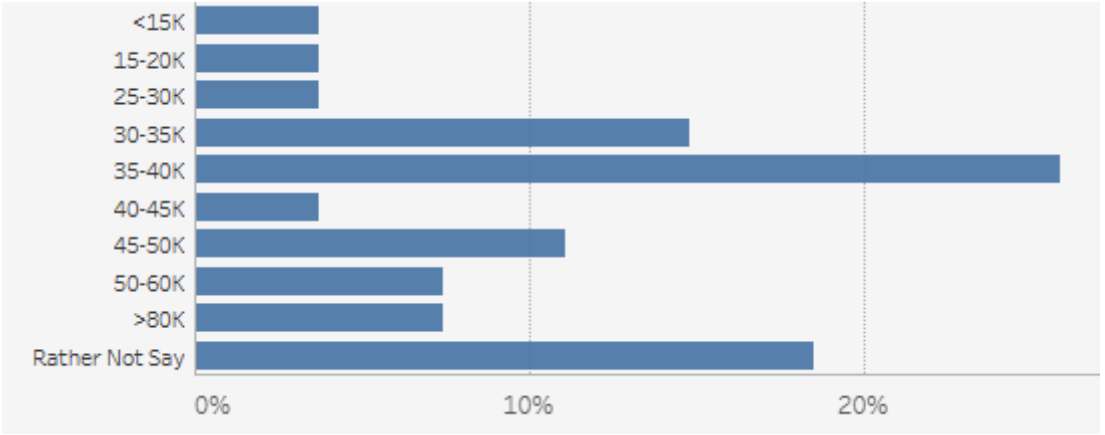
Career Opportunities

Employment status 9 months after graduation
(2021/22 academic year*)



*Graduate Outcomes Survey | Tableau Public

Annual salary or scholarship stipend
(2021/22 academic year*)



Rahul

ME graduate (2021 – 2023)

Current Position: Maintenance Systems Coordinator, Royal Oak Distillery

"The ME Biosystems and Food Engineering programme at UCD was highly influential in the trajectory of my career - it helped me approach engineering principles from a practical viewpoint…. I completed a 6-month internship at the Royal Oak Distillery, mainly working towards compliance engineering, quality and safety. I was then offered a graduate position immediately upon the completion of my degree"

Biosystems and Food Engineering modules

Stage 2

Biosystems Engineering Research Trends (BSEN20040)

Subject:	Biosystems Engineering	Module Coordinator:	Professor Enda Cummins
College:	Engineering & Architecture	Trimester:	Spring
School:	Biosystems & Food Engineering	Mode of Delivery:	Blended
Level:	2 (Intermediate)	Internship Module:	No
Credits:	5	How will I be graded?	Letter grades

Intro to Carbon and Energy Footprinting (BSEN20190)

Subject:	Biosystems Engineering	Module Coordinator:	Dr Fionnuala Murphy
College:	Engineering & Architecture	Trimester:	Spring
School:	Biosystems & Food Engineering	Mode of Delivery:	On Campus
Level:	2 (Intermediate)	Internship Module:	No
Credits:	5	How will I be graded?	Letter grades

Biosystems and Food Engineering modules

Stage 3

Bioprocess Engineering Principles (BSEN30010)

Subject:	Biosystems Engineering	Module Coordinator:	Professor Francis Butler
College:	Engineering & Architecture	Trimester:	Autumn
School:	Biosystems & Food Engineering	Mode of Delivery:	On Campus
Level:	3 (Degree)	Internship Module:	No
Credits:	5	How will I be graded?	Letter grades

Food Process Engineering (BSEN30320)

Subject:	Biosystems Engineering	Module Coordinator:	Dr Ronald Halim
College:	Engineering & Architecture	Trimester:	Spring
School:	Biosystems & Food Engineering	Mode of Delivery:	Blended
Level:	3 (Degree)	Internship Module:	No
Credits:	5	How will I be graded?	Letter grades

Water and Wastewater Engineering (BSEN30280)

Subject:	Biosystems Engineering	Module Coordinator:	Dr Rajat Nag
College:	Engineering & Architecture	Trimester:	Autumn
School:	Biosystems & Food Engineering	Mode of Delivery:	On Campus
Level:	3 (Degree)	Internship Module:	No
Credits:	5	How will I be graded?	Letter grades

Who to Contact?

Dr. Ronald Halim

Programme Director

ME Biosystems and Food Engineering

ronald.halim@ucd.ie

Prof. Enda Cummins

Head of Teaching and Learning

School of Biosystems and Food Engineering

Enda.cummins@ucd.ie