Electronic & Electrical Engineering
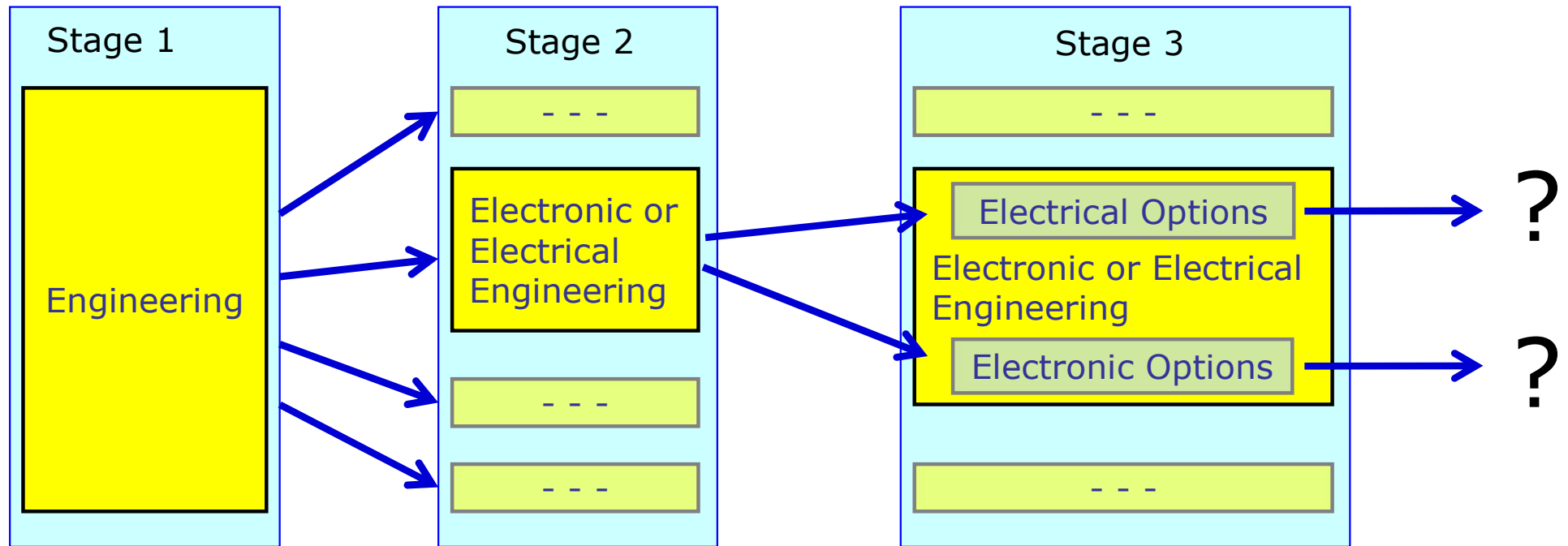
Information for Stage 3 Students

February 2025

UCD School of Electrical and Electronic Engineering
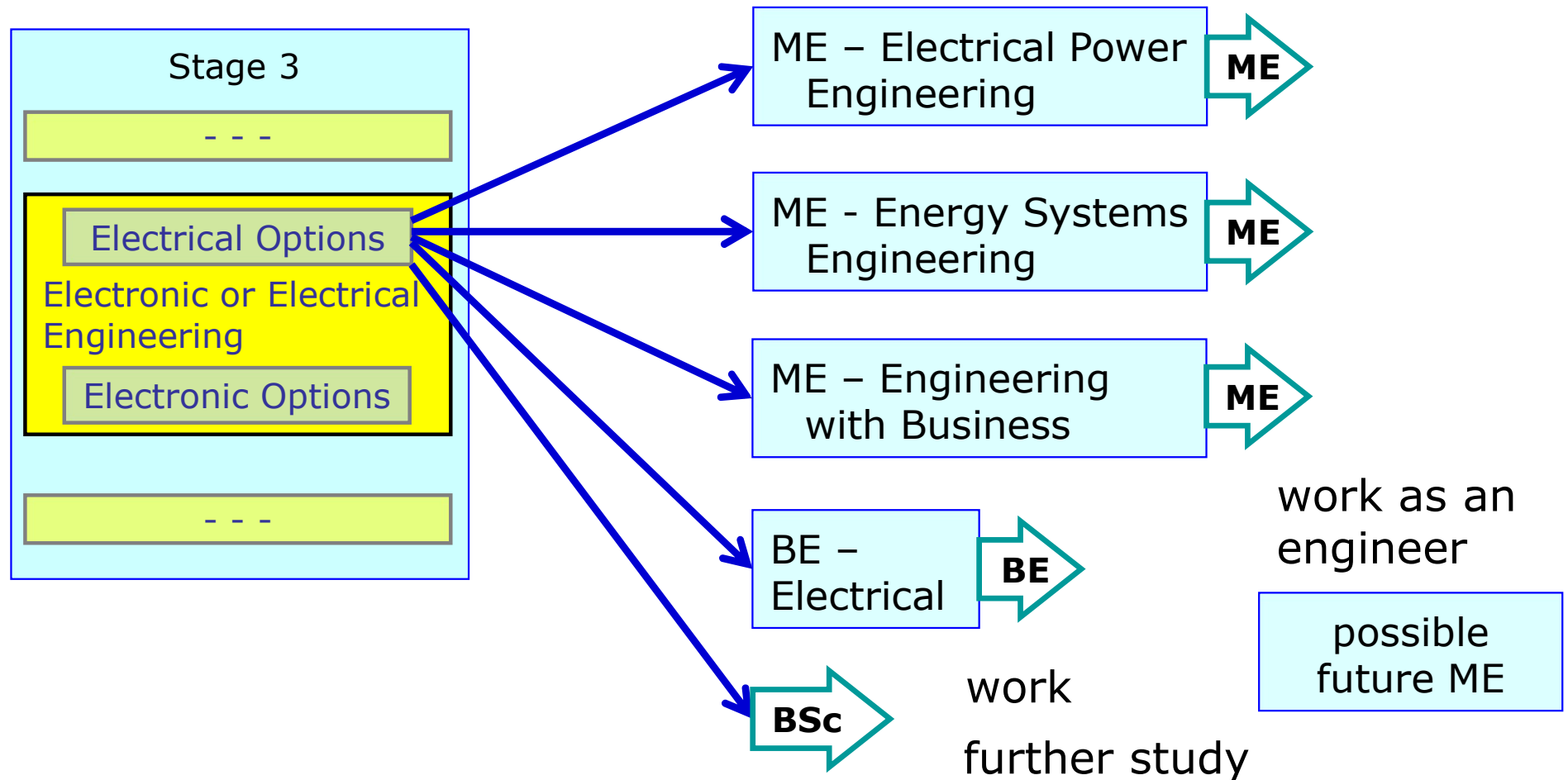
Scoil na hInnealtóireachta Leictrí agus Leictreonaí UCD
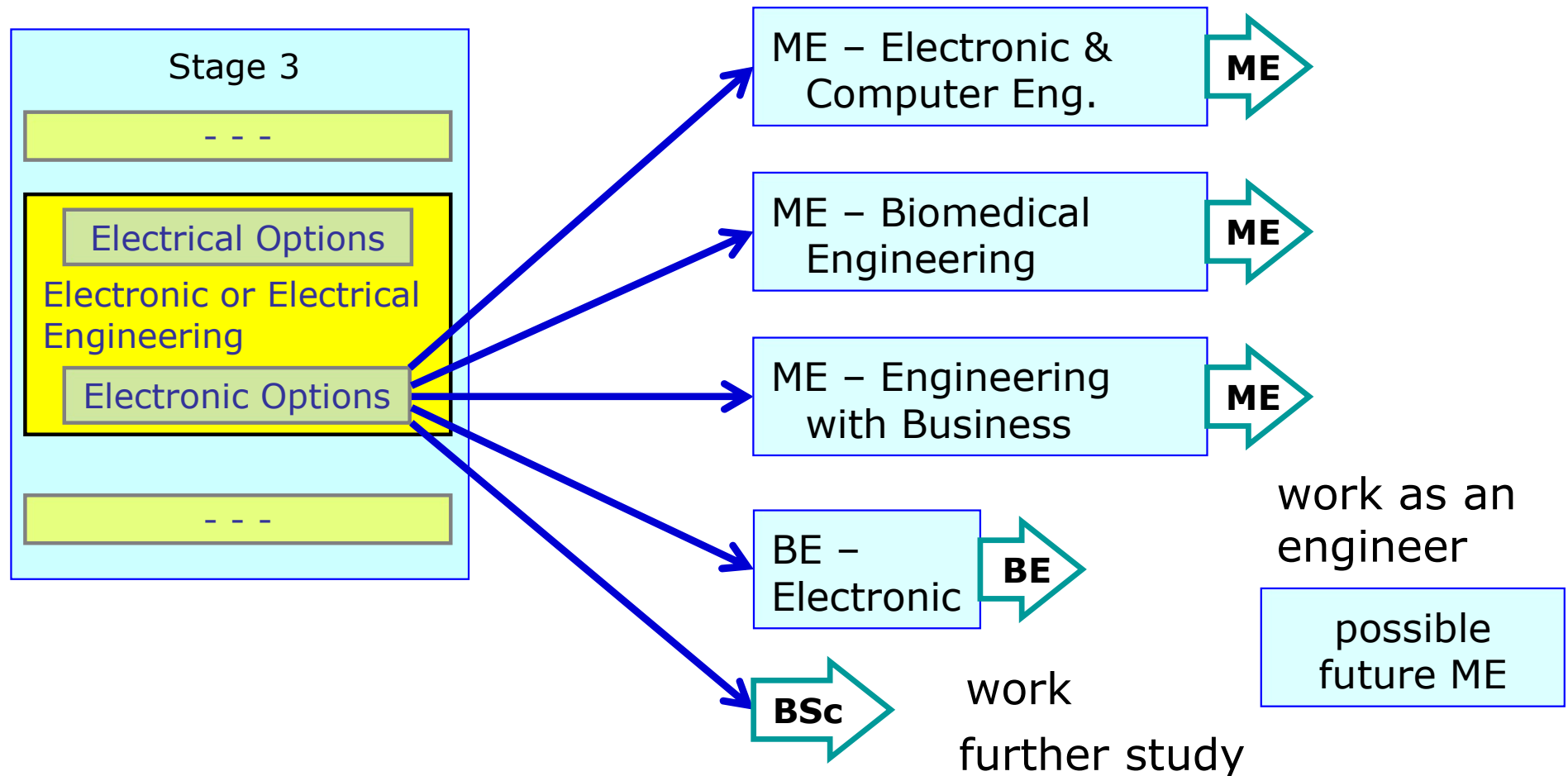
Your Choices So Far

- **Decision at end of Stage 1**
  - you chose the Electronic/Electrical stream
- **Decision at the start of Stage 3**
  - you chose options to prepare for either Electronic Engineering or Electrical Engineering

Your Choices Now – Electrical

Stage 3

- - -

Electrical Options

Electronic or Electrical Engineering

Electronic Options

- - -

ME – Electrical Power Engineering → **ME**

ME - Energy Systems Engineering → **ME**

ME – Engineering with Business → **ME**

BE – Electrical → **BE**

BSc →

work as an engineer

possible future ME

work

further study

- **Main choices (there are others)**
  - continue towards ME or BE, or graduate with BSc
    - would get BSc (Engineering Science) on route to ME…

Your Choices Now – Electronic

Stage 3

- - -

Electrical Options

Electronic or Electrical Engineering

Electronic Options

- - -

ME – Electronic & Computer Eng. **ME**

ME – Biomedical Engineering **ME**

ME – Engineering with Business **ME**

BE – Electronic **BE**

BSc

work as an engineer

possible future ME

work

further study

- ## Main choices (there are others)
  - continue towards ME or BE, or graduate with BSc
    - would get BSc (Engineering Science) on route to ME…

4

BSc (Engineering Science) Degree

- **Bachelor of Science degree**
  - 3 years, 180 credits
  - not a professional engineering qualification

- **To be compatible with the European system:**
  - *first cycle* = Bachelor degree (often 3 years)
  - *second cycle* = Master degree (typically 2 years)
  - *third cycle* = PhD (minimum 3 years)
  - you could choose this now if you want an ME programme in continental Europe...

- **To provide an exit from Engineering**
  - BSc degree provides a strong technical foundation
    - to pursue a career in another field
    - to continue your studies in another area

Bachelor of Engineering (BE) Degree

- Traditional qualification in Engineering
  - still respected in the workplace
  - accredited for membership of Engineers Ireland
    - the professional body for engineering here
  - but no longer sufficient for Chartered Engineer

- Four years study in total
  - stage 4 has some flexibility: option modules
  - project module: 15 credits through both trimesters
  - no formal work placement

- No extra barrier to entry
  - normal progression rules apply
    - under the current regulations, you need at least 50 credits in Stage 3 and all previous stages complete

BE - Electronic Engineering

- **Core Modules**
  - Professional Eng. Project
  - Control Theory
  - Digital Communications
  - Professional Engineering (Management)
  - Wireless Systems

Option lists are not complete, and may change for 2025-26

- **Choose 2 options, autumn**
  - Advanced Signal Processing
  - Analogue Integrated Circuits
  - Entrepreneurship in Engineering
  - Optimisation Techniques
  - Power Electronics Technology
  - Software Engineering

- **Choose 3 options, spring**
  - Adv. in Wireless Networking
  - Data Science in Python
  - Digital & Embedded Systems
  - Neural Engineering
  - Mixed-Signal Integrated Circuits
  - Professional Eng. (Finance)

- **9 taught modules = 45 credits, project = 15 credits**

- **Programme Director: Prof. Mark Flanagan**

BE - Electrical Engineering

- **Core Modules**
  - Professional Eng. Project
  - Appl. of Power Electronics
  - Control Theory
  - Power Electronics & Drives
  - Power System Design
  - Power System Operation
  - Professional Engineering (Management)

- **Choose 3 options**
  - Data Science in Python
  - Energy Economics & Policy
  - Entrepreneurship in Engineering
  - Optimisation Techniques for Engineers
  - Power Electronics Technology
  - Power System Dynamics & Control
  - Professional Engineering (Finance)
  - Renewable Energy Systems

Modules may change for 2025-26

- 9 taught modules = 45 credits, project = 15 credits

- Programme Director: Prof. Terence O'Donnell

Professional Engineering Project Modules

- Separate modules for Electrical, Electronic
  - you must progress to Stage 4 to be eligible
  - we propose a list of projects (early September)
  - you choose your preferences
    - projects are allocated according to Stage 3 GPA
  - option to propose your own project – act early!

- Independent work through both trimesters
  - mix of: research, analyse, design, build, test...
  - guided by your supervisor – meet at least weekly

- Assessment through the year
  - interim report, final report
  - oral presentation, poster presentation
  - interview – supervisor and another examiner

After the BE…

- Work
  - often with further training, specific to employer
  - maybe a higher degree later in your career?

- Taught Master's degree
  - in engineering or in another area
  - minimum 90 credits (full year)
  - fees payable

- Research Master's degree
  - 18 months to 2 years…

- PhD
  - typically 4 years research, can be more…
    - finish with a substantial thesis, original work
  - fees payable, but often scholarship available… 10

Chartered Engineer – CEng

- Used in Ireland, UK, India, …
  - US, Canada: PE = professional engineer
  - Australia, NZ: CPEng = chartered prof. engineer
- Registered title, protected by law
  - required by law for certain engineering activities
- Awarded by the Professional Body
  - Engineers Ireland (you must also be a member!)
- Requirements:
  - education to a suitable standard - accredited
    - since 2013, that is Master's level or equivalent
  - development of competence in practice
    - minimum 4 years responsible experience
 - continuing professional development – CPD

Master of Engineering (ME) Degree

- Professional qualification for the future
  - level required to become a Chartered Engineer
  - level expected in most of Europe

- Two years of specialised study – 5 years total
  - includes work placement: usually ~7 months
  - includes major project (20–25 credit)

- Entry requirement is based on BSc degree GPA
  - average of grade points for modules in stages 2 and 3, weighted by factors 3 and 7
  - minimum GPA is 2.8 (equivalent to C grade)
  - a higher GPA is strongly recommended!
   - no easy way back to BE if finding ME too hard…

Master of Engineering (ME) Degree

BSc Engineering Science 180 credit	→	ME Programme 120 credit
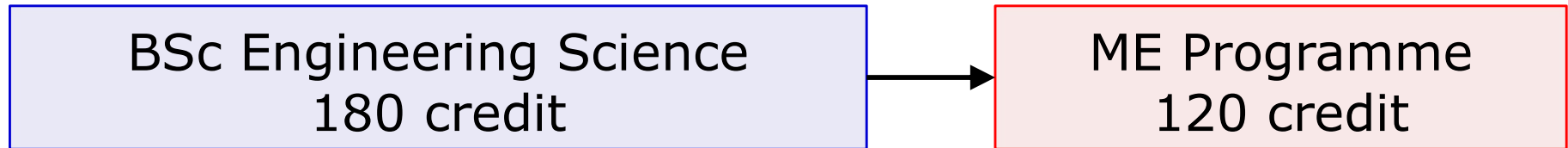
- **Full tuition fees payable**
  - currently €9530 per year for EU students
  - "free fees" only applies to bachelor degree
    - you pay "student contribution", not full tuition fee

- **In principle…**
  - you graduate with BSc (Engineering Science)
    - this should be in summer 2025 for you
  - degree GPA based on grades in stages 2 and 3
    - using weighting factors 3 and 7 respectively
  - then apply to enter ME programme in September
    - pay full fees for two years of the ME

Master of Engineering (ME) Degree

BSc Engineering Science stages 1, 2, 3	BSc stage 4

ME Programme
120 credit
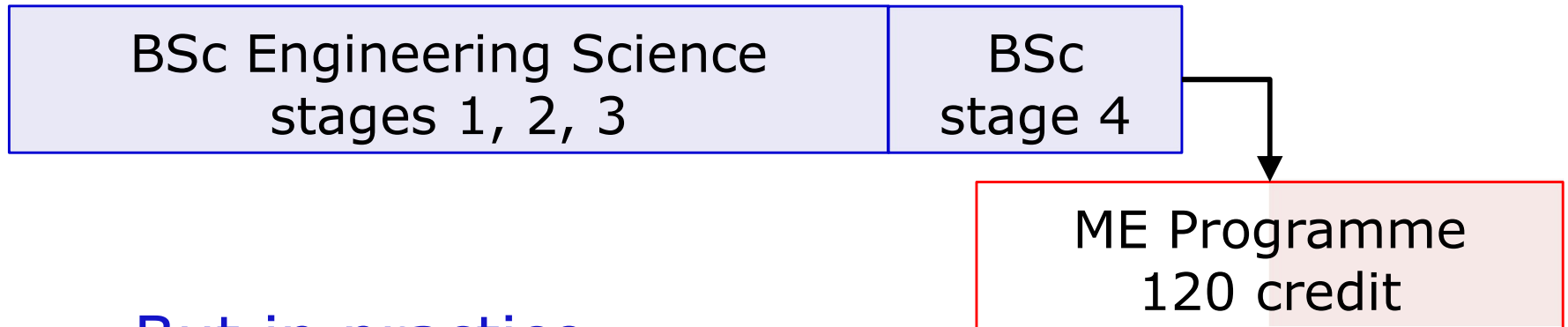
- **But in practice…**
  - transfer to Engineering Science degree programme
    - in summer 2025, after completing stage 3
    - but defer graduation – continue to stage 4
    - take modules appropriate to your chosen ME
    - then graduate with the BSc degree in 2026
    - degree GPA based on stages 2 and 3 as before
  - enter the ME programme in September 2026
    - use the surplus credits from stage 4 of the BSc
    - complete the ME in 1 year
    - pay full tuition fees for the final year only…

14

ME Work Placement

- **Most ME programmes have two options**
  - 30 credit, January to August (2026 for you)
    - replaces the entire spring trimester
    - this is the preferred option
  - 10 credit, June to August 2026
    - take modules in spring 2026 to make up credits
  - UCD will arrange these placements
    - competitive process, starts September/October
    - often involves an interview by the employer
    - usually paid a small salary
  - you may propose your own work placement
    - but you must work through the UCD office

ME Project Modules

- ## 20 or 25 credits, depending on programme
  - runs through the last two trimesters of the ME
  - similar arrangements to the BE project
  - but expect Master's-level work...

- ## Example projects:
  - Dual-function radar communication system
  - Underground carpark: where am I?
  - Low-voltage high-performance RF DAC
  - High-efficiency RF power amplifiers for wireless comms.
  - Machine learning on quantum computers
  - Bidirectional battery charger for electric vehicles
  - DC transmission in a 100% renewable power system
 - Grid support services from grid-forming converters

Scholarships

- Réalta ME Scholarships – €9500
  - students for whom the ME fees would be an issue
  - see College of Engineering & Architecture web site

- Industry wants you, and offers incentives!
  - www.ucd.ie/students/scholarships/prospectivepostgraduatestudents/

- Analog Devices Ireland – €2000
  - electronic engineering students, especially ME

- Arup – €2500
  - electrical engineering students continuing to ME

- Intel Ireland – €3000
  - students entering ME Electronic & Computer Eng.

- Terms & Conditions – all limited numbers…

Electronic & Computer Engineering

- **Electronic Engineering**
  - using electronics for control, communication, entertainment, computing, etc.

- **Work at many different levels**
  - IC design – analogue & digital
  - algorithms, signal processing
  - system design – at various scales

- **Traditional focus on hardware**
  - but most hardware now involves a computer
    - embedded processor or linked to processor
    - often linked to the Internet…
  - so the computer and software side is important 18
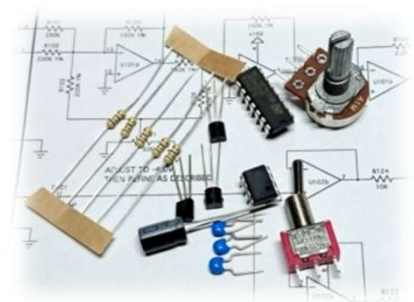
ME - Electronic & Computer Engineering

- Core Modules
  - Control Theory
  - Optimisation Techniques
  - Software Engineering
  - Wireless Systems
  - Digital Communications
  - Professional Eng. (Mgt.)
  - ME Project (25 credit)
  - Work Placement
    - 10 or 30 credit

- + 7 or 11 options
  - from a long list
  - details may change…

- Example Options
  - Advanced Signal Processing
  - Analogue ICs
  - Mixed-Signal ICs
  - Data Science in Python
  - Digital & Embedded Systems
  - Entrepreneurship in Eng.
  - Information Theory
  - Machine Learning
  - Neural Engineering
  - Numerical Algorithms
  - Power Electronics Technology
  - Quantum Computing
  - Wireless Networking
  - . . .

Work Placements

- Examples from 2023-24 & 2024-25
  - 48 students currently on placement
  - in 19 different companies this year

Electrical Power Engineering

- ## Electrical Engineering
  - Power system and smart grid sectors

- ## Many challenging areas
  - Power system analysis & design
  - Power electronics devices
  - Renewable energy systems and technology
  - Network management, control & communications
  - Electricity market operations

- ## Real-world, global revolution
  - Fundamental to the energy transition
  - Electrification central to achieve Net Zero Carbon
  - Power system resilience + energy security

ME – Electrical Power Engineering

Core Modules

- Control Theory
- Applications of Power Electronics
- Power Electronics & Drives
- Power System Design
- Power System Dynamics & Control
- Power System Operation
- Renewable Energy Systems
- Professional Engng (Mngmt)
- ME Project (25 credits)
- Work Placement
  - Long or short

+ 5 or 7 options

Example Options

- Data Science in Python
- Energy Economics & Policy
- Energy Systems & Climate Change
- Engineering Thermodynamics 2
- Entrepreneurship in Engineering
- Fossil Fuels, Carbon Capture
- Machine Learning for Engineers
- Networks & Internet Systems
- Numerical Algorithms
- Optimisation Techniques
- Power Electronics Technology
- Power System Stability Analysis
- Professional Engng (Finance)
- …..

Work Placements

ME Biomedical Engineering

- Biomedical Engineering ?
  - 'The application of engineering principles to understand, modify or control biological systems'

- Wide variety of application areas
  - medical device industry
  - bio-signal and bio-image processing
  - rehabilitation engineering, orthopaedics...

- ME programme
  - open to students from electronic engineering
  - biomedical modules available to fill gaps...

- Separate information session:
  - Mon. 3rd March
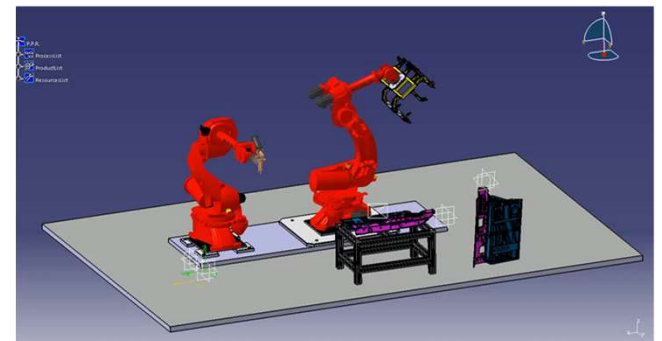
ME Energy Systems Engineering

- Broad approach to the energy problem
  - inputs from Mechanical, Electrical, Chemical Eng.
  - also Geology, Economics, Business…
  - open to students from electrical or mechanical engineering background
  - flexible module choices, to fill any gaps…

- Separate information session
  - Wed. 5 March, 1pm, Eng 135
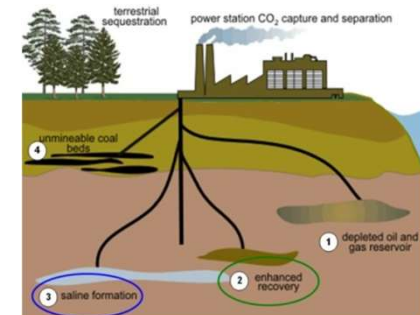
ME Engineering with Business

- Mix of technical and business modules
  - technical modules ~30 credits
    - separate plans for electrical and electronic engineering
  - technology management, business ~50 credits
  - placement, project, etc. 40 credits
- Work placement has different timing
  - summer and autumn 2025
- Project also has different arrangements
- Separate information session
  - Wed 26 Feb, 1pm, Eng 135

More Information

- **ME Programme Directors:**
  - Electronic & Computer Engineering: Prof. Mark Flanagan
  - Electrical Power Engineering: Prof. Terence O'Donnell
  - Energy Systems Engineering: Prof. James O'Donnell
  - Biomedical Engineering: Prof. Stephen Redmond
  - Engineering with Business: Dr Kevin Roche

Your Choices in Brief…

- **Graduate with BSc (Eng. Sci.) in 2025**
  - if eligible: 180 credits at appropriate levels

- **Continue in BE programme (default)**
  - you could graduate in 2026
  - you could work as a professional Engineer
    - but not yet qualified for Chartered Engineer…

- **Continue towards an ME in UCD (if eligible)**
  - you could graduate in 2027
  - different modules in stage 4, to support the ME
    - if you choose this, but are not eligible, default to BE

- **Decision needed by Friday 11 April**
  - online form, arranged by the College Office