

# Electronic & Electrical Engineering

## Information for Stage 3 Students

March 2024

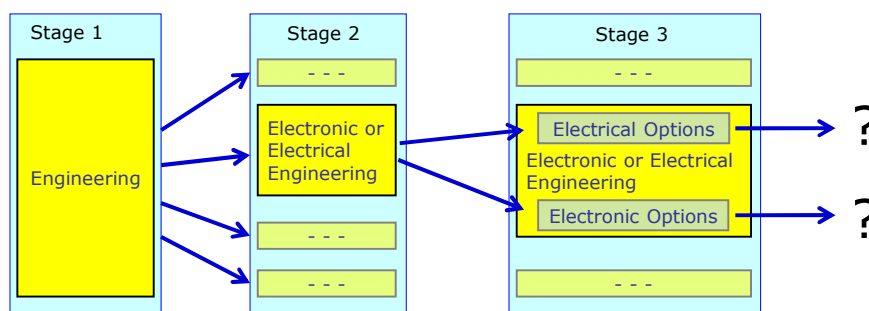


UCD School of Electrical and  
Electronic Engineering

Scoil na hInnealtóireachta  
Leictrí agus Leictreonaí UCD

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## 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<sub>2</sub>



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### Your Choices Now – Electrical

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

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### Your Choices Now – Electronic

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

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## 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



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## 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



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## BE - Electronic Engineering

- Core Modules
  - Professional Eng. Project
  - Control Theory
  - Digital Communications
  - Professional Engineering (Management)
  - Wireless Systems
- Choose 2 options, autumn
  - Advanced Signal Processing
  - Analogue IC Design
  - 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)

Option lists are not complete, and may change for 2024-25



- 9 taught modules = 45 credits, project = 15 credits
- Programme Director: Prof. Mark Flanagan

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## 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 2024-25



- 9 taught modules = 45 credits, project = 15 credits
- Programme Director: Prof. Damian Flynn

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## 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



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## 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...



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## 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



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## 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...



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## Master of Engineering (ME) Degree

BSc Engineering Science  
180 credit

ME Programme  
120 credit

- Full tuition fees payable
  - currently €9300 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 2024 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



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## 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 2024, 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 2025
    - degree GPA based on stages 2 and 3 as before
  - enter the ME programme in September 2025
    - 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...



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## ME Work Placement

- Most ME programmes have two options
  - 30 credit, January to August (2025 for you)
    - replaces the entire spring trimester
    - this is the preferred option
  - 10 credit, June to August 2025
    - take modules in spring 2025 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



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## 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



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## 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/](http://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...

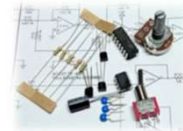


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## Electronic & Computer Engineering

- 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<sup>18</sup>



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## 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
  - . . .

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## Work Placements

- Examples from 2022-23 & 2023-24
  - 23 students currently on placement
  - in 13 different companies this year

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## 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



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## 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

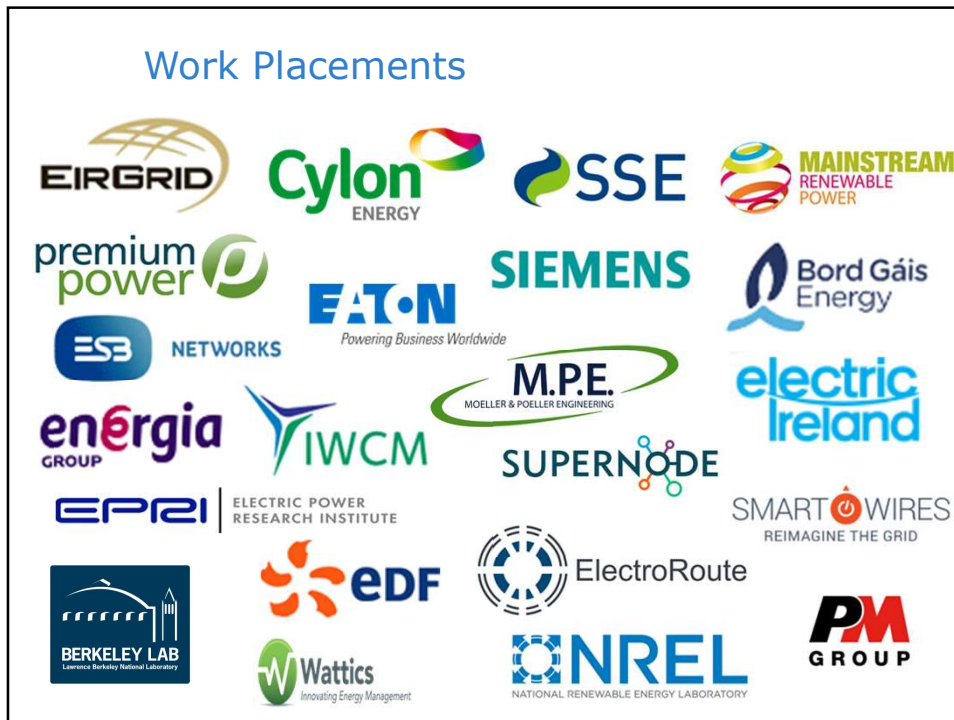
### Example Options

- 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)
- .....

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## Work Placements



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## 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, Wed. 28 February
    - recording will be available if you missed it



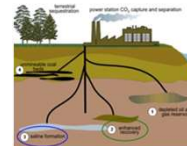
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## ME Energy Systems Engineering



- **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**
  - Thursday 7 March, 1pm, Eng 326

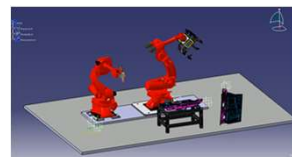


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## ME Engineering with Business

- **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**
  - Tuesday 5 March, 1pm, Eng 234



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## More Information

- **ME Programme Directors:**
  - Electronic & Computer Engineering: Prof. Mark Flanagan
  - Electrical Power Engineering: Prof. Damian Flynn
  - Energy Systems Engineering: Dr James O'Donnell
  - Biomedical Engineering: Prof. Madeleine Lowery
  - Engineering with Business: Dr Nikolaos Papakostas
  
- **ElecSoc career talks – all at 6 pm in Eng 326**
  - Monday 4 March – electrical engineering
    - speakers from H&MV and Eaton
  - Tuesday 5 March – electronic engineering
    - speakers from Qualcomm and FoodMarble
  - Wednesday 6 March – energy systems

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## Your Choices in Brief...

- **Graduate with BSc (Eng. Sci.) in 2024**
  - if eligible: 180 credits at appropriate levels
- **Continue in BE programme (default)**
  - you could graduate in 2025
  - 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 2026
  - different modules in stage 4, to support the ME
    - if you choose this, but are not eligible, default to BE
- **Decision needed by Friday 12 April**
  - online form, arranged by the College Office



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