

Electronic & Electrical Engineering

Information for Stage 2 Students April 2025



UCD School of Electrical and
Electronic Engineering

Scoil na hInnealtóireachta
Leictrí agus Leictreonaí UCD

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Introductions

- **Professor Terence O'Donnell**
 - School of Electrical and Electronic Engineering, UCD
 - UCD Energy Institute
- **Dr. Le-Nam Tran**
 - new Programme Director, Stages 2 & 3
BE Electronic & Electrical Engineering
 - nam.tran@ucd.ie
- **Brian Mulkeen**
 - current Programme Director,
BE Electronic & Electrical Engineering
 - brian.mulkeen@ucd.ie



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Stage 3 Core Modules – Autumn

- **Multi-variable Calculus for Engineers 2**
 - vector calculus, double integrals, etc.
 - supports Electromagnetic Waves in Spring
 - Fourier transform and Fourier series...
- **Circuit Theory**
 - circuit analysis, 2-port networks, matrix descriptions
 - concept of feedback, analogue filters, etc.
- **Signals & Systems**
 - tools to analyse signals and systems that handle them
 - supports Signal Processing, Communication Theory, etc.
- **Computer Science for Engineers 2**
 - object-oriented programming, C++, and more

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Stage 3 Core Modules – Spring

- **Modelling & Simulation**
 - computer techniques for solving engineering problems
 - all continuous assessment: practical assignments
- **Electromagnetic Waves**
 - radio waves, microwaves, light...
 - transmission lines and free-space propagation
- **Analogue Electronics**
 - multi-transistor circuits, op-amps
 - feedback, stability, oscillators
 - PLL, data converters
- **Signal Processing**
 - techniques for processing signals in digital form
 - signal analysis, digital filters, etc.

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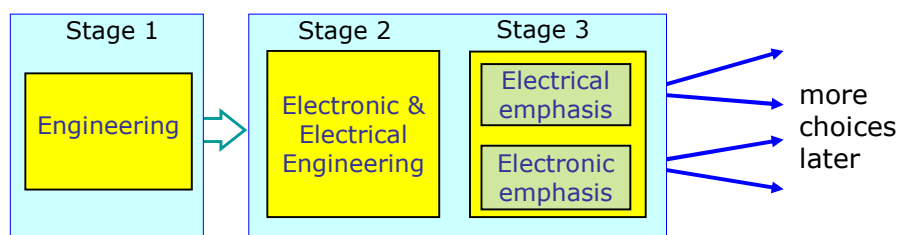
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Stage 3 Option Modules – Choose 2

- Electrical Engineering
- **Electrical Machines (Autumn)**
 - transformers, electric motors, generators, etc.
 - design, testing and control of devices
 - **Power System Engineering (Spring)**
 - simulation of large-scale power systems
 - analysis of normal & abnormal conditions
- Electronic Engineering
- **Digital System Design (Autumn)**
 - emphasis on design, from specification to chip
 - hardware description language, synthesis...
 - **Communication Theory (Spring)**
 - physical layer communications
 - signals, modulation, demodulation, noise... ⁵
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Electronic & Electrical Route



- **You make a decision entering Stage 3**
 - free choice – no restrictions
 - just choose the appropriate option modules
 - start to specialise in either Electrical Engineering or Electronic Engineering
 - **Could use electives to keep both options open**
 - but you have to specialise in stage 4...
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Next Decision at End of Stage 3

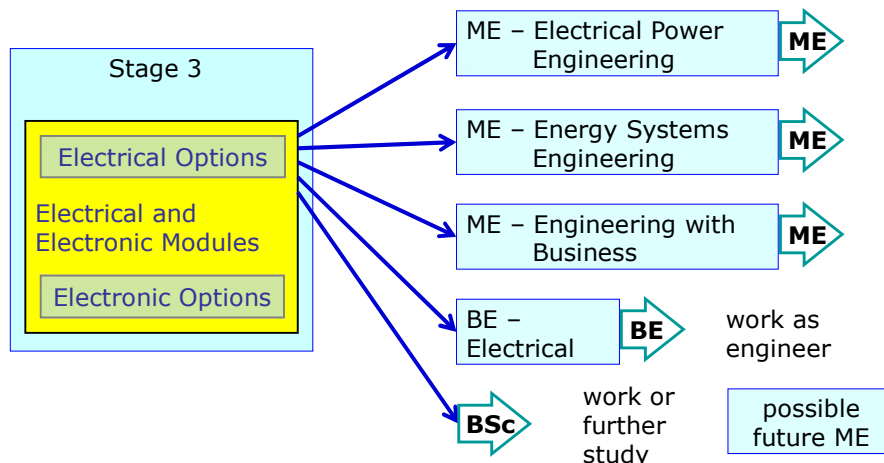
- Continue towards the BE degree (default)
 - traditional engineering qualification, 4 years
- Graduate with a BSc (Engineering Science)
 - for an ME in Europe, or a change of direction
- Switch to head towards an ME programme
 - separate 2-year degree programme
 - you also get the BSc (Engineering Science) degree on the way to the ME degree
 - ME programmes have entry requirements
 - need a GPA at least 2.8, higher is recommended
 - GPA is calculated on grades in stages 2 and 3, with weighting factors 3 and 7 respectively
 - only from UCD modules with normal grading...



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Future Choices – Electrical

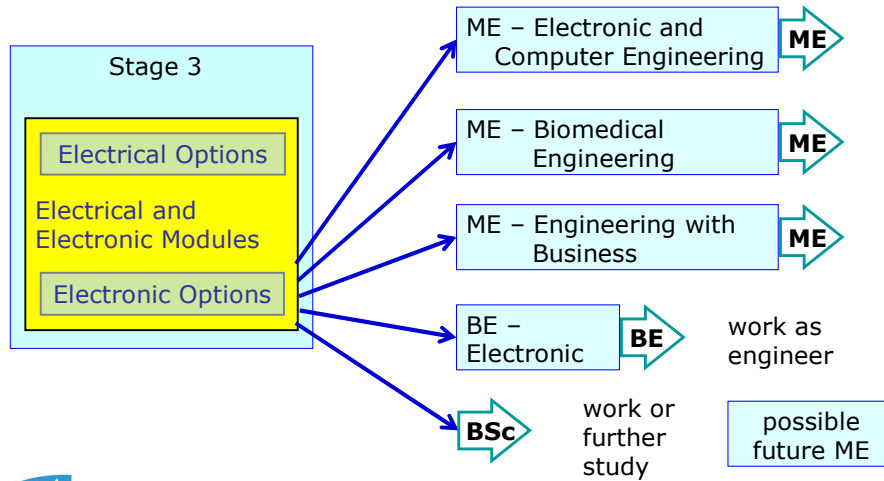


- These are the obvious choices in UCD
 - there may be more, in UCD or elsewhere

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Future Choices – Electronic



- These are the obvious choices in UCD
– there may be more, in UCD or elsewhere

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Master of Engineering (ME) Degree

BSc Engineering Science
180 credit

ME Programme
120 credit

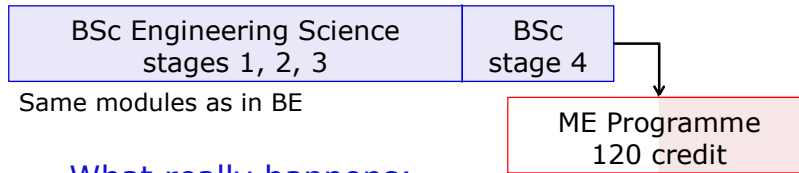
- Full tuition fees payable
 - currently €9300 per year for EU students
 - “free fees” only applies to bachelor degree
- In principle, you graduate with a BSc degree
 - after completing stage 3 (summer 2025 for you)
 - degree GPA based on stages 2 and 3
 - using weighting factors 3 and 7 as before
 - then apply to enter ME programme in September
- In practice, you defer graduation for 1 year
 - so you only have to pay full fees for one year



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Master of Engineering (ME) Degree



- **What really happens:**
 - if you want an ME degree, after Stage 3, you transfer to Engineering Science degree programme
 - but defer graduation – continue to stage 4
 - take modules appropriate to your chosen ME
 - exactly as if you had joined the ME programme
 - graduate with the BSc degree after Stage 4
 - degree GPA based on stages 2 and 3 as before
 - enter the ME programme at that point
 - use the surplus credits from stage 4 of the BSc
 - complete the ME in 1 year



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BE Electrical Engineering ME Electrical Power Engineering



- **Electrical Engineering**
 - Power system and smart grid sectors
- **Many challenging areas**
 - Power system analysis & design
 - Power electronics applications
 - Sustainable power systems
 - Smart grid communication architectures
 - Electricity market operations
- **Real-world, global revolution**
 - Diverse generation & demand-side technologies
 - Stability & economic operation of future power systems



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Future (Ireland) Power System



- 80% renewables target by 2030
- 950,000 EVs on the road
- upto 9 / 5 GW onshore/offshore wind capacity
- upto 8 GW grid-scale solar capacity
- 70 GW ocean energy potential

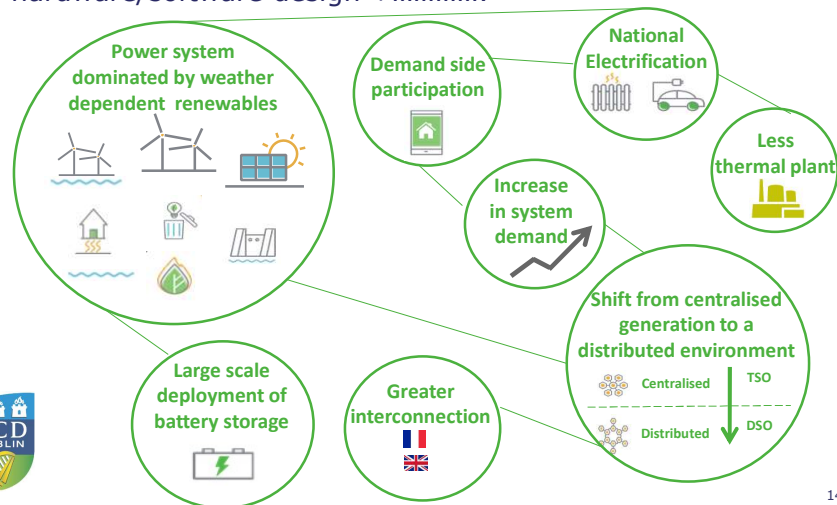


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Future System Challenges

power system modelling & analysis + power electronics + control systems + optimisation + machine learning + hardware/software design +.....



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Electrification of Transport

Electric motors + batteries + power electronics + control systems



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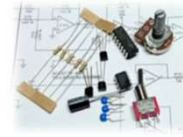
Work Placements (in ME programme)



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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 ¹⁷



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Work Placements (in ME programme)



- **Examples from 2022-23**
 - 41 students on placement
 - in 22 different companies



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Key Points

- **Important option choice in August/September**
 - choose 2 option modules from 4
 - you must choose a compatible pair of modules!
 - choice determines electrical or electronic route...
- **Further decisions on BSc / BE / ME later**
 - in April 2025 – more information before then
- **But...**
 - if considering ME in Engineering with Business
 - Professional Engineering (Finance) is recommended as an elective in stage 3
- **Ask for advice if you are not sure**
 - e-mail nam.tran@ucd.ie



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