

# Electronic & Electrical Engineering

## Information for Stage 2 Students

April 2024



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](mailto:nam.tran@ucd.ie)
- **Brian Mulkeen**
  - current Programme Director,  
BE Electronic & Electrical Engineering
  - [brian.mulkeen@ucd.ie](mailto: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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## 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

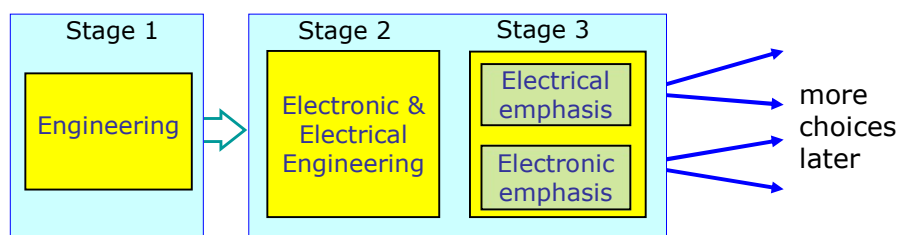
Electronic Engineering

- **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... <sup>5</sup>



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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

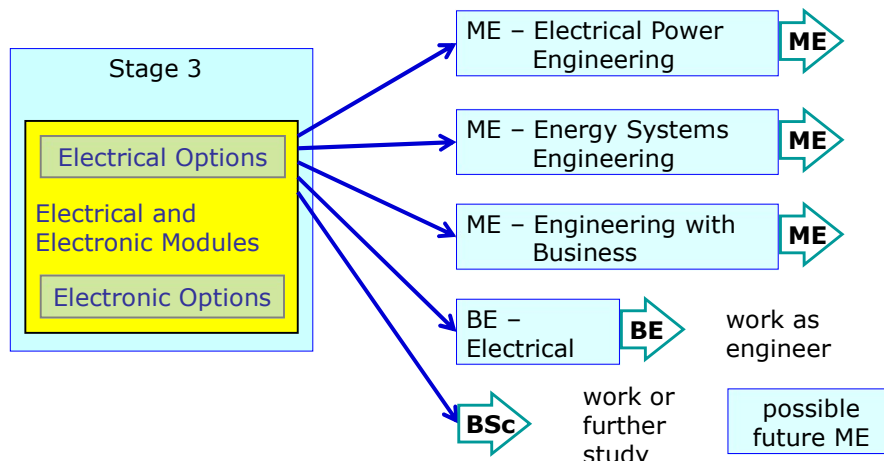
- Continue towards the BE degree (default)
  - traditional engineering qualification, 4 years
- Graduate with a BSc (Engineering Science)
  - for an ME in Europe, or a change of direction
- Switch to head towards an ME programme
  - separate 2-year degree programme
    - you also get the BSc (Engineering 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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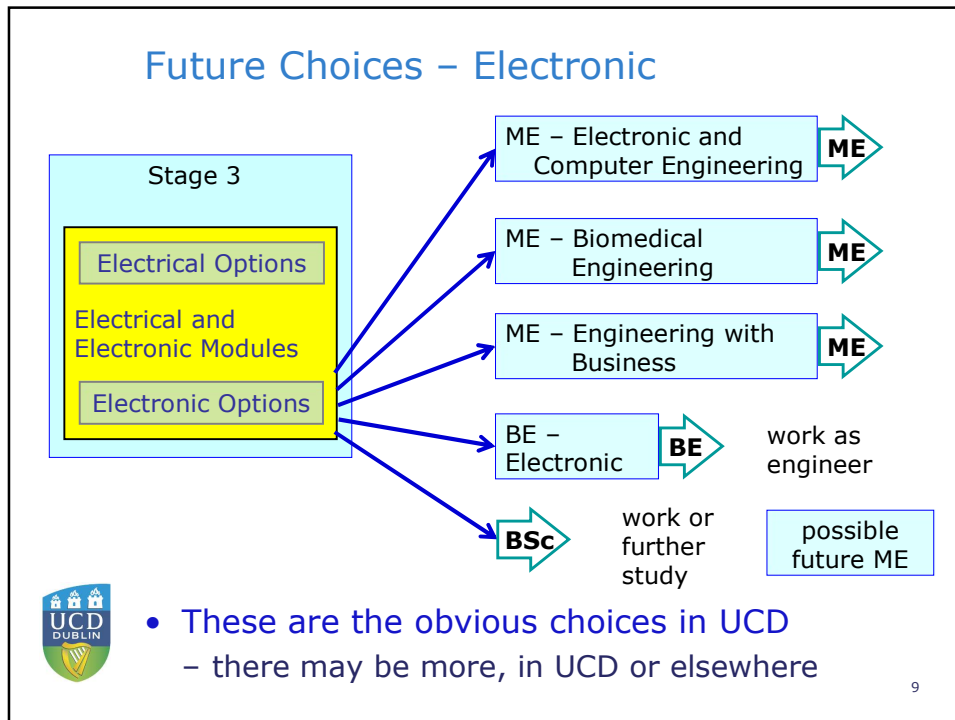
## Future Choices – Electrical



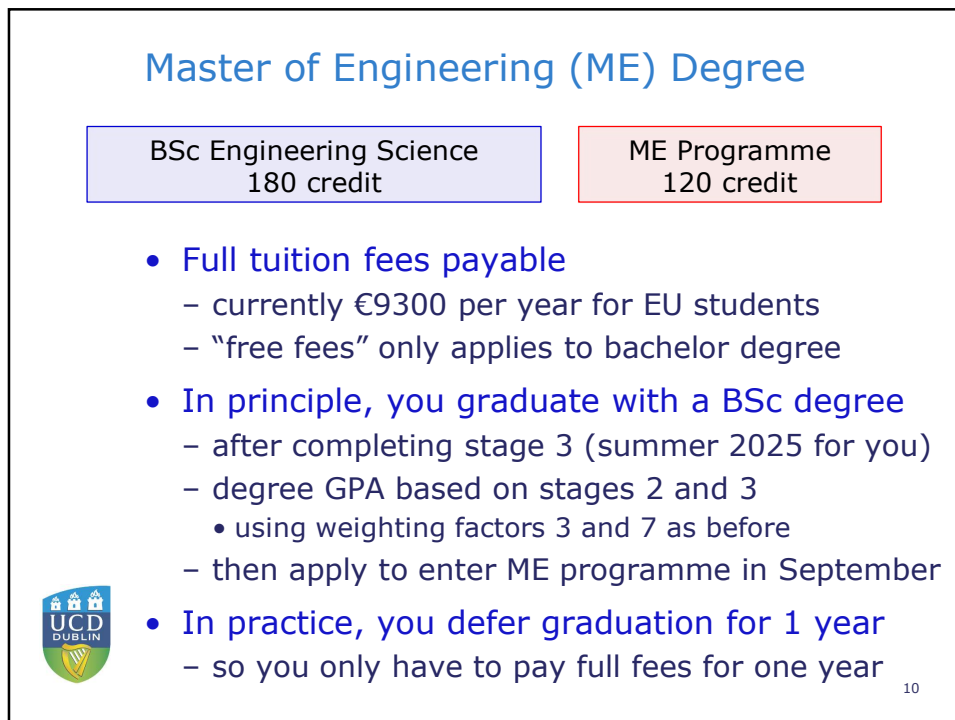
- These are the obvious choices in UCD
  - there may be more, in UCD or elsewhere

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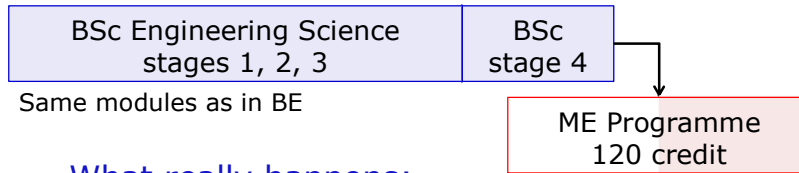


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## Master of Engineering (ME) Degree



- **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

CLIMATE ACTION PLAN 2023  
Changing Ireland for the Better

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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)

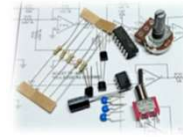


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## Electronic & Computer Engineering

- **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 <sup>17</sup>



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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](mailto:nam.tran@ucd.ie)



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