

Electronic & Electrical Engineering

Information for Stage 1 Students

November 2023



UCD School of Electrical and
Electronic Engineering

Scoil na hInnealtóireachta
Leictrí agus Leictreonaí UCD

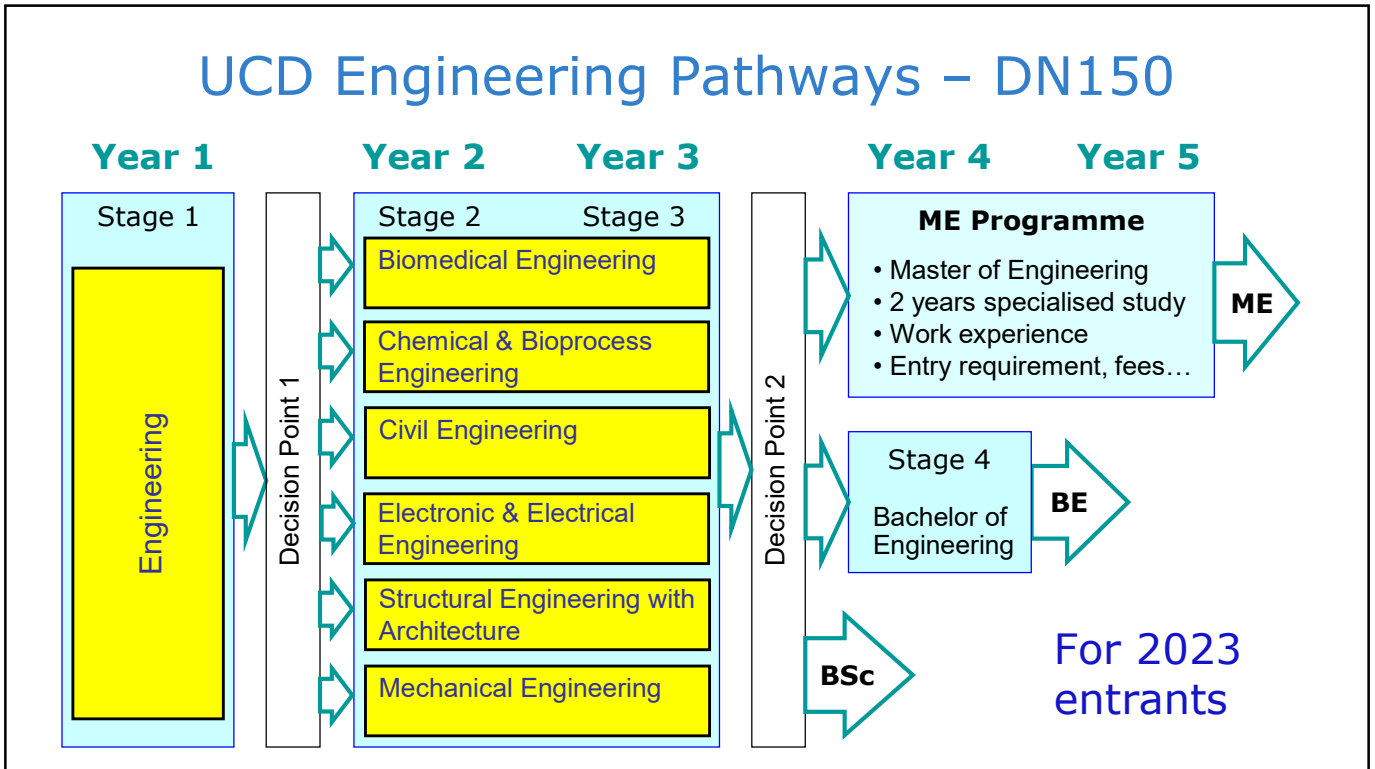
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Introductions

- **Professor Peter Kennedy**
 - Professor of Microelectronic Engineering
- **Dr. Paul Cuffe**
 - lecturer, electrical engineering
- **Professor Paul Curran**
 - Head of School of Electrical and Electronic Engineering
 - responsible for all EEEN modules
- **Brian Mulkeen**
 - lecturer, electronic engineering
 - programme director, BE E&E engineering



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Path Choices

- Choose one of 6 paths
 - decision in March/April 2024
- Within the Electronic & Electrical path
 - Stage 2 is common
 - start to specialise in Stage 3
 - choose options for electrical engineering or for electronic engineering

Stage 2	Stage 3
Electronic & Electrical Engineering	<input type="checkbox"/> Electrical <input type="checkbox"/> Electronic

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What is Electrical and Electronic Engineering?

Professor Peter Kennedy
Professor of Microelectronic Engineering
University College Dublin

School of Electrical & Electronic Engineering



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What is Engineering?

“...the application of *science* and *mathematics* by which the *properties of matter* and the *sources of energy* in nature are made *useful to people*...”

Merriam-Webster

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What is Electrical and Electronic Engineering?

“...the application of *science* and *mathematics* by which the *electrical* and *electronic* properties of matter and the sources of energy in nature are made *useful to people*...”

Merriam-Webster

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Electrical and Electronic Engineering

- **Electrical** Engineering: mainly processing **energy** in electrical form
- **Electronic** Engineering: mainly processing **information** in electrical form



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Processing *Energy* Electrically

- Thermodynamics
- Machines
- Electromagnetics
- Communications
- Systems
- Control
- Energy



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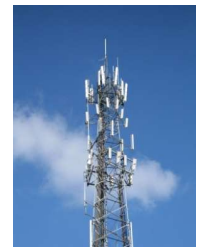
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Processing *Information* Electronically

- Sensors
- Signal Processing
- Communications
- Data Analytics
- Computation
- Actuators
- Control



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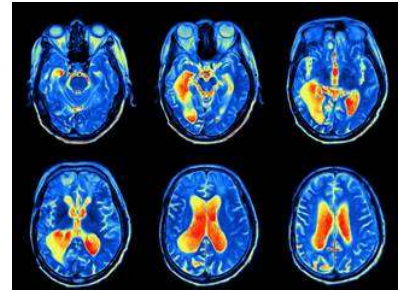
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Processing (Biomedical) *Information* Electronically

- Sensors
- Signal Processing
- Imaging
- Communications
- Data Analytics
- Control
- Actuators



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“Take Homes”

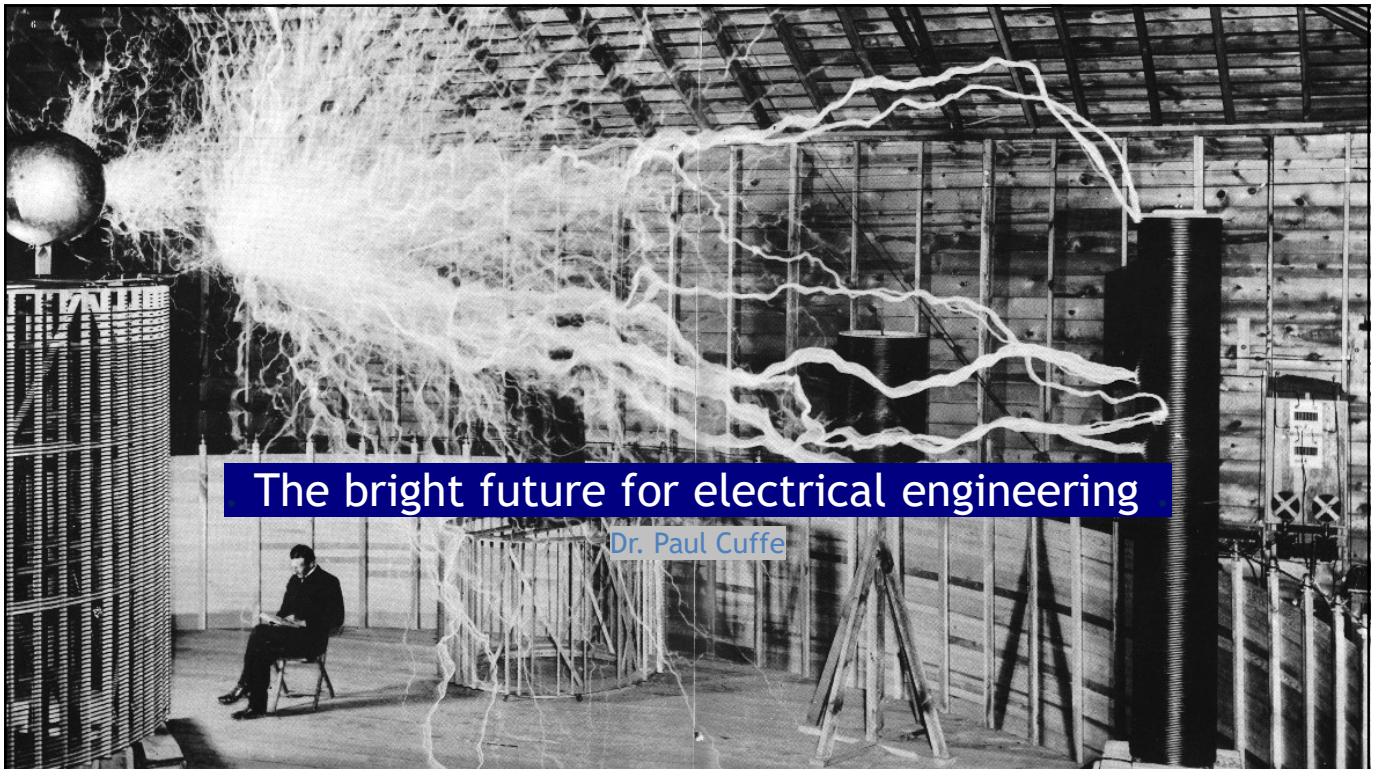
- Engineering is about solving problems using science, maths, and the properties of materials
- Electrical and Electronic Engineering use *electrical* properties of materials to process *energy* and *information*
- Electrical and Electronic Engineering have revolutionized society and will continue to transform our lives
- Every application domain needs more Electrical and Electronic Engineering
- The demand for core Electrical and Electronic Engineering skills is strong worldwide

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The bright future for electrical engineering

Dr. Paul Cuffe

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“Software is eating the world”

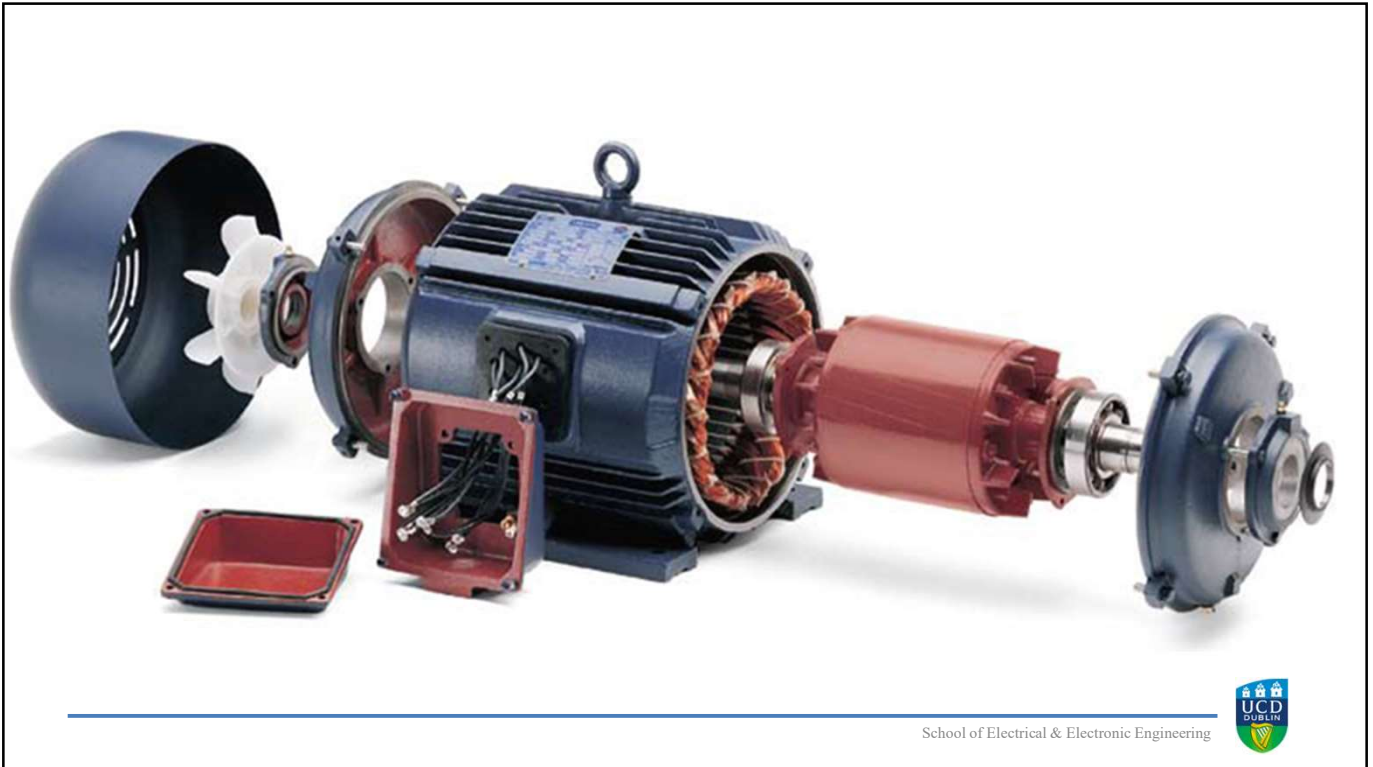
- Marc Andreessen of *a16z*



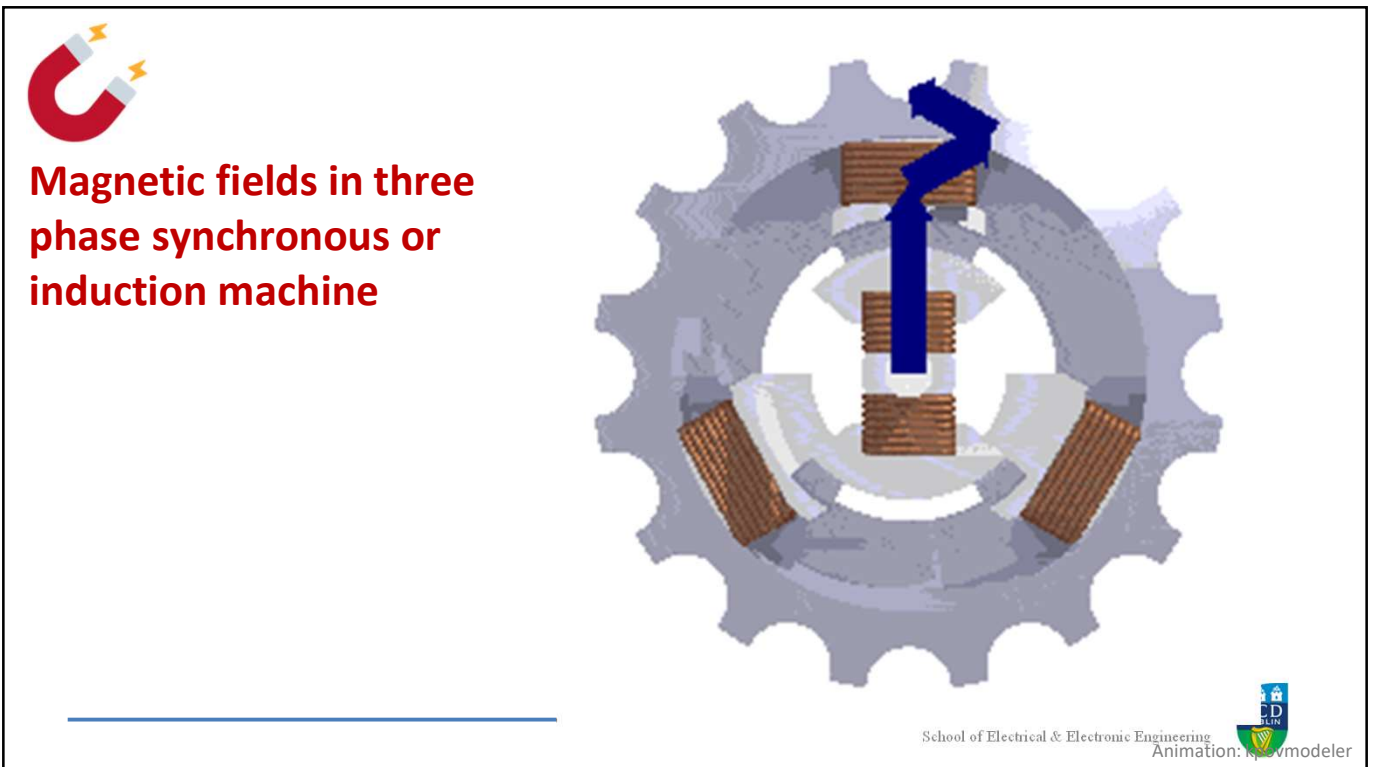
Thanks to cheap **batteries** and **renewable**
energy, so is **electrical engineering**



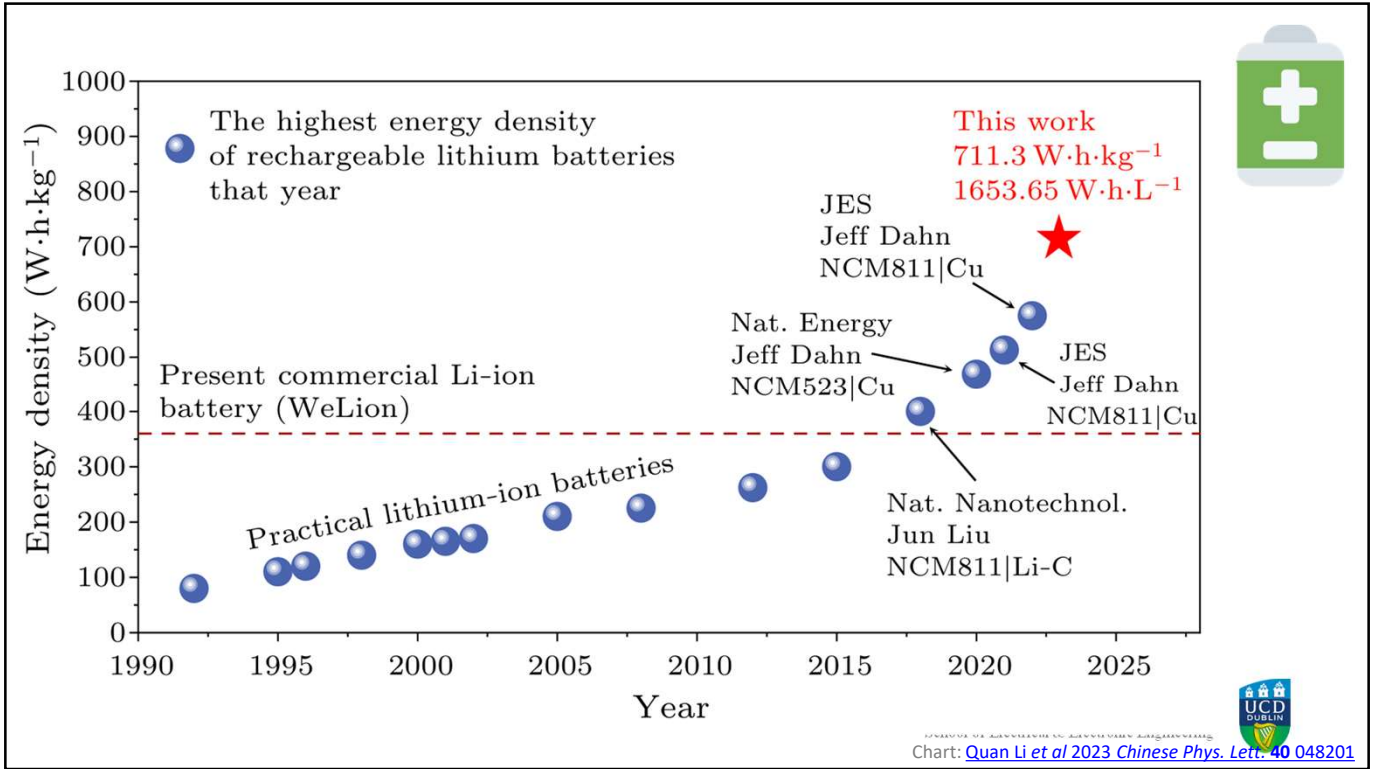
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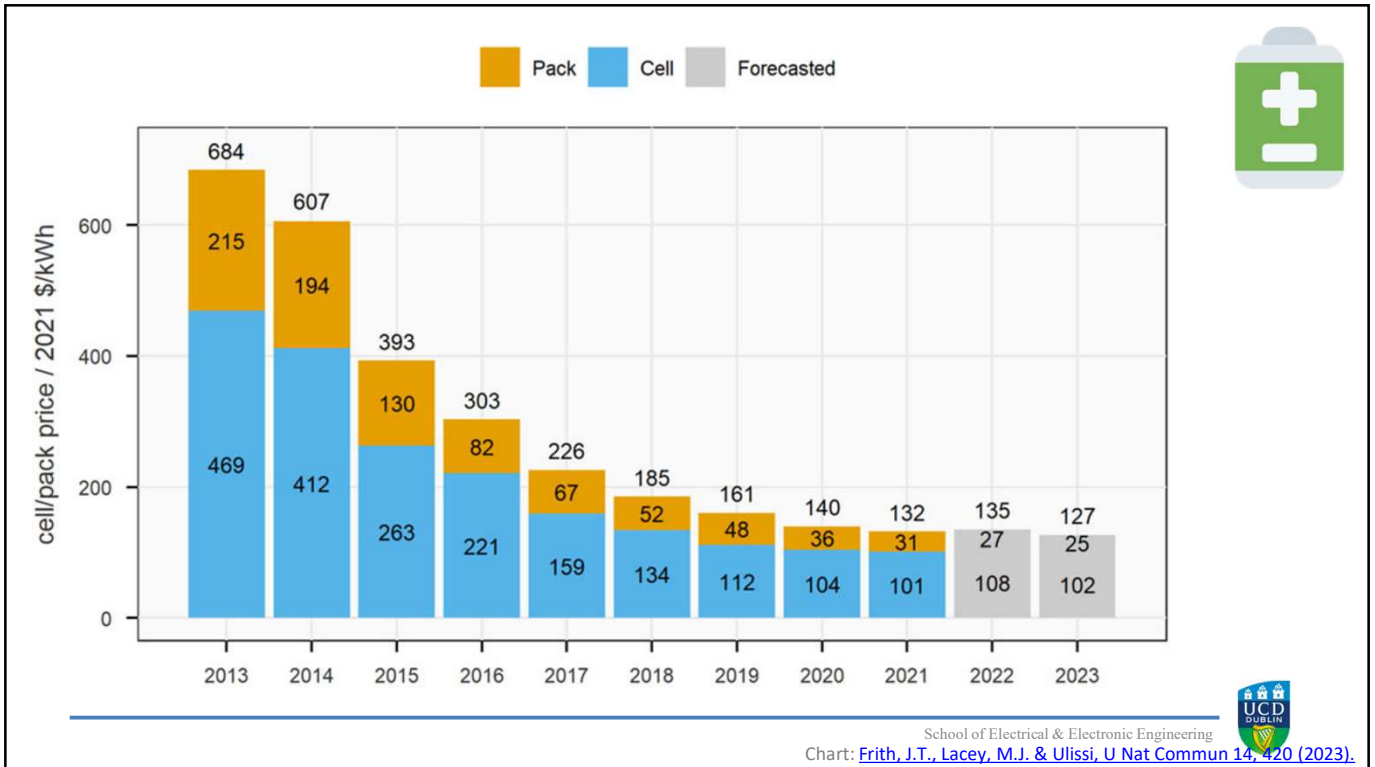
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All transport will be **electric**:



Small, powerful
three-phase motors



Cheap, robust power
electronics to drive them



Acceptably light, affordable
batteries to power them



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Motors are
small, cheap
and **mighty**:



= 2.4 kW



= 2.4 kW



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RTÉ NEWS SPORT ENTERTAINMENT BUSINESS LIFESTYLE CULTURE PLAYER TV RADIO

NEWS BUSINESS Business of Climate Future of Work Brexit Watch and Listen Your Money Technology

Legislation approved to allow e-scooters on Irish roads

Updated / Wednesday, 20 Oct 2021 08:31



The bill is due to go before the Oireachtas

By **Dyane Connor**

The Government has approved a new Road Traffic Bill which legislates, for the first time, the use of e-scooters and e-bikes on Irish roads.

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© Raptor Direct Drive Skateboard



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© EHang 184 Human Carrying Drone

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© KittyHawk Cora

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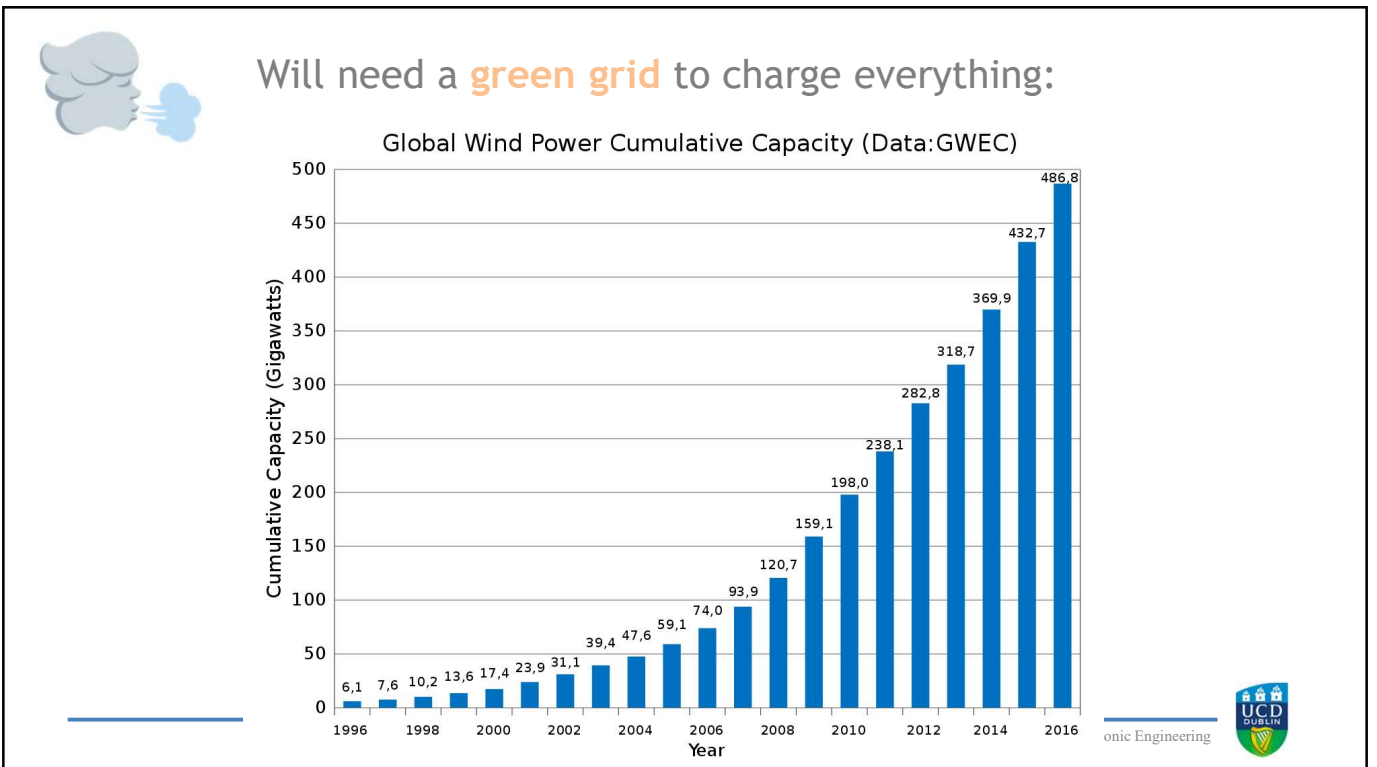
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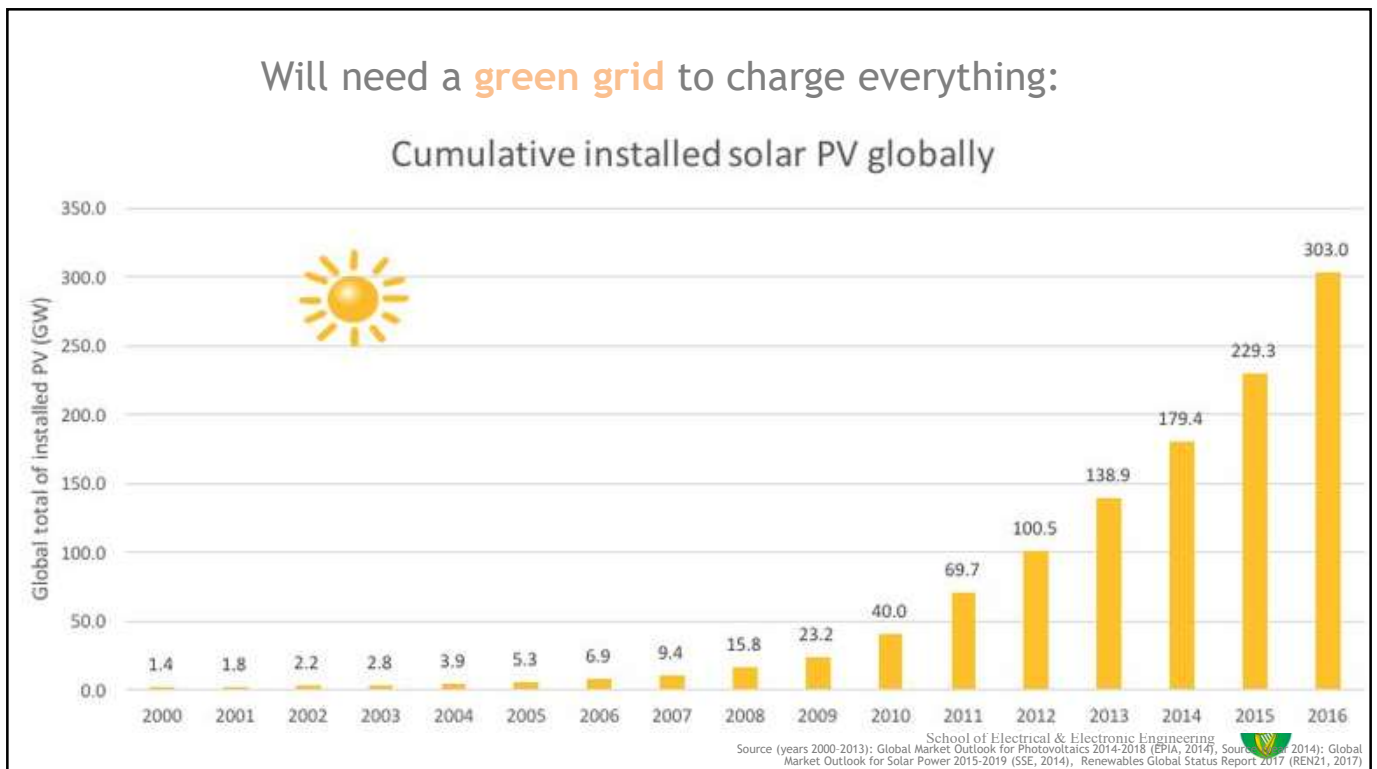
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Batteries are **cheap** and renewables have **won**



We can't get the **toothpaste back in the tube**

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What future do you believe in?

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Module Choices in Stage 1 (First Year)

- Option Module in Spring – choose 1 of 4
 - not critical, but better if you choose the relevant option
 - Understanding Human Disease – Biomedical Engineering
 - Chem. Eng. Process Principles – Chemical & Bioprocess Eng.
 - **Computer Science – Electrical, Electronic, Energy Eng.**
 - Structures: Eng. and Arch. – Civil, Structural Eng. with Arch.
- Elective Module in Spring – free choice across UCD
 - including other options from above
 - and some modules designed for you, for example:
 - **Robotics Design Project**
 - Energy, Climate Change and Policy



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Decision at end of Stage 3

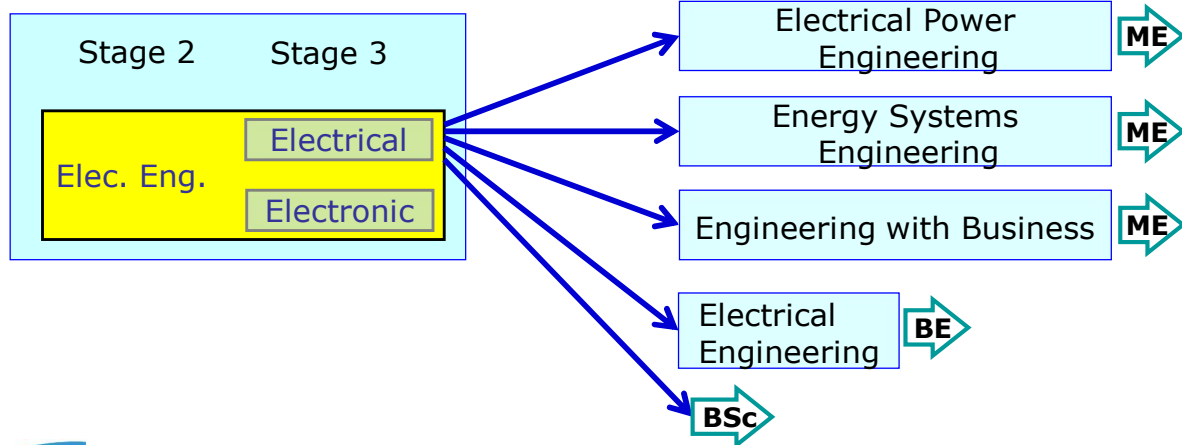
- Continue towards BE (bachelor of engineering)
 - four years study in total
 - traditional qualification for a professional engineer
- Enter ME (master of engineering) programme
 - two years specialised study (five years total)
 - various options available...
 - entry requirement, fees...
- Option to graduate with BSc (Engineering Science)
 - 3 years, 180 credits, not a professional qualification
 - for work or further study in another area
 - or for an ME programme elsewhere in Europe



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Electrical Engineering Choices

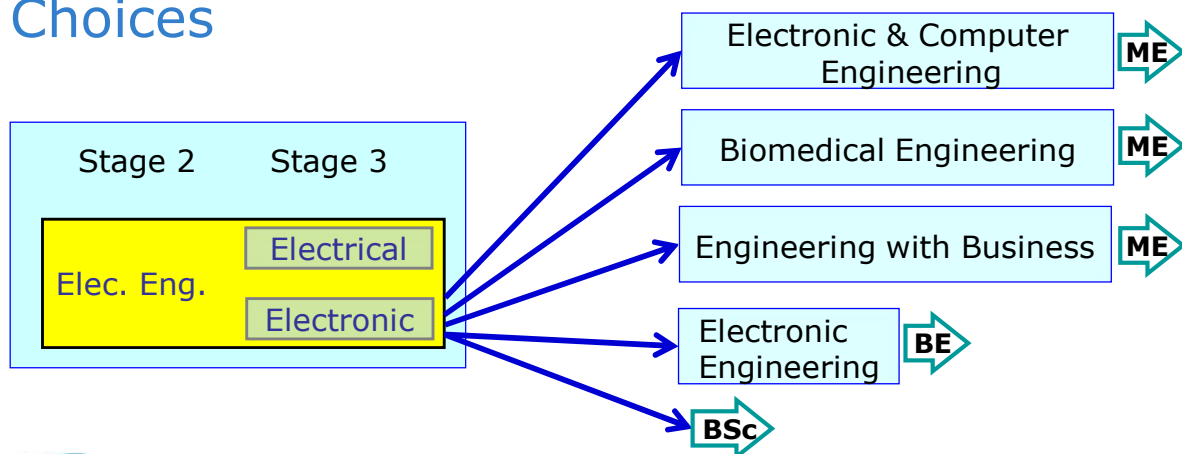


- Other options are possible...
 - these are the obvious paths in UCD at present
 - ME Energy Systems is also available from the Mechanical route

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Electronic Engineering Choices



- Other options are possible...
 - these are the obvious paths in UCD at present
 - ME Biomedical is also available from the Biomedical route

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Electronic & Electrical Stage 2

Autumn

- Computer Engineering
- Digital Electronics
- Electrical & Electronic Circuits
- Multivariable Calculus
- Solid-State Devices

Plus 2 elective modules

Spring

- Communication Systems
- Electrical Energy Systems
- Electromagnetic Fields
- Electronic Circuits
- Statistics & Probability



- **Fundamentals of Electronic & Electrical Engineering**
 - both areas build on the same principles
 - start to apply your knowledge to real-world problems
 - lots of lab work, normally in groups of two...

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E & E Stage 3

Core modules:

- Circuit Theory
- Computer Science for Eng. 2
- Multivariable Calculus 2
- Signals & Systems
- Analogue Electronics
- Electromagnetic Waves
- Modelling and Simulation
- Signal Processing

Options: choose two of:

- Communication Theory
- Digital System Design
- Electrical Machines
- Power Systems Engineering

Stage 2	Stage 3
Electronic & Electrical Engineering	Electrical
	Electronic

- **Specialise further: Electrical or Electronic**
 - by choosing two option modules
- **More complex topics, but more interesting...**
 - still plenty of laboratory & computer work



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ME Programmes

- Two years of study in your chosen field
 - making five years in total
 - includes a major project at Master level (20-25 credit)
 - includes a work placement (usually 7 months, 30 credit)
 - UCD will arrange this work placement
- Entry requirement
 - based on stages 2 and 3, weighting factors 3 and 7
 - minimum GPA 2.8 (equivalent to C grade)
- Tuition fees apply
 - currently €8830 per year for EU students
 - usually arrange so you only pay for the last year...



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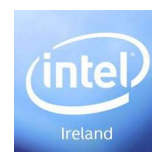
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Scholarships

- Réalta scholarships from UCD - €9500
 - for students for whom ME fees would be an issue
- Industry wants more graduates in these areas
 - so offering incentives to encourage more students
 - scholarships vary from €2000 to €3000
 - for a small number of students each year
 - terms and conditions apply!

ARUP

- Arup
- Analog Devices Ireland
- Intel Ireland



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Study Abroad



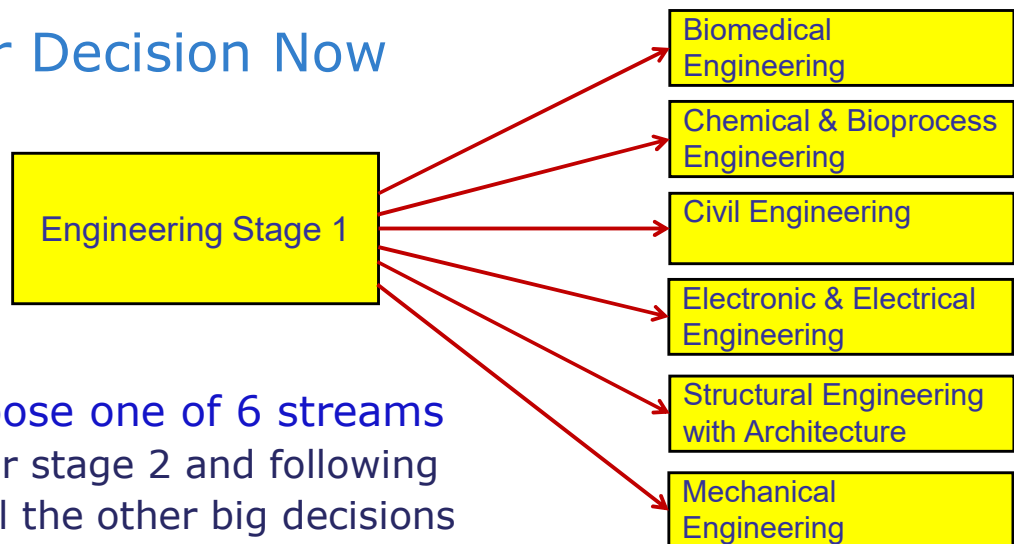
- Usually in Stage 3
 - arranged through UCD Global...
 - Erasmus exchange in Europe
 - or non-EU exchange to Australia, Canada, USA, etc.
- Requirements (for all engineering students)
 - Stage 1 complete, minimum GPA 3.0
 - Stage 2 autumn complete, minimum GPA 3.0
 - no grade less than C- in any core module
 - some exceptions allowed if GPA is at least 3.5...



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Your Decision Now



- Choose one of 6 streams
 - for stage 2 and following
 - all the other big decisions can wait until later...
- Decision needed in March/April 2024
 - there will be another information session before then...



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