Electronic & Electrical Engineering

Information for Stage 1 Students
February 2024

UCD School of Electrical and Electronic Engineering

Scoil na hInnealtóireachta Leictrí agus Leictreonaí UCD

1

Introductions

- Hugh Fitzpatrick
  - Stage 2 BE student, E&E Engineering

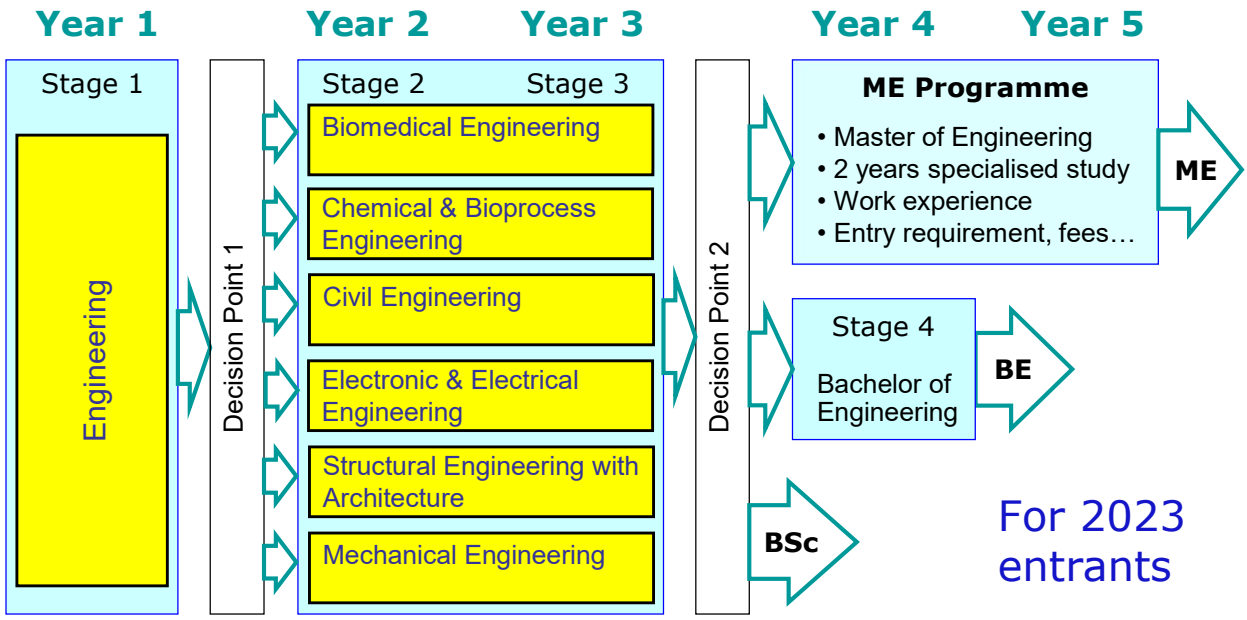
- Jesse Onolememen
  - Stage 4 BE student, Electrical Engineering

- Danielle O'Connor
  - ME student, Electronic & Computer Engineering
- Brian Mulkeen (brian.mulkeen@ucd.ie)
  - Programme Director, BE Electronic & Electrical Engineering

2

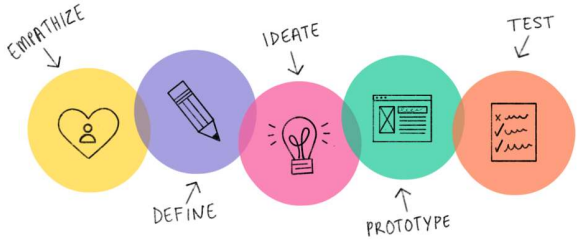
2

UCD Engineering Pathways – DN150



3

What Do Engineers Do?



- Design and Innovate
  - create things that did not exist before
  - maybe a completely new concept
  - maybe just better, cleaner, safer, cheaper…
- Solve problems
  - making the world better (or some small part of it)
  - you might work on a few big problems in your career
  - or many smaller problems

4

4

Electrical Engineers

- Focus on electricity as a form of energy
  - for heat, light, transport, machines, etc.
  - usually large scale, high power
- Generating electricity – many new challenges
  - renewable energy is changing the norms…
- Transporting electricity to where it is needed
  - the "grid" is critical infrastructure in the 21st century
  - not just big wires now – "smart grid" needs control, communications, optimisation, etc.

5

5

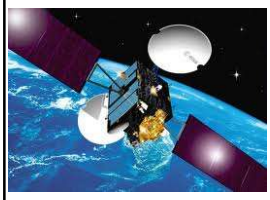
Electrical Engineers

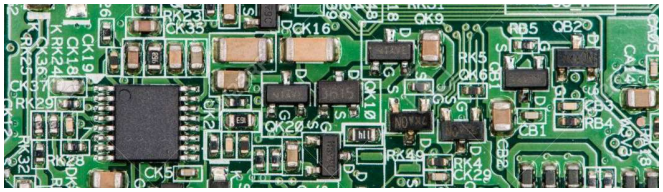
- Storing electricity – on a large scale
  - would bring huge benefits with renewable generation
- Electrifying transport – some good progress
  - but many problems remain to be solved
  - need chemical and mechanical engineers on the team
- Electrical machines, electrical installations
  - in every building, domestic, commercial, industrial
  - all designed by electrical engineers

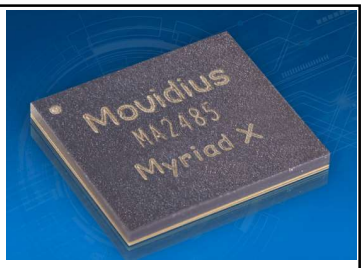
6

6

Electronic Engineers







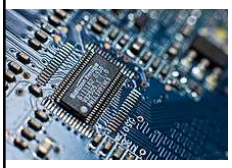
Intel Movidius

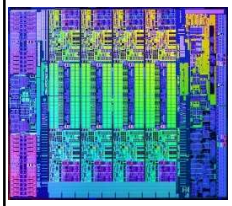
- Focus on electricity for information
  - computers – storing and processing information…
  - telecommunications – moving information…
  - entertainment – delivering content, gaming…
  - usually low power – do more with less energy?
- Electricity for control
  - electronic controls in aircraft, cars, washing machines…
  - often hidden, now becoming connected…

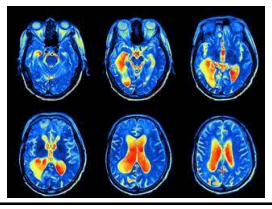
7

7

Smart Systems







- Many different systems
  - getting "smarter"
  - connecting to the Internet
    - "Internet of Things"
  - healthcare devices, wearables
  - home appliances
    - TV, washing machine…
    - home security, automation…

8

8

Why Choose Electronic/Electrical?

- Interesting and exciting field
  - technology is changing all the time
  - making possible new products, new systems…
  - you have an opportunity to be part of that!
- Broad field – you can specialise further later
  - within the degree programme (more on this later…)
  - or after graduation – where you work, what you do…
- Choose to suit your aptitude & interests
  - relies heavily on maths – design, analysis, etc…
  - computer – use as a tool, to solve complex problems…
    - also write software, design hardware…

9

9

Electronic & Electrical Stage 2

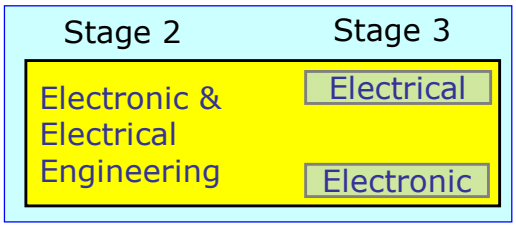
- Computer Engineering
- Digital Electronics
- Electrical & Electronic Circuits
- Multivariable Calculus
- Solid State Devices
- Communication Systems
- Electrical Energy Systems
- Electromagnetic Fields
- Electronic Circuits
- Statistics & Probability

- Fundamentals of Electronic & Electrical Engineering
  - both areas build on the same principles
  - so common curriculum in Stage 2
- Apply your knowledge to real-world problems
  - lots of lab work, mostly in groups of two…

10

10

E & E Stage 3



Core modules:

- Circuit Theory
- Computer Science
- Signals and Systems
- Multivariable Calculus
- Analogue Electronics
- Electromagnetic Waves
- Modelling and Simulation
- Signal Processing

Options: choose two of:

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

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

11

11

Study Abroad

- Usually in Stage 3
  - arranged through UCD Global…
  - need GPA ≥ 3.00 (for all Engineering students)
  - normally, all core module grades at least C-
- Popular destinations:
  - Australia
  - Canada
  - Singapore
  - USA
    - at least 10 different universities
- Europe: Erasmus
  - France
  - Germany
  - Switzerland

12

12

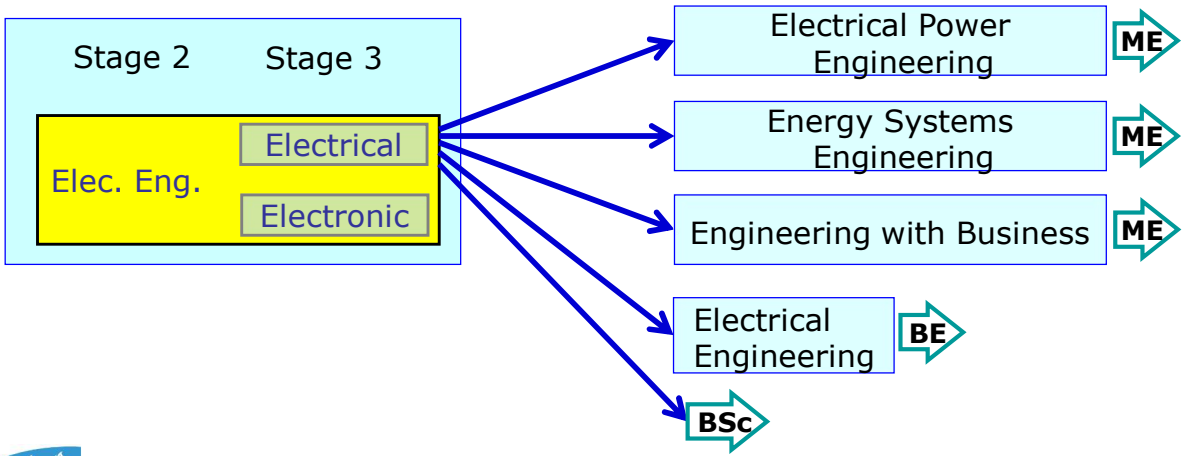
Decision at end of Stage 3

- 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

13

13

Electrical Engineering Choices

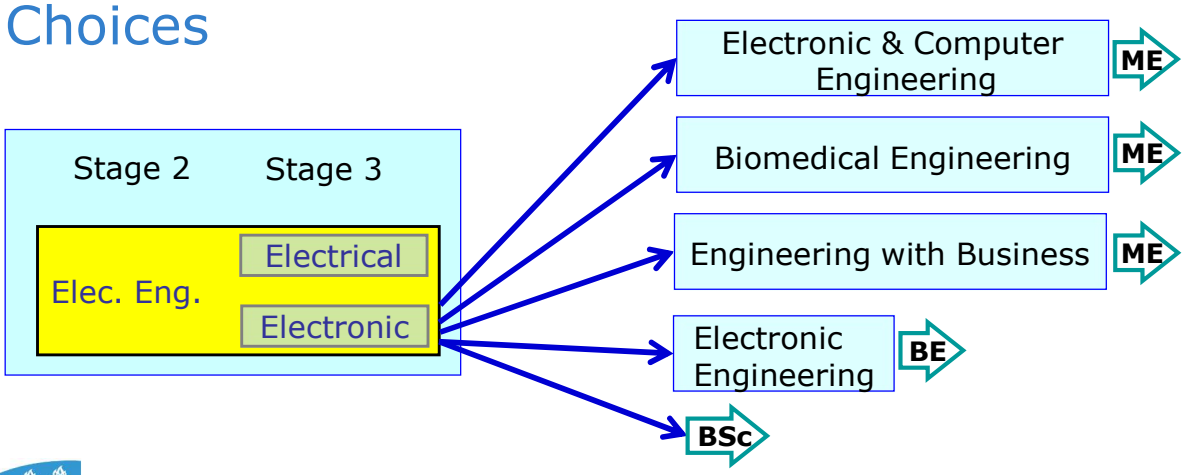


- Other options are possible…
  - these are the obvious paths in UCD at present
    - ME Energy Systems is also available from the Mechanical route

14

14

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

15

15

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 a C grade)
- Tuition fees
  - currently €9300 per year for EU students
  - usually only have to pay for last year…

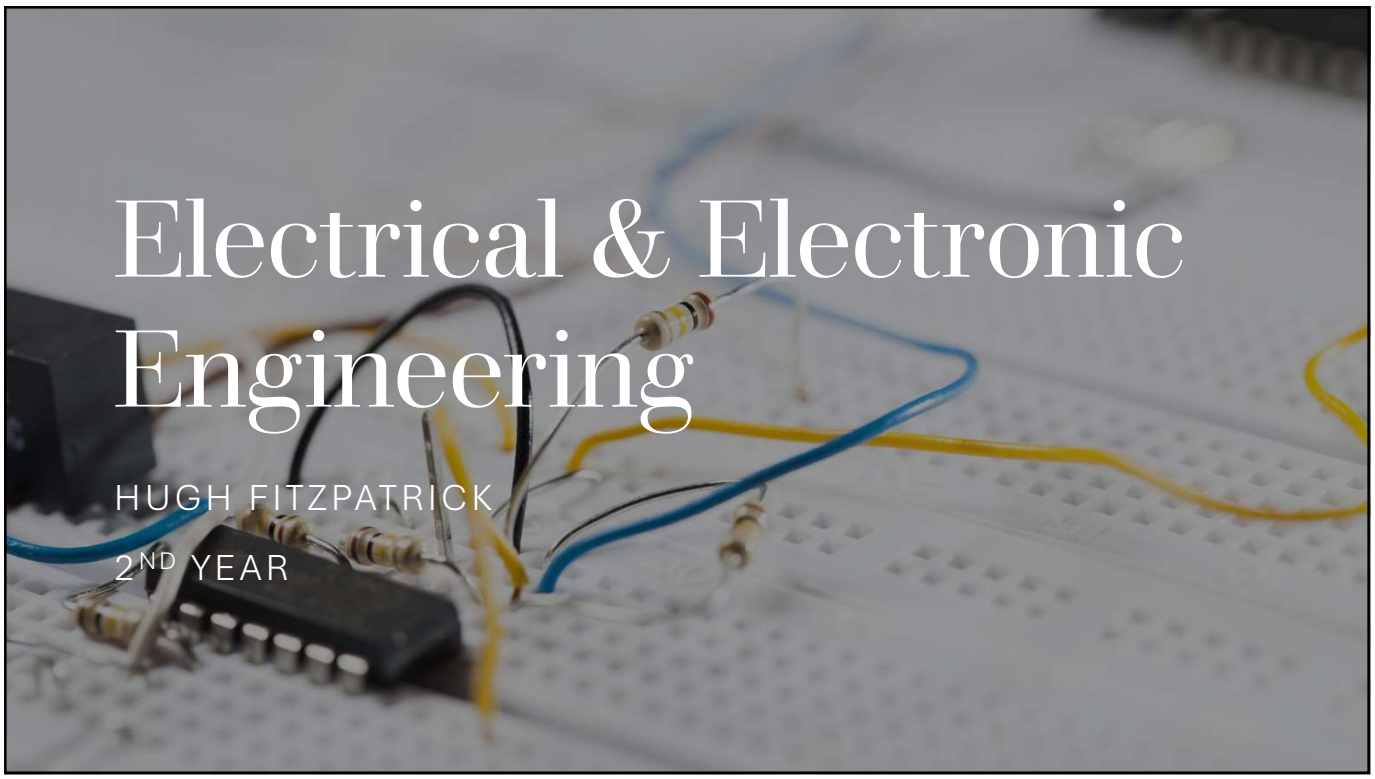
16

16

Scholarships for ME Programmes

- Réalta scholarships from UCD - €9500
  - aimed at students for whom ME fees are 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
- Analog Devices Ireland
- Intel Ireland

17



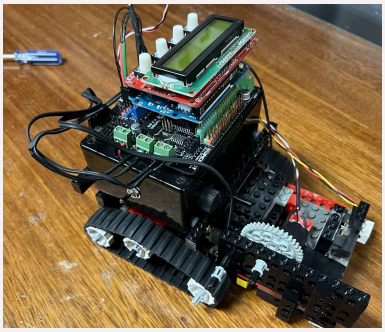
18

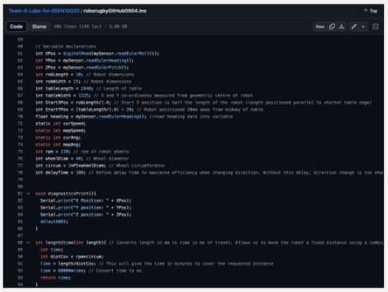
About me

Maths, Applied Maths, DCG, no Physics

Interest in coding and computers

First Year – Elec Circuits 1st Semester, Physics 2nd Semester, CompSci Elective & Robotics 2nd Semester

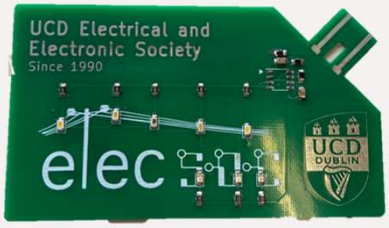


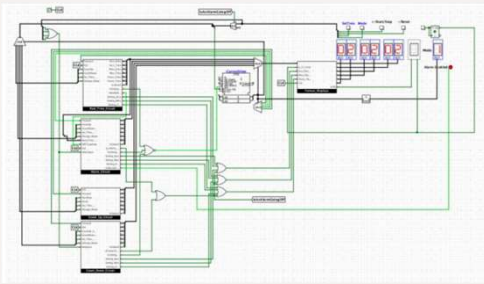


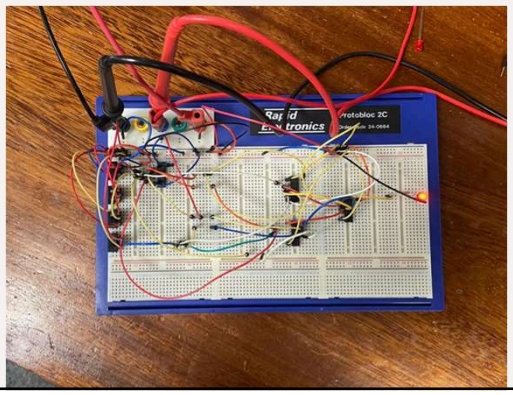
19

Elec Engineering – 2nd Year, What to Expect

- Physics
- Coding
- Digital Logic (1st Year Module)
- Circuit Analysis
- Maths – Calculus, Statistics
- Fun stuff – Digital Labs, Circuit Labs, Digital Clock competition
- ElecSoc Events







20

My Career Future

1st Year Internship Completed!

2nd Year Internship – Currently on the hunt

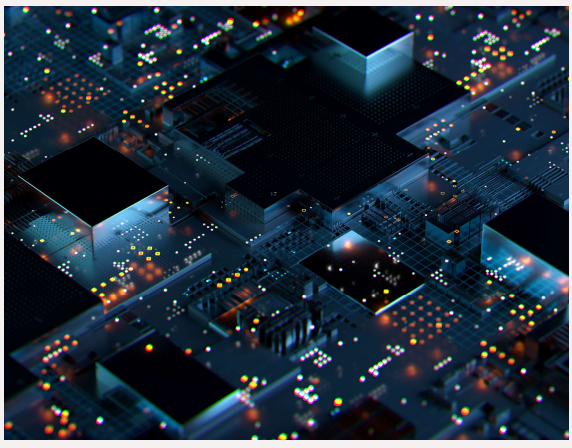
Computer Engineering Industry

Re Internships – Make a LinkedIn

21

Why Elec Engineering?

- Enjoyed first year modules
- Interest in course content - circuits, power systems, information systems, coding & computers, electrical physics
- Coding – Often a perceived barrier, no need for any experience!



Our future is electrical & electronic – sustainable power, electric cars, AI, computer systems, quantum computing

22

Thank you

Hugh.fitzpatrick2@ucdconnect.ie

Email me anytime – happy to help

Any questions?

23

ME ELECTRONIC AND COMPUTER ENGINEERING

Danielle O'Connor

danielle.oconnor@ucdconnect.ie

24

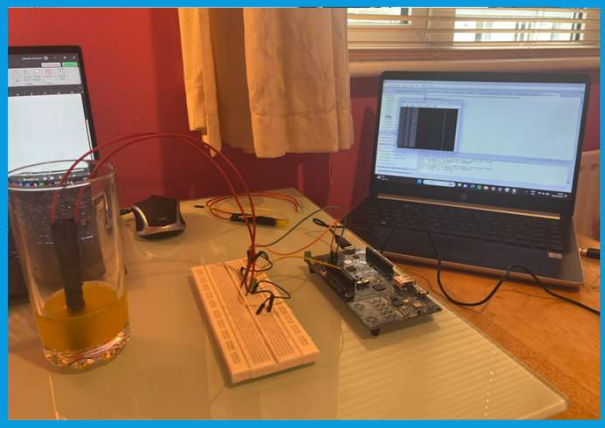
INTERNSHIP

- Verification Engineer
- Verify the functionality of hardware/software by creating test cases and scenarios
- Worked on software that tested scripts by inserting 'bugs' and 'faults' into the design code to see if the verification code was able to find it

25

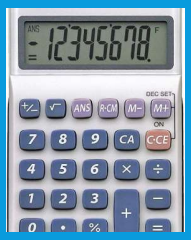
THESIS

- Capacitive Liquid Level Sensing



26

PROJECTS I'VE DONE IN ELEC



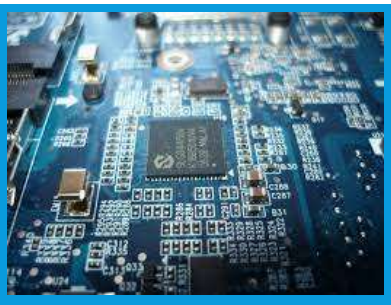
- Made a 24-hour clock starting from just gates in Digital Electronics (2nd yr)
- Made a calculator from scratch in Digital System Design (3rd yr)
- Made a Solitaire game and a Backgammon game written in Java in Software Engineering (4th yr)

```
[Player Stats] Score: 0    Moves: 0

D:              H:              C:              S:
P:      [24]

Lane 1: |10 of Spades|
Lane 2: |         x         ||7 of Clubs|
Lane 3: |         x         ||         x         ||9 of Spades|
Lane 4: |         x         ||         x         ||         x         ||King of Clubs|
Lane 5: |         x         ||         x         ||         x         ||         x         ||Ace of Clubs|
Lane 6: |         x         ||         x         ||         x         ||         x         ||         x         ||Ace of Diamonds|
Lane 7: |         x         ||         x         ||         x         ||         x         ||         x         ||         x         ||Jack of Diamonds|
```

27

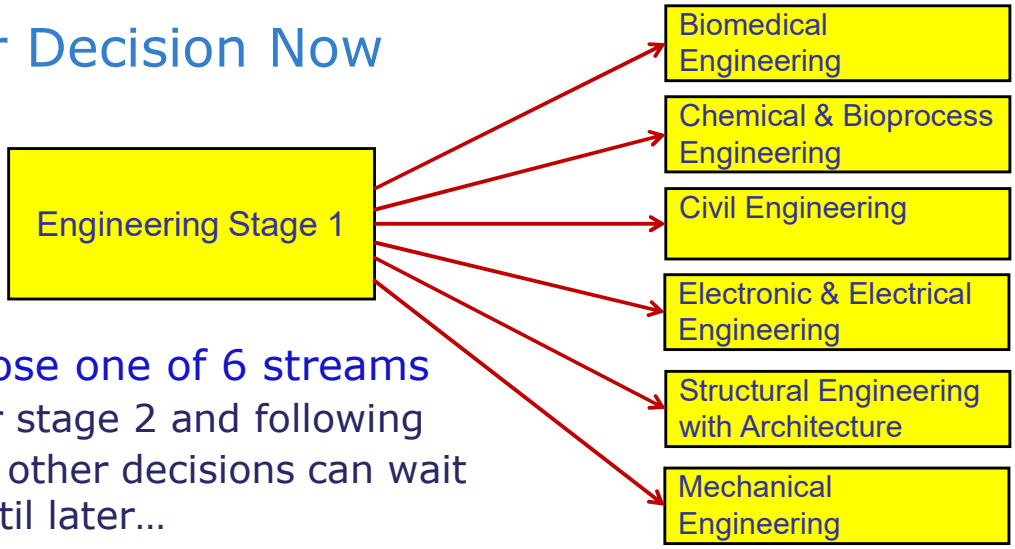
WHY DID I PICK ELECTRONIC ENGINEERING?

- **Really enjoyed the electronic module in first year**
- **Leaves your options open**
  - I was in between picking electronic and biomedical
- **Enjoyed the coding option module**
  - Don't have to be great at it
  - I never did any other coding before the option module



28

Your Decision Now



- Choose one of 6 streams
  - for stage 2 and following
  - all other decisions can wait until later…
- Decision needed by Friday 12 April
  - collected by an on-line survey form
  - from Engineering & Architecture College Office

29

29