

Electronic Engineering Fundamentals

Kyriaki Niotaki
`kyriaki.niotaki@mu.ie`

Who am I?

My name is **Kyriaki Niotaki**. I am a lecturer at Electronics Engineering Department at Maynooth University.

Previously I was an RF Design Engineer in the industry.

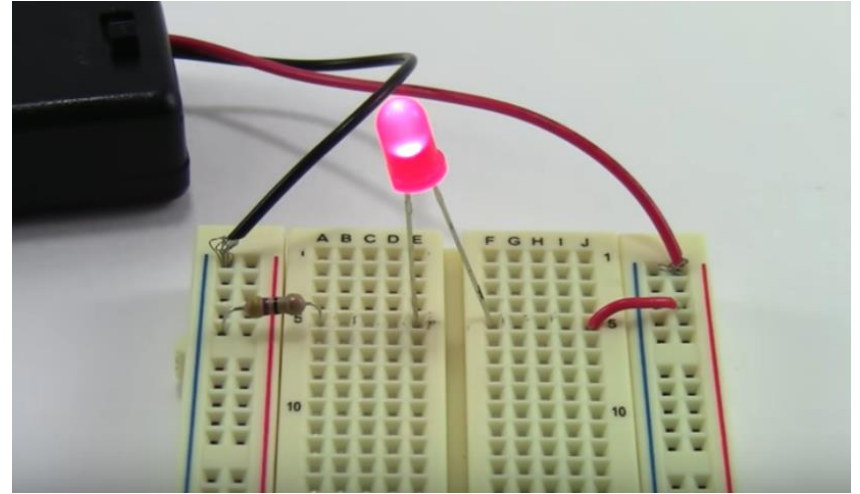
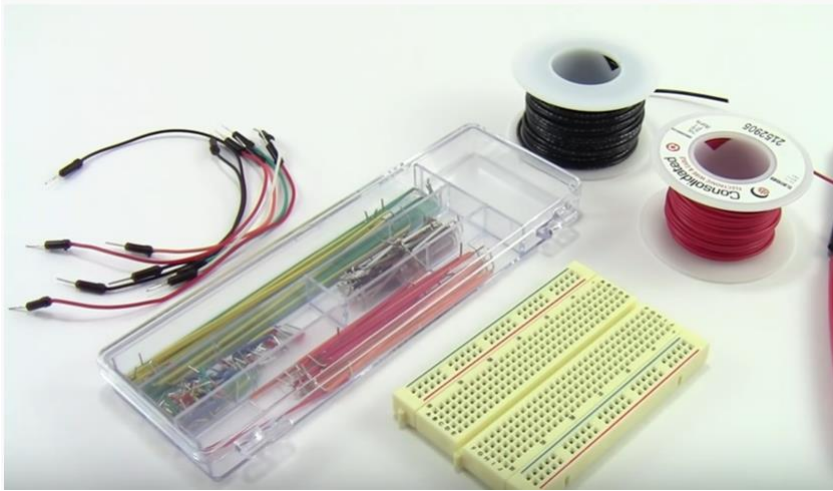


Course Outline

This module consists of

- Lectures
- Lab sessions
- Tutorials

Laboratories



Missed labs cannot be repeated, in general.

Lab Reports

Reports with **high similarity scores** will be heavily penalised (either you copied, or you were copied)

Moodle ***Turn-it-in*** will be used. ***Turn-it-in*** allows for checking submitted pieces of writing for potential instances of plagiarism, unclear referencing etc.

Turn-it-in will be used also for the assignments.

Course Outline

Assessment Structure

- Lectures
- Lab sessions (15%) – lab reports
- Assignments (10%)
- 2-hour end of year exam (75%)

Important!

Late submission of assignments and laboratory reports will be subject to a penalty of **10%** of the assessment grade **for each day** (or part thereof) overdue.

All assignments & lab reports will be submitted on Moodle.

Fundamentals of Electronic **Engineering**

Engineering is a way of thinking - a methodical approach to solving technical problems and creating new solutions.

The laws of physics cannot lie, engineers can only understand them and try to bend them to achieve a certain function.

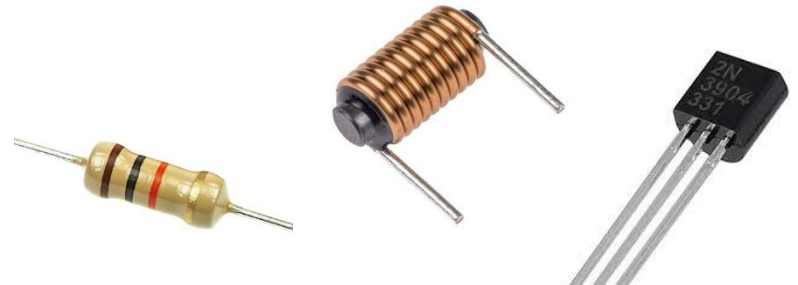
Understanding the limitations of the technology, and understanding the way the technology designers work, is essential if you wish to create new capabilities.

Fundamentals of Electronic **Engineering**

Electrical engineering tends to focus on *power generation and distribution*.

Electronic engineering focuses on applications, particularly in areas where we want to *control things, perform calculations, or cause an effect*.

Transistors, resistors, capacitors, inductors, diodes are the primary tools of an electronic engineer.



and so . . .

Successfully communicating to engineers or any techie requires:

Precision of language: a 2 cm long part is not the same as a 2.01 cm long part. All options must be defined.

Understanding of limitations: just because you want something to work in a certain way, doesn't mean it can or will.

Engineers deal with the art of the possible not the impossible.

and so . . .

The state of the art keeps changing.

What was impossible yesterday, might be possible tomorrow.



and so . . .

The state of the art keeps changing.

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1st Generation
(1G)



2nd Generation
(2G)



3rd Generation
(3G)



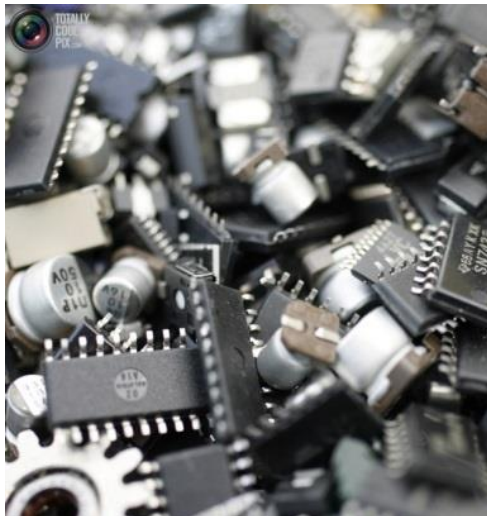
4th Generation
(4G)

So why do this module?

Why do this module?

Electronic Engineering & Robotics students

- The art of solving problems with Electricity and Electromagnetic Fields
- Learn how to analyse basic circuits



Why do this module?

Computer Science & Multimedia Mobile students

- Most computers need electricity
- Often you'll have to work with hardware
- Processors are just collections of transistors



Why do this module?

The future is “**smart**” with the **Internet of Things (IoT)**



What do we hope you will learn:

- An **understanding of electricity** and **how we build circuits**.
- How to make sure you get the most energy from a battery (**efficiency**).
- A bit **on radio waves**, and how we **communicate** across long distances.
- Cross some of the **linguistic/cultural boundaries** between techies and designers.

Course Outline

Introduction and Motivation: Electronics in Society, Scientific Notation and Exponents, Engineering Notation

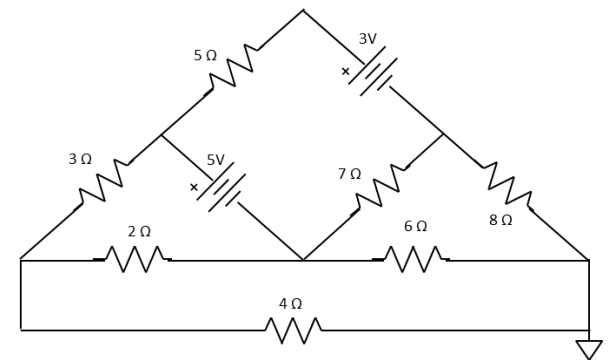
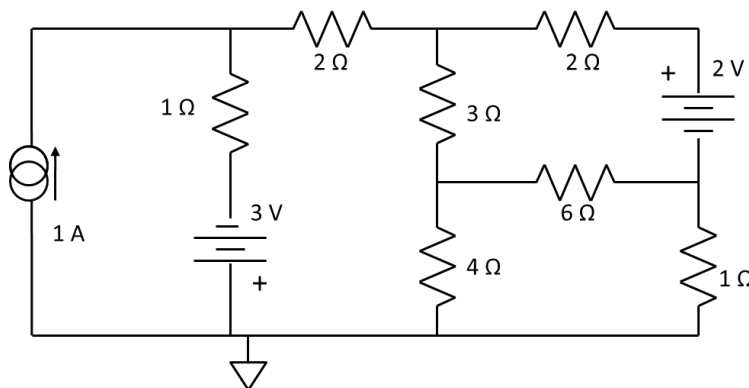
Basic Electromagnetics: Charge, Vectors and Coulombs Law and Applications

Electricity: Voltage and Current, Resistance and Conductance, Resistivity, Fundamental Relations: Ohm's Law, Energy, Power

Very Simple Circuit Analysis: Voltage Division, Current Division, Series and Parallel Circuits

More Circuit Analysis: Kirchhoff's Laws, Circuit Theorems, Source Transformations: Thevenin's Theorem & Norton's Theorem

Even more circuits analysis: Multiloop Circuits, Nodal Analysis, Mesh Analysis



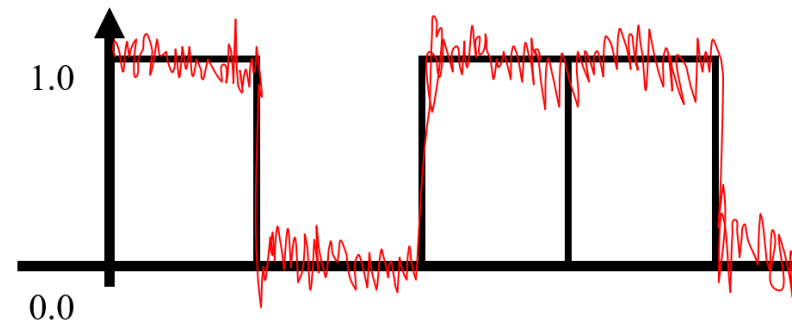
Course Outline

Basic Electronics: Ideal Diodes, Transistors, simple circuits

Electrical Safety: at home and at work

The Environment, Social Responsibility: the impact of our decisions on our peers and the environment

Communication: communication networks, principles of wireless communications, receivers and transmitter



Course Outline

What you need to succeed at this course:

- a little bit of maths (basic maths will be enough)
- a little bit of physics (not a lot)
- a lot of mental flexibility (many new concepts)
- an ability to ask questions (and listen to answers)

The rest we do from scratch.

How to **Fail** the Module?

- **Do not turn up for your labs** or don't your assignments (instant loss of 25%)
- **Do not turn up for your lectures ...** Moodle has the slides but I will provide the additional information you need..
Take notes!!!
- **Do not ask questions** I am happy to answer any questions you have..



how to
fail

Engineering Notation

We need to speak a common language so as to understand the numbers we use in engineering. Without the right notation, it's meaningless.

- What's the temperature??
- The temperature outside is 16.

16 oranges? **We need units** so as everyone, from any discipline or any country will know exactly what we mean.

The temperature is also usually a 'normal' number.

However, through science, we often have to deal with very large and very small numbers.

Engineering Notation

Many quantities use very big or very small numbers so we need a convenient way to deal with this too.

Scaling units (down)

m milli (10^{-3})
μ micro (10^{-6})
n nano (10^{-9})
p pico (10^{-12})
f femto (10^{-15})

Scaling units (up)

k kilo (10^3)
M mega (10^6)
G giga (10^9)
T terra (10^{12})

Scaling down normally uses lower case, scaling up big case (“k – kilo” is an exception).

*However in general **be careful of** mixing “m M” because they mean very different things...*

Fundamental Units

1. Kilogram (kg): the unit of mass.
2. Ampere (A): the unit of current.
3. Metre (m): the unit of distance.
4. Second (s): the unit of time.
5. Kelvin (K): the unit of heat.
6. Mole (mol): the unit of amount of a substance.
7. Candela (cd): the unit of light.

Derived Engineering Units-Examples

Watt (W): the unit of power. $(\text{m}^2)(\text{kg})(\text{s}^{-3})$

Newton (N): the unit of force. $(\text{m})(\text{kg})(\text{s}^{-2})$

Joule (J): the unit of energy, heat. $(\text{m}^2)(\text{kg})(\text{s}^{-2})$

Hertz (Hz): the unit of frequency. (s^{-1})

Celsius ($^{\circ}\text{C}$): an unofficial unit of heat. $(\text{K}-273.15)$

Coulomb (C): the unit of electric charge. $(\text{s})(\text{A})$

Volt (V): the unit of voltage, potential difference. $(\text{m}^2)(\text{kg})(\text{s}^{-3})(\text{A}^{-1})$

Ohm (Ω): the unit of electrical resistance. $(\text{V})(\text{A}^{-1})$

Farad (F): the unit of electrical capacitance. $(\text{C})(\text{V}^{-1})$

Siemens (S): the unit of electrical conductance. (Ω^{-1})

Henry (H): the unit of electrical inductance. $(\text{V})(\text{s})(\text{A}^{-1})$

Use of Engineering Units

In every course, the incorrect use of units will result in lost marks!

This is due to the fact that I won't know whether your answer is right or wrong or out by a factor of 1000 or whether you knew what you were doing.

Ways to go wrong:

- Not using any units (most common)
- Not using the right units (common)
- Getting your scaling factors wrong (very common)

Communicating through Moodle

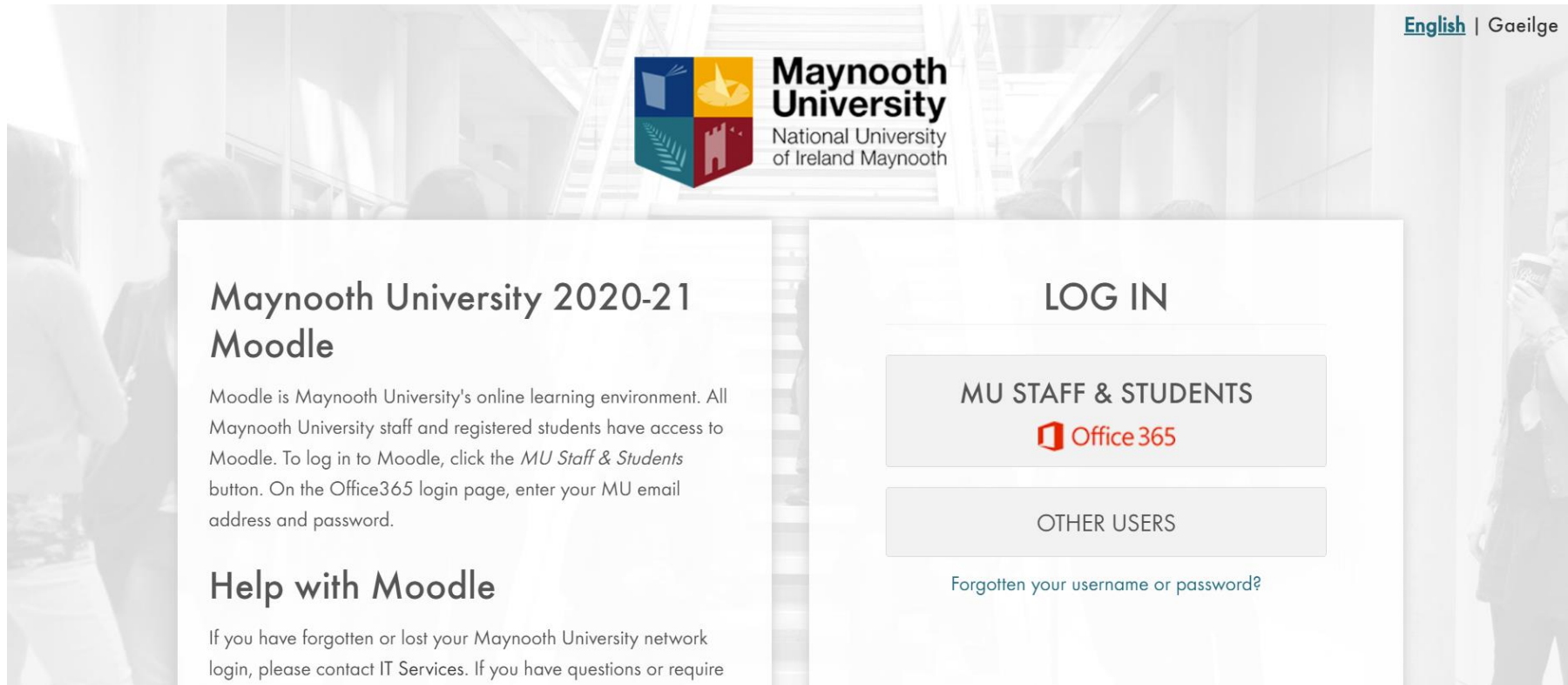
Moodle is the Virtual Learning Environment used at Maynooth International Engineering College (MIEC).

It is an online environment:

- with learning resources for the modules delivered
- where students and lecturers interact with each other

Communicating through Moodle

<https://2021.moodle.maynoothuniversity.ie/login/index.php>

The image shows a screenshot of the Maynooth University Moodle login page. The background is a grayscale photo of a modern building interior with a staircase. At the top center is the Maynooth University logo, which consists of a shield divided into four quadrants (blue, yellow, green, red) with icons of a book, a sun, a leaf, and a castle. To the right of the logo is the text 'Maynooth University' and 'National University of Ireland Maynooth'. In the top right corner, there are links for 'English' and 'Gaeilge'. The main content area is divided into two columns. The left column has a heading 'Maynooth University 2020-21 Moodle' followed by a paragraph explaining Moodle and how to log in. Below this is a heading 'Help with Moodle' and a paragraph about forgotten passwords. The right column has a heading 'LOG IN' followed by two large buttons: 'MU STAFF & STUDENTS' (which includes the Office 365 logo) and 'OTHER USERS'. Below these buttons is a link for 'Forgotten your username or password?'.

English | Gaeilge

Maynooth University
National University of Ireland Maynooth

Maynooth University 2020-21 Moodle

Moodle is Maynooth University's online learning environment. All Maynooth University staff and registered students have access to Moodle. To log in to Moodle, click the *MU Staff & Students* button. On the Office365 login page, enter your MU email address and password.

Help with Moodle

If you have forgotten or lost your Maynooth University network login, please contact IT Services. If you have questions or require

LOG IN

MU STAFF & STUDENTS
Office 365

OTHER USERS

[Forgotten your username or password?](#)

Communicating through Moodle

<https://2021.moodle.maynoothuniversity.ie/login/index.php>



MY DASHBOARD ARCHIVES ▾ HELP ▾ MY COURSES ▾

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DASHBOARD

🗖 QUICK LINKS

HIDE MENU

MY COURSES

PAST CURRENT FUTURE

- 🔗 2020 Spark Initiative
- 🔗 Moodle Help for Staff
- 🔗 Moodle Help for Students
- 🔗 Remote Teaching Staff Guide
- 🔗 TurningPoint Resources
- 🔗 EE101FZ[A] (20-21:S1)
- 🔗 EE121FZ[A] (20-21:S1)

Dashboard

2020 Spark Initiative - 'Change one thing and do it well'

EE101FZ[A] – Electronic Engineering Fundamentals (2020-21:Semester 1)

EE121FZ[A] – Electronic Engineering Fundamentals (2020-21:Semester 1)

MC:SCT STAFF (20-21) – Turnitin Self-check: Staff (2020-21:Year-long)

Moodle Help for Staff

Moodle Help for Students

Remote Teaching Staff Guidance Page

Test Course Space – Kyriaki Niotaki (2020-21)

TurningPoint Resources

<https://able.moodle.maynoothuniversity.ie/my/#>

Communicating through Moodle



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✎ Turn editing on

EE121FZ[A] (20-21:S1)

PARTICIPANTS

GRADES

🔗 GENERAL

🔗 SECTION 1

🔗 SECTION 2

🔗 SECTION 3

🔗 SECTION 4

🔗 SECTION 5

🔗 SECTION 6

🔗 SECTION 7

🔗 SECTION 8

HIDE MENU

EE121FZ[A] – Electronic Engineering Fundamentals (2020-21:Semester 1)

Dashboard / EE121FZ[A] (20-21:S1)

⚙️ Manage Course

💬 Lecturer Announcements

💬 Class Discussion Forum

Instructions: Clicking on the section name will show / hide the section.

SECTION 1



SECTION 2



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<https://2021.moodle.maynoothuniversity.ie/login/index.php>



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▶ SECTION 8

HIDE MENU

EE121FZ[A] – Electronic Engineering Fundamentals (2020-21:Semester 1)

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Lecturer Announcements



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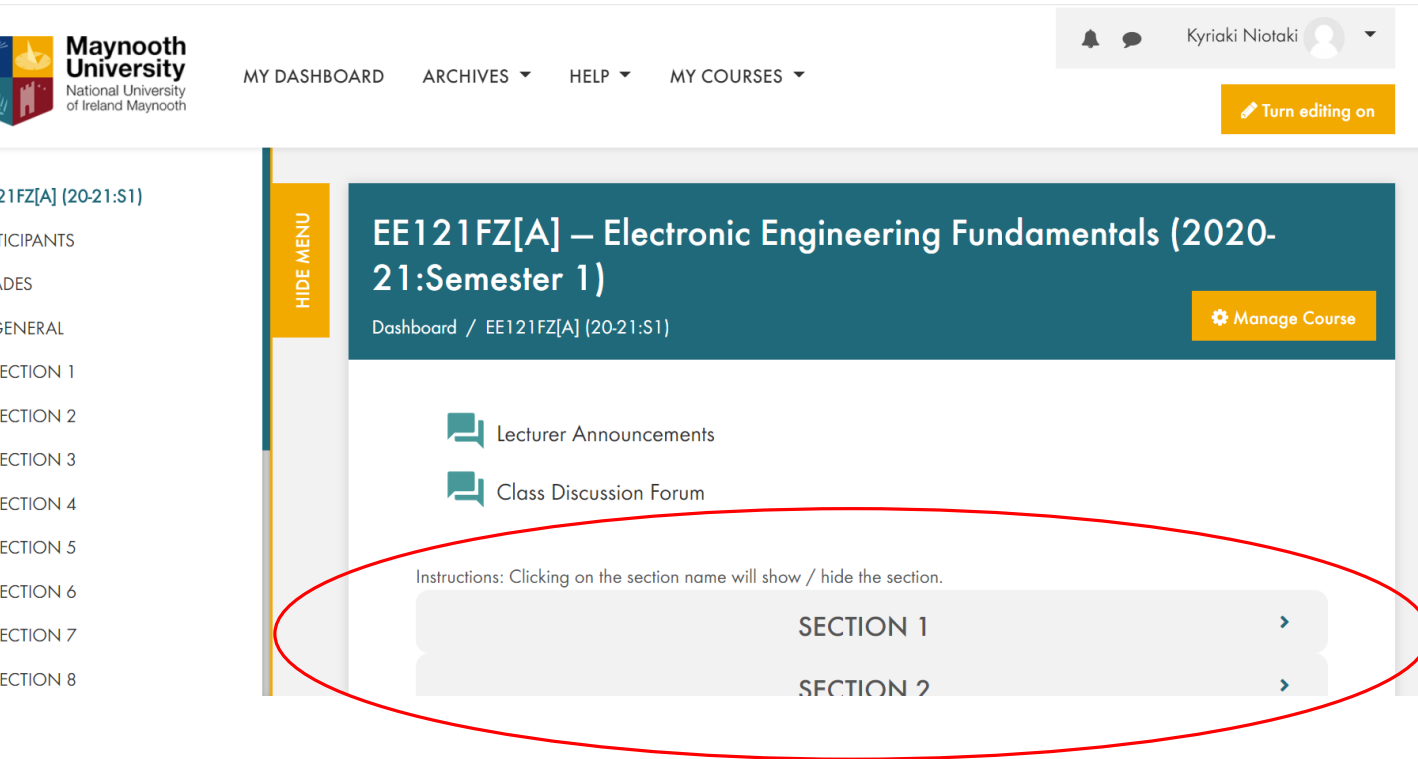


SECTION 2



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EE121FZ[A] (20-21:S1)

Participants

Modules

General

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EE121FZ[A] – Electronic Engineering Fundamentals (2020-21:Semester 1)

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Lecturer Announcements

Class Discussion Forum

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SECTION 1 >

SECTION 2 >

Presentation slides,
supplementary
material, laboratories
etc



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EE121FZ[A] – Electronic Engineering Fundamentals (2020-21:Semester 1)

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SECTION 1



SECTION 2



Summary

- Course Outline & Content
- Assessment Criteria
- The importance of this module
- Engineering Notation
- Communicating through Moodle