

# Electronic Engineering Fundamentals

Jinling Yu  
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# Who am I?

My name is **Jinling Yu** (俞金玲).

I am a professor at School of Physics and Information Engineering at Fuzhou University.

The website of me: 物理与信息工程学院 (fzu.edu.cn)



# Course Arrangement and Outline

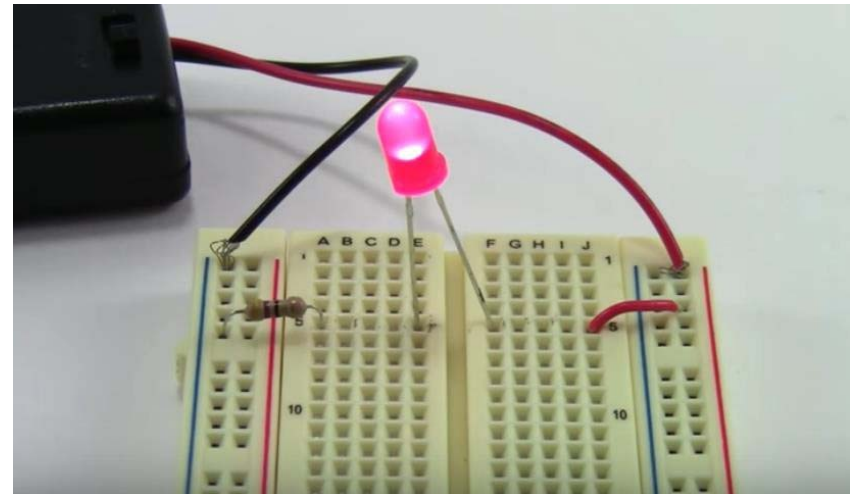
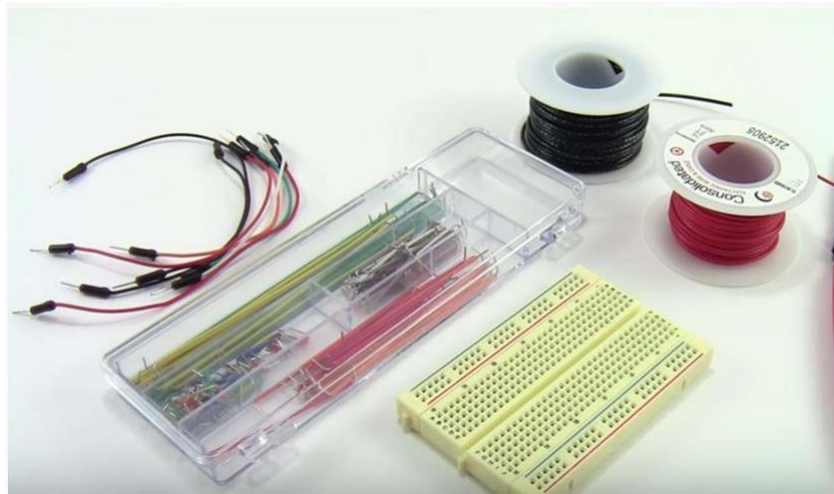
This course will be taught by me and Mr. Diao.  
He is a Lecturer at Maynooth University.

The first half of the course will be taught by me, and the another half of the course will be taught by Mr. Diao.

This module consists of

- Lectures (34 credit hour)
- Lab sessions (24 credit hour)
- Tutorials (14 credit hour)

# Laboratories



***Missed labs cannot be repeated,*** in general.

# Lab Arrangement

Week	Time	Content	Credit hour	Students
The first experiment (Week 10) Tuesday	2021/11/2 18:30-21:30	Lab: Resistance, Current and Voltage	4	Electronic Information and Software Engineering
The second experiment (Week 11) Tuesday	2021/11/9 18:30-21:30	Lab: Kirchhoff's Current and Voltage Laws	4	Electronic Information and Software Engineering
The third experiment (Week 12) Tuesday	2021/11/16 18:30-21:30	Lab: Source and Thevenin's Theorem	4	Electronic Information and Software Engineering
The fourth experiment (Week 13) Tuesday	2021/11/23 18:30-21:30	Lab: Inductors, Capacitors and Oscilloscopes	4	Electronic Information and Software Engineering
The fifth experiment (Week 16) Tuesday	2021/12/14 18:30-21:30	Lab: Diodes and Rectification	4	Electronic Information and Software Engineering
The sixth experiment (Week 17) Tuesday	2021/12/21 18:30-21:30	Lab: Communications I and II	4	Electronic Information and Software Engineering

# Tutorial Arrangement

课次 (Slot)	周数 (Week)	日期 (Date)	教 学 内 容 (Teaching Content)	教学形式 (Delivery Method)	计划 课时数 (No. of Periods)
1	Week 5 Friday	2021-10-1	Tutorial: Electrostatics & Ohms Law	T	2
2	Week 9 Friday	2021-10-29	Tutorial: Circuit Analysis I	T	2
3	Week 11 Friday	2021-11-12	Tutorial: Circuit Analysis II	T	2
4	Week 15 Friday	2021-12-10	Tutorial: signal and Modulation	T	2
5	Week 18 Friday	2021-12-31	Tutorial: Telecommunications	T	2
6	Week 19 Friday	2022-1-7	Tutorial: Ethics and health	T	2
7	Week 20 Friday	2022-1-14	Tutorial: Electricity grid	T	2

# Arrangement of tutors

Group number	students	Group leader	tutor
1	832101101- 832101115	王文锐	Jinling Yu (俞金玲)
2	832101116- 832101130	周文轩	张宗恒
3	832101201- 832101215	王心怡	兰尔铭
4	832101216- 832101230	陈冠廷	苏宸巧
5	832101301- 832101315	王学彬	陶乐溪
6	832101316- 832101330	陈璐歆	聂宇鑫

# 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.

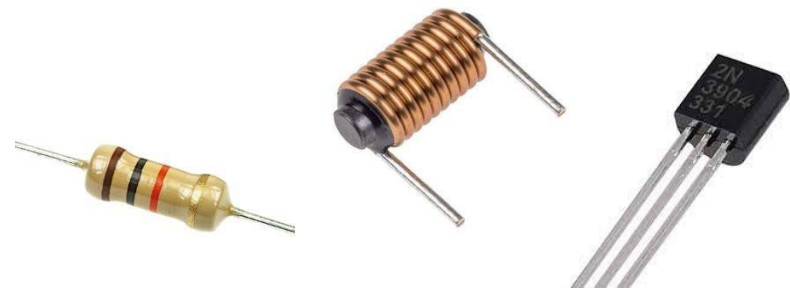
Understanding the limitations of the technology, and understanding the way the technology designers work, is essential if you wish to create new capabilities.

# 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.**

What was impossible yesterday, might be possible tomorrow.



1<sup>st</sup> Generation  
(1G)



2<sup>nd</sup> Generation  
(2G)



3<sup>rd</sup> Generation  
(3G)



4<sup>th</sup> 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

## Fundamentals of Electronic Engineering

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

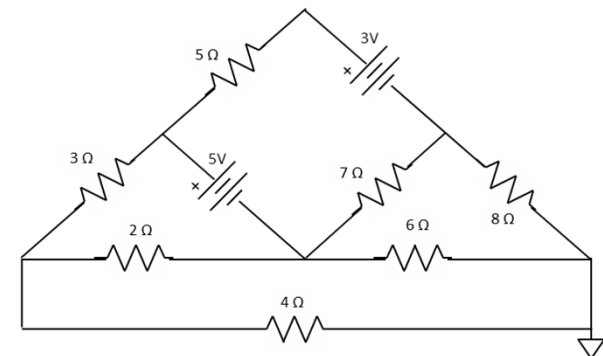
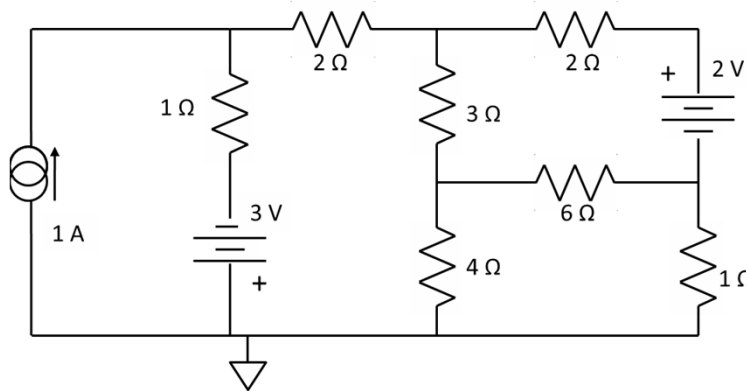
**Basic Electromagnetics:** Charge, Vectors and Coulombs Law and Applications

**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

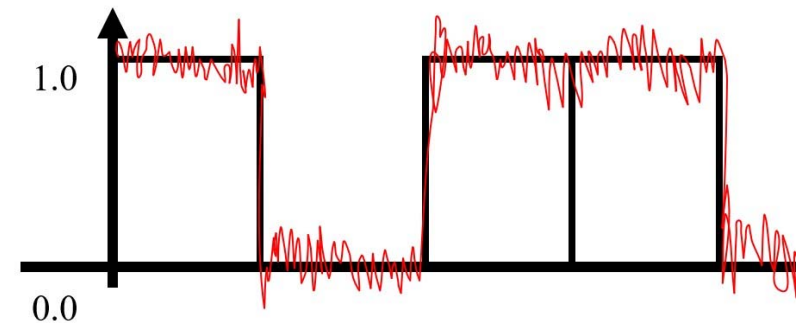
## Fundamentals of Electronic Engineering

**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 do 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 ( $10^{-3}$ )  
 $\mu$  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.*

*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.  $(\text{s}^{-1})$

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 ( $\Omega$ ): 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.  $(\Omega^{-1})$

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

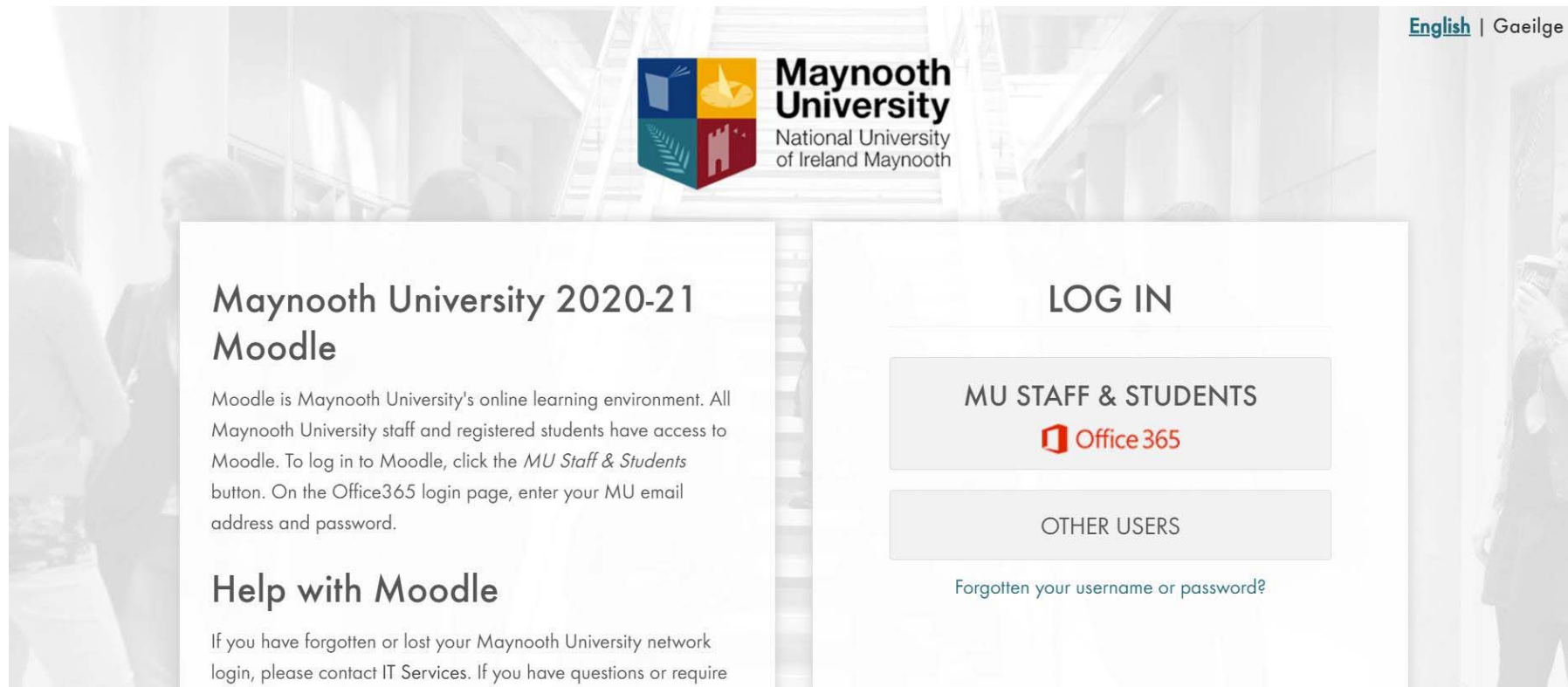
**Moodle is the Virtual Learning Environment** used at Maynooth International Engineering College (MIEC).

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>



[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?](#)

INTRODUCTION

30

# Communicating through Moodle

The screenshot shows the Moodle interface for Maynooth University. The browser address bar displays the URL: <https://moodle.maynoothuniversity.ie/course/search.php?search=101>. The top navigation bar includes the Maynooth University logo, the text "Maynooth University National University of Ireland Maynooth", and links for "MY DASHBOARD", "HELP", and "MY COURSES". On the right, there is a user profile for "Jinling Yu" and a search bar with the text "Search courses" and "101". A "Go" button is next to the search bar. The main content area shows a list of search results. The first result is "EE101[A] – Electronic Engineering Fundamentals (2020-21:Semester 1)". The second result is "EE101[A] – Electronic Engineering Fundamentals (2021-22:Semester 1)". The third result is "EE101FZ[A] – Electronic Engineering Fundamentals (2020-21:Semester 1)". The fourth result, "EE101FZ[A] – Electronic Engineering Fundamentals (2021-22:Semester 1)", is circled in red. The fifth result is "EN101[A] – Foundational English 1a: Prose and Fiction (2020-21:Semester 1)".

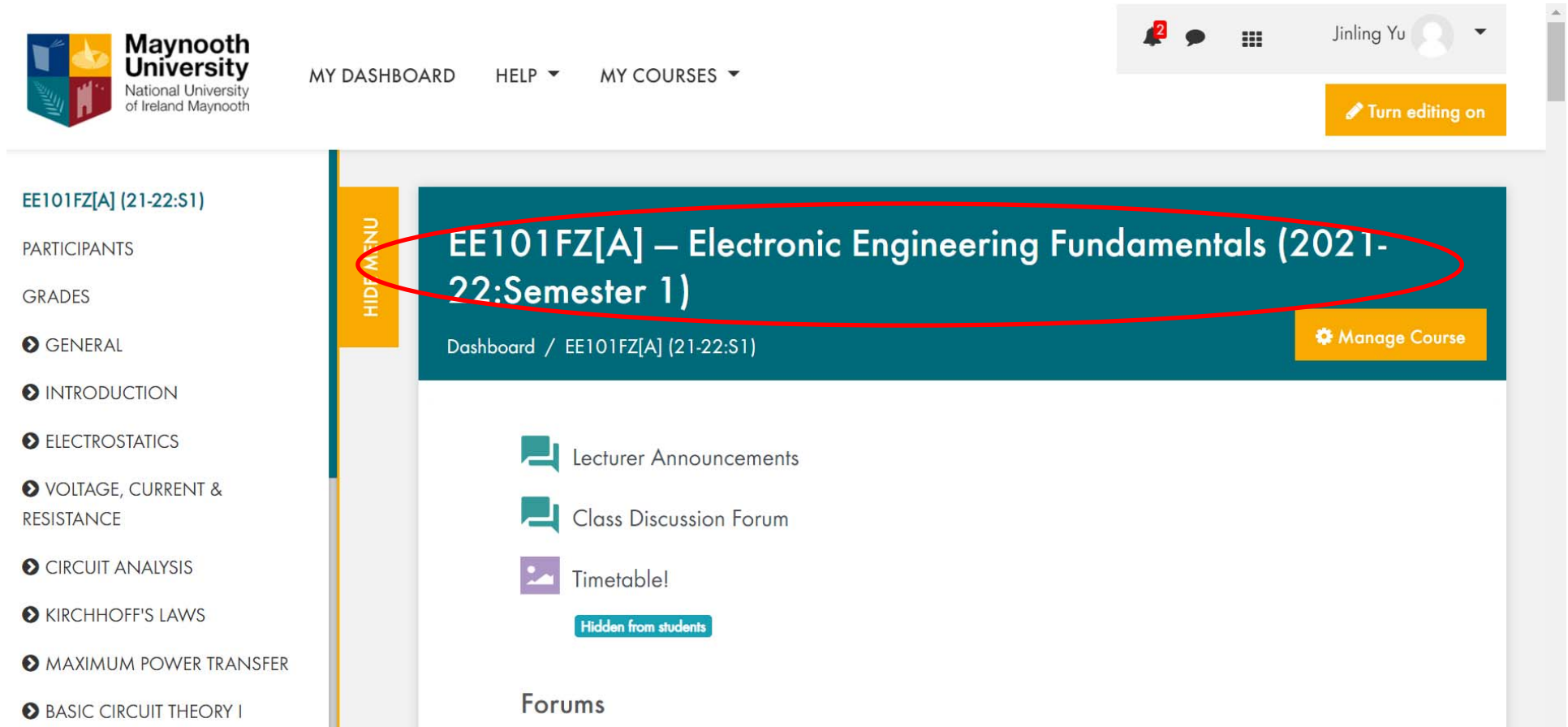
DASHBOARD

HIDE MENU

long)

- EE101[A] – Electronic Engineering Fundamentals (2020-21:Semester 1)
- EE101[A] – Electronic Engineering Fundamentals (2021-22:Semester 1)
- EE101FZ[A] – Electronic Engineering Fundamentals (2020-21:Semester 1)
- EE101FZ[A] – Electronic Engineering Fundamentals (2021-22:Semester 1)
- EN101[A] – Foundational English 1a: Prose and Fiction (2020-21:Semester 1)

# Communicating through Moodle



**Maynooth University**  
National University of Ireland Maynooth

MY DASHBOARD    HELP ▾    MY COURSES ▾

Jinling Yu ▾

Turn editing on

EE101FZ[A] (21-22:S1)

PARTICIPANTS

GRADES

GENERAL

INTRODUCTION

ELECTROSTATICS

VOLTAGE, CURRENT & RESISTANCE

CIRCUIT ANALYSIS

KIRCHHOFF'S LAWS

MAXIMUM POWER TRANSFER

BASIC CIRCUIT THEORY I

HIDE MENU

**EE101FZ[A] – Electronic Engineering Fundamentals (2021-22:Semester 1)**

Dashboard / EE101FZ[A] (21-22:S1)    Manage Course

Lecturer Announcements

Class Discussion Forum

Timetable!

Hidden from students

Forums



# Communicating through Moodle

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

The screenshot displays the Moodle interface for a course. At the top, the Maynooth University logo is on the left, and navigation links for 'MY DASHBOARD', 'HELP', and 'MY COURSES' are in the center. On the right, there's a user profile for 'Jinling Yu' and a 'Turn editing on' button. The course title 'EE101FZ[A] (21-22:S1)' is shown in the sidebar. The main content area features a large teal header with the course title 'EE101FZ[A] – Electronic Engineering Fundamentals (2021-22:Semester 1)' and a 'Manage Course' button. Below the header, a list of activities is shown: 'Lecturer Announcements' (highlighted with a red box and a black arrow), 'Class Discussion Forum', and 'Timetable!'. A 'Hidden from students' label is also visible. The footer shows 'INTRODUCTION' and the page number '33'.

Maynooth University  
National University of Ireland Maynooth

MY DASHBOARD HELP MY COURSES

Jinling Yu

Turn editing on

EE101FZ[A] (21-22:S1)

PARTICIPANTS

GRADES

GENERAL

INTRODUCTION

ELECTROSTATICS

VOLTAGE, CURRENT & RESISTANCE

CIRCUIT ANALYSIS

KIRCHHOFF'S LAWS

MAXIMUM POWER TRANSFER

BASIC CIRCUIT THEORY I

HIDE MENU

EE101FZ[A] – Electronic Engineering Fundamentals (2021-22:Semester 1)

Dashboard / EE101FZ[A] (21-22:S1)

Manage Course

Lecturer Announcements

Class Discussion Forum

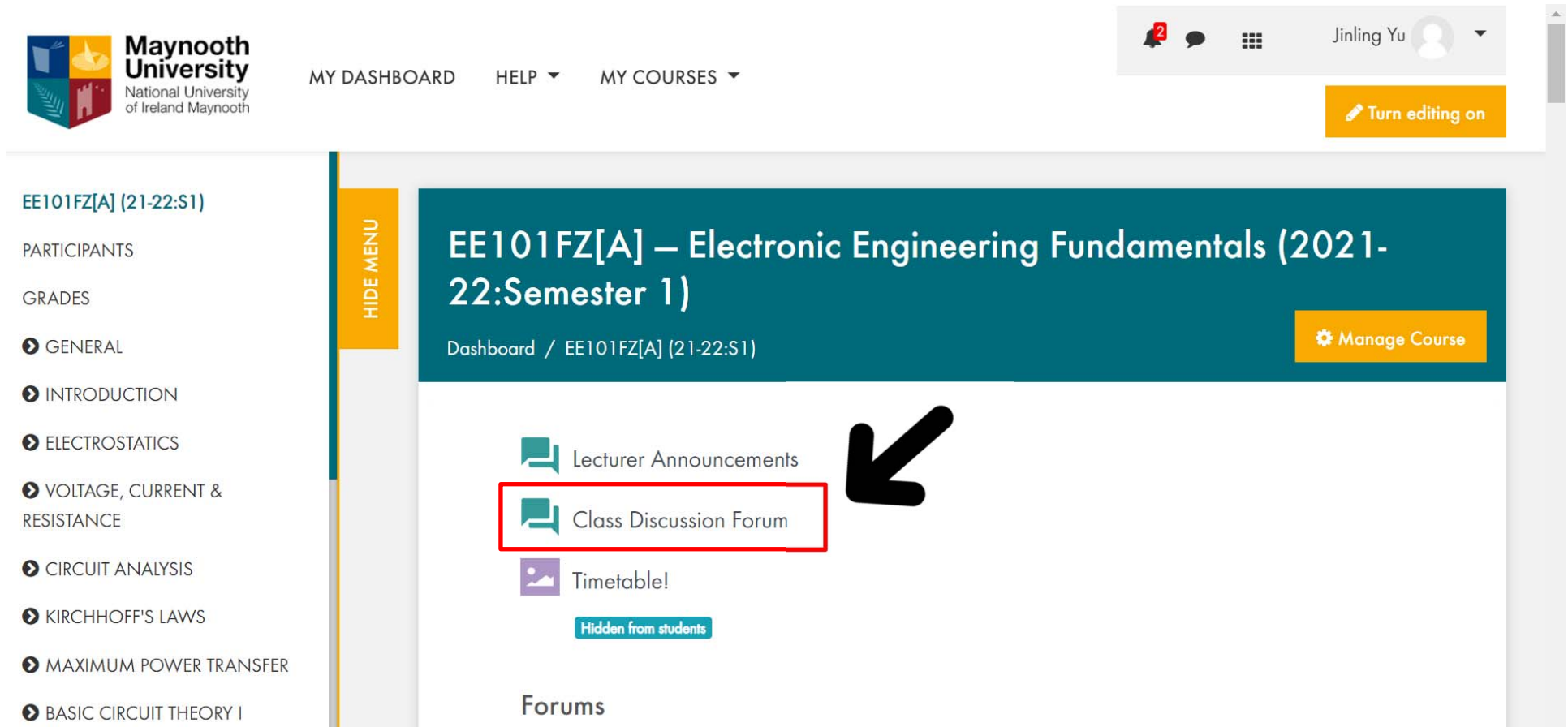
Timetable!

Hidden from students

Forums

# Communicating through Moodle

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



The screenshot displays the Moodle interface for the course **EE101FZ[A] – Electronic Engineering Fundamentals (2021-22:Semester 1)**. The top navigation bar includes the Maynooth University logo, navigation links (MY DASHBOARD, HELP, MY COURSES), a user profile for Jinling Yu, and a 'Turn editing on' button. The left sidebar shows the course menu with options like PARTICIPANTS, GRADES, and a list of topics including GENERAL, INTRODUCTION, ELECTROSTATICS, VOLTAGE, CURRENT & RESISTANCE, CIRCUIT ANALYSIS, KIRCHHOFF'S LAWS, MAXIMUM POWER TRANSFER, and BASIC CIRCUIT THEORY I. The main content area features a header for the course and a 'Manage Course' button. Below this, a list of resources is shown: 'Lecturer Announcements', 'Class Discussion Forum' (highlighted with a red box and a black arrow), and 'Timetable!'. A 'Hidden from students' button is also visible. The 'Forums' section is partially visible at the bottom.

# Communicating through Moodle



MY DASHBOARD

HELP ▾

MY COURSES ▾



Jir

EE101FZ[A] (21-22:S1)

PARTICIPANTS

GRADES

➤ GENERAL

➤ INTRODUCTION

➤ ELECTROSTATICS

➤ VOLTAGE, CURRENT &  
RESISTANCE

➤ CIRCUIT ANALYSIS

➤ KIRCHHOFF'S LAWS

➤ MAXIMUM POWER TRANSFER

➤ BASIC CIRCUIT THEORY I

HIDE MENU

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

INTRODUCTION



Introduction

ELECTROSTATICS




Electrostatics

VOLTAGE, CURRENT & RESISTANCE







Voltage, Current and Resistance

# Communicating through Moodle

**Maynooth University**  
National University of Ireland Maynooth

MY DASHBOARD    HELP ▾    MY COURSES ▾



Jinling Yu 

Turn editing on

E101FZ[A] (21-22:S1)

ARTICIPANTS

GRADES

GENERAL

INTRODUCTION

ELECTROSTATICS

VOLTAGE, CURRENT & RESISTANCE

CIRCUIT ANALYSIS


KIRCHHOFF'S LAWS


MAXIMUM POWER TRANSFER

BASIC CIRCUIT THEORY I

HIDE MENU

### Tutorial

 Communications Tutorial

 Communication Tutorial Solutions

Hidden from students

TUTORIALS

LABS

ASSIGNMENTS

EXAM PREPARATION

# Summary

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