ECEN203 Analogue Circuits and Systems

(Lec 0 Introduction)

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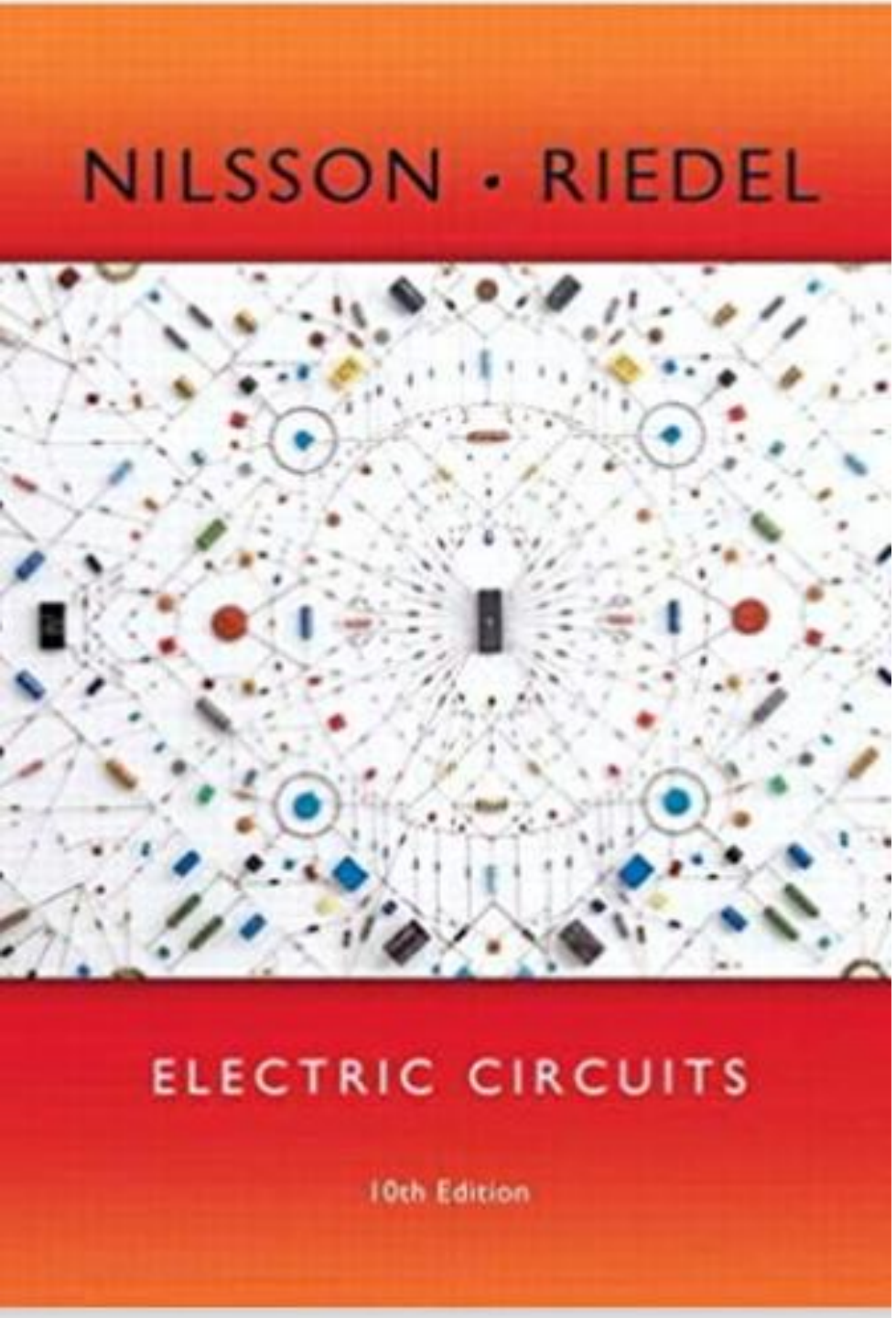
Course Information:

- Course lecture slides, assignments, homeworks and labs materials will be posted on Victoria University of Wellington (VUW) webpage.
- https://ecs.wgtn.ac.nz/Courses/XMUT203_2026T2/WebHome
- You submit your work on that page too, under “Submission”.

Analogue Circuits and Systems Course Overview

- This is a 1 semester undergraduate course, covering the basics of Analogue Circuits and Systems:
  - ☐ Circuit Terminology
  - ☐ Resistive Circuits
  - ☐ Circuit Analysis Techniques
  - ☐ Operational Amplifiers (Op-Amps)
  - ☐ 1st Order Circuits – RC and RL
  - ☐ 2nd Order Circuits – RLC
  - ☐ AC Analysis
  - ☐ Frequency Response and Filters
  - ☐ Laplace Transform

  All LABS will be conducted and assessed by XMUT teacher Huang Junqi



Textbook – any other circuit books are also okay

- Chapter 1 to 9 & Chapter 13 to 15 (most of them).
- Many solved examples in the book – very good!
- End of chapter exercises – do it and I can check your solutions for you.
- Read the book to enhance understanding!
- Help you Practice and Enhance your English too.

- Can read books in Chinese for a start but I strongly encourage you to read this book.

Teaching method

- Weekly Tuesday + odd week Thursday Lectures
- Labs every week,
- Homework at regular intervals
- Tutorials posted for your own exercises,
- Use WeChat group for instant messaging.

Assessment Criteria (subject to confirmation)

- One end-of-semester final exam 30%.
- 1 mid-semester Test at 30%.
- 4 Labs to be done. Note that: Lab 1 (5%) and Lab 3 (5%) will be assessed; total 10%.
- 4 Homework Assignments. 5% each, with a total 20%.
- Participation in classes and labs = 10%

On top of the above, you need to manage on your own:

- Tutorials
- Reading

Teaching Schedule (please check course webpage regularly)

Teaching Schedule

Week	Lectures	Labs	Homework	Due	Tutorials
1	Introduction Terminology	Lab 1 LTSpice 1 + examples			Tut 1
2	Resistive Circuits	Lab 1 LTSpice 1 + examples			Tut 2
3	Analysis Techniques	Lab 1 LTSpice 1 + examples	HW1		
4	Analysis Techniques	Lab 1 LTSpice 1 + examples		Lab 1 LTSpice 1 (5%)	Tut 3
5	Analysis Techniques (Nat. Day break?)	Lab 2 Matlab for Circuit Analysis		HW1 (5%)	
6	Operational Amplifiers	Lab 2 Matlab for Circuit Analysis	HW2		Tut 4
7	RC and RL 1st Order Circuits	Extra: LTSpice for 1st order circuits			Tut 5
8	RC and RL 1st Order Circuits	Extra: LTSpice for 1st order circuits		HW2 (5%); **Test (30%)**	

(Note: schedule for second half of semester will appear closer to the start)

A little bit about Labs

- You will be introduced to LTspice, owned by Analog Devices (+ Matlab too)
- Can be downloaded at https://www.analog.com/en/design-center/design-tools-and-calculators/ltspice-simulator.html#
- It is a limited version but sufficient for our learning purpose.
- 4 Lab materials will be given for you to practise using LTspice. You will need to submit 2 reports (10%)

LTspice

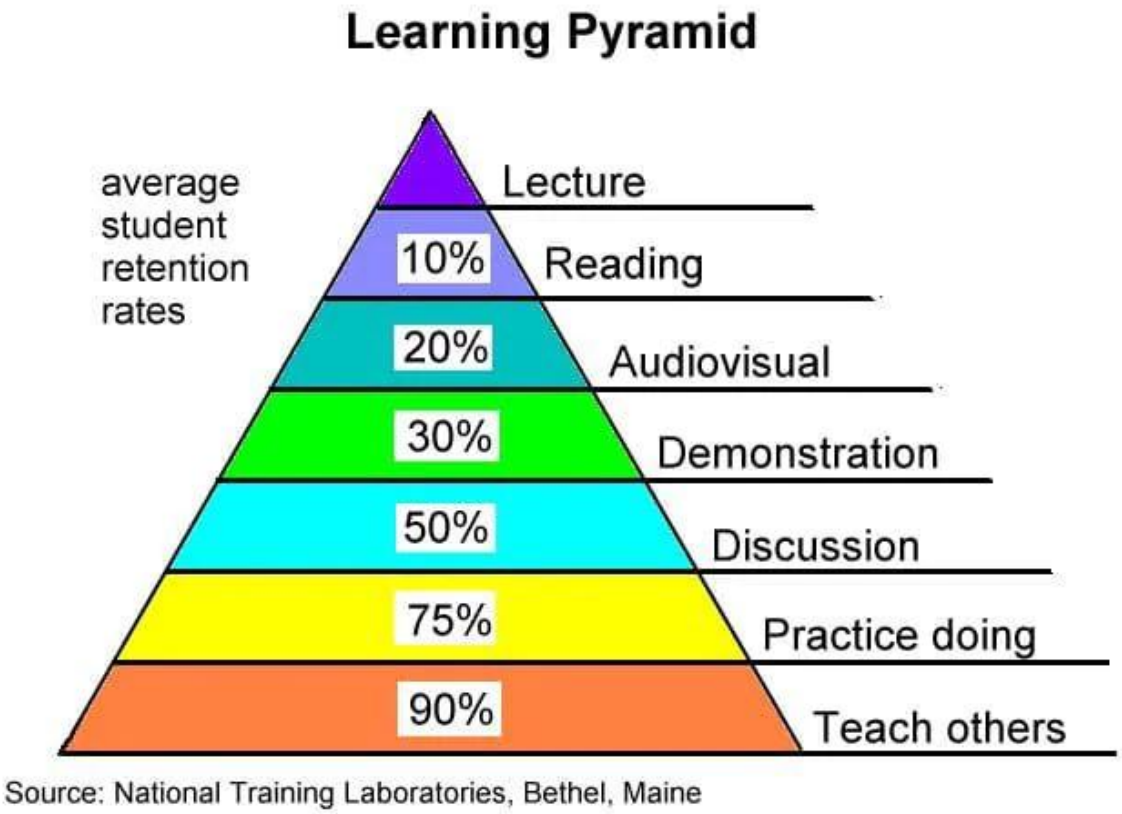
LTspice® is a high performance SPICE simulation software, schematic capture and waveform viewer with enhancements and models for easing the simulation of analog circuits. Included in the download of LTspice are macromodels for a majority of Analog Devices switching regulators, amplifiers, as well as a library of devices for general circuit simulation.

How to study Analogue Circuits and Systems?

Tell me and I forget,

Show me and I remember,

Involve me and I learn.



Expected hours of study

- 2 periods (~1.5 hours) of Lectures per week,
- 2 periods (~1.5 hours) of Labs per week (in XMUT),
- You also need self-directed study; how many hours per week will be required?
- At VUW this is a 15-point course; 1 point ~ 10 hours, so this means a total of 150 total hours for whole course.
- We have 16 weeks, minus one week of National Day holidays, there are 15 weeks, so ~ **10 hours per week**!
- These include class/lab times, doing homeworks, assignments, write lab reports, reading etc

General Information

- Difference between the style of teaching and learning at VUW and XMUT
- Plagiarism – do not copy from your classmates
- Attendance – make sure you have enough attendance to sit final exam.
- Mark scaling between VUW and XMUT
- Resit exam – course marks will be calculated.

Different systems and teaching styles

- “Easy in Difficult out” vs “Difficult in Easy out”,
- Students treated as mature adults, not higher secondary students,
- Training you to be an independent professional with critical thinking and problem solving skills,
- More hands-off => you explore and teach yourself,
- Open ended questions, reports etc,
- Tests and Exams are usually not the repeat of homeworks.

Plagiarism (also known as copying/cheating)

- Meaning to copy others' works and submit as your own. This is NOT OK.
- You can discuss and seek help from classmates, BUT
- DO NOT just COPY => you must work on your own.
- This includes NOT just copy and translate words from webpages/textbooks => you must re-write in your own words.
- This includes diagrams and figures!
- In group lab work, indicate all members' names and IDs.
- Please do not disclose your VUW login passwords.
- Penalty: verbal warning, followed by 0 marks in assessment, then report to School.

Attendance

- By XMUT's rules, you need to have a minimum level of attendance rate in classes. I think it is 70%?
- Otherwise, you will not be allowed to take the final exam => you will fail the course.

Mark scaling

- Different pass marks: 50 marks in VUW and 60 marks in XMUT.
- Does this mean it is easier to pass in VUW?
- NO, due to an inverse relationship => a lower pass mark means assessments are usually more difficult.
- As long as you get 50 marks in VUW's courses, you would have passed!
- When reporting to XMUT, we will apply a piecewise linear scaling so that 50 in VUW becomes 60 in XMUT.

Resit exams

- There is NO resit exams in VUW!
- BUT we have adapted to XMUT's system, by offering resit exams BUT with a major difference: your normal assessments and tests marks will still be included.
- This is different from XMUT where only the resit exam marks will be considered.
- This means, if your normal assessment marks are too low, you will still not pass the resit exam => in some cases even if you get 100% in the resit exam!
- Please take note!

If you need help on the course…

- Okay to ask questions during or after classes.
- You can message me using WeChat.
- Please refrain from posting unrelated stuff/comments in our WeChat Group. Also, if you need help, message me privately instead.
- I encourage you to communicate in English.

A little bit about myself

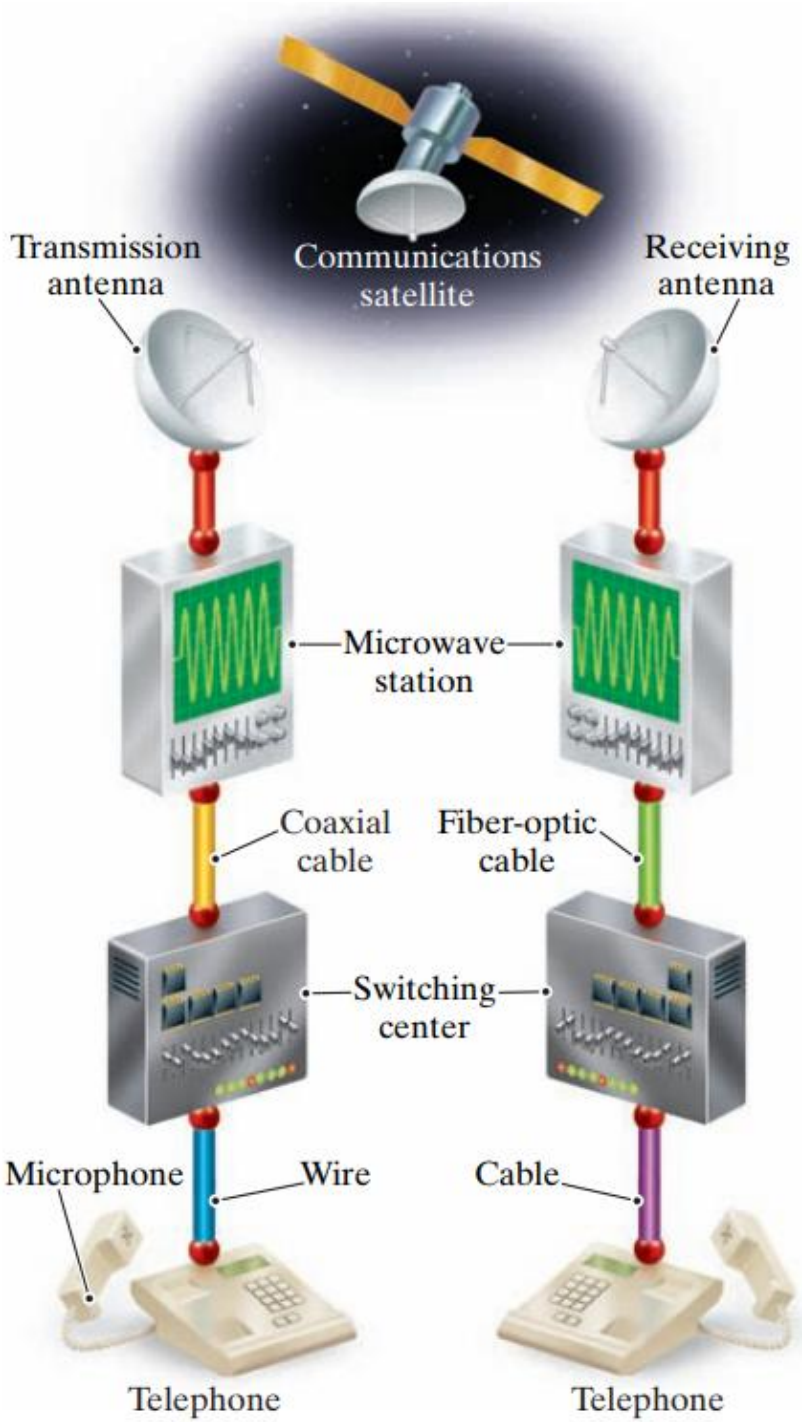
- Myself https://people.wgtn.ac.nz/YauHee.Kho
- Jimmi Rosa
- XMUT co-teacher Huang Junqi
- Our class…

So Why study Circuits and Systems?

- Needed for any electrical systems that produce, transmit and measure electric signals, for example 5 of these systems:

- Communications Systems,
- Computer Systems,
- Control Systems,
- Power Systems,
- Signal Processing Systems, etc

Let’s take a closer look at communication systems:



Example 1 of an Electrical System: Communication Systems

- Electrical systems that generate, transmit and distribute information.
- Example: television, radio, telephone, satellite, radar etc.
- We will be studying XMUT310 Communication Engineering next semester.

In real life, any system can involve all the above 5 systems.

Example 2 of a Combination of all 5 systems: Airplanes, e.g. C919

1. A sophisticated communications system enables the pilot and the air traffic controller to monitor the plane's location, permitting the air traffic controller to design a safe flight path for all of the nearby aircraft and enabling the pilot to keep the plane on its designated path.
2. An onboard computer system is used for managing engine functions, implementing the navigation and flight control systems, and generating video information screens in the cockpit.
3. A complex control system uses cockpit commands to adjust the position and speed of the airplane, producing the appropriate signals to the engines and the control surfaces (such as the wing flaps, ailerons, and rudder) to ensure the plane remains safely airborne and on the desired flight path.
4. The plane must have its own power system to stay aloft and to provide and distribute the electric power needed to keep the cabin lights on, make the coffee, and show the movie.
5. Signal-processing systems reduce the noise in air traffic communications and transform information about the plane's location into the more meaningful form of a video display in the cockpit.

Circuit Theory: the common thing for these different systems

- An electric circuit is a mathematical model that approximates the behavior of an actual electrical system.
- We will learn the models, the mathematical techniques, and the language of circuit theory.
- Circuit theory is a special case of electromagnetic field theory: the study of static and moving electric charges.

Three basic assumptions permit us to use circuit theory

1. Electrical effects happen instantaneously throughout a system (if the system is less than 1/10 th of the wavelength) = so can use lumped-parameter system => voltage, current, resistor, capacitor & inductor.

2. The net charge on every component in the system is always zero.

3. There is no magnetic coupling between the components in a system (but can happens within a component).

Circuit theory here is **not** for high frequency systems. Why?

$$\lambda = c/f$$

e.g. mobile phones use frequency of 10^9 Hz, meaning wavelength is 0.3 m, so it has to be less than 3cm to use lumped-parameter system… not possible!

High frequency systems behave totally different; beyond our scope here.

Problem solving skills!

- As a practicing engineer, you will **not** be asked to solve problems that have already been solved.
- But as a student, you will devote much of your attention to the discussion of problems already solved.
- By reading about and discussing how these problems were solved in the past, and by solving related homework and exam problems on your own, you will begin to develop the skills to successfully attack the unsolved problems you'll face as a practicing engineer.

Techniques of "Problem Solving"

1. Identify what's given and what's to be found – note down important information.
2. Sketch a circuit diagram or other visual model – it simplifies the analysis.
3. Think of several solution methods and decide on a way of choosing among them – some may require less steps.
4. Calculate a solution – put pen to paper.
5. Use your creativity - if you suspect your answer is not right, pause and recheck.
6. Test your solution – does your solution make sense?

These problem-solving steps cannot be used as a recipe to solve every problem in this or any other course. You may need to skip, change the order of, or elaborate on certain steps to solve a particular problem. Use these steps as a guideline to develop a problem-solving style that works for you.

What will you learn in this course?

- To build an understanding of concepts and ideas explicitly in terms of previous learning. Students are constantly challenged by the need to layer new concepts on top of previous concepts they may still be struggling to master.
- To emphasize the relationship between conceptual understanding and problem-solving approaches – analytically and by simulation using LTspice (+Matlab).
- To provide students with a strong foundation of engineering practices – real life component values and examples will be used.