

CG1111: Engineering Principles and Practice I

Admin Lecture



CG1111 Instructors

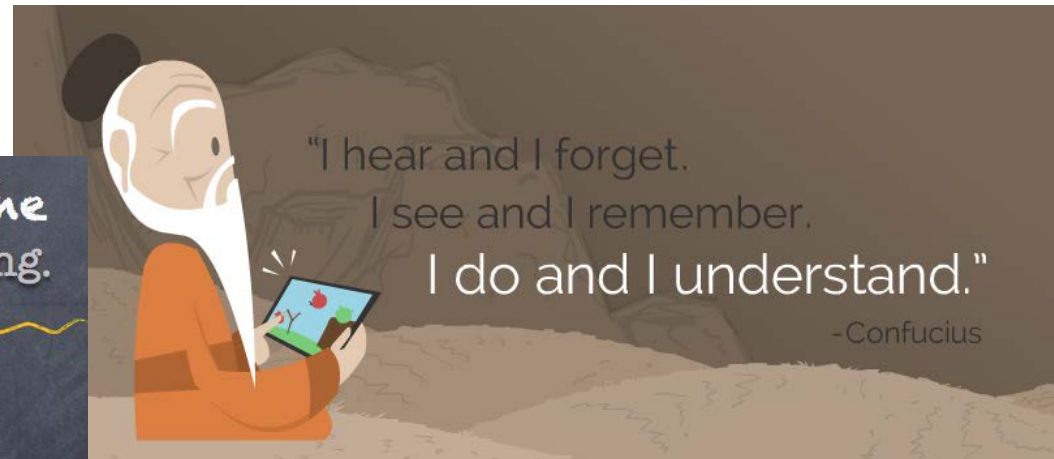
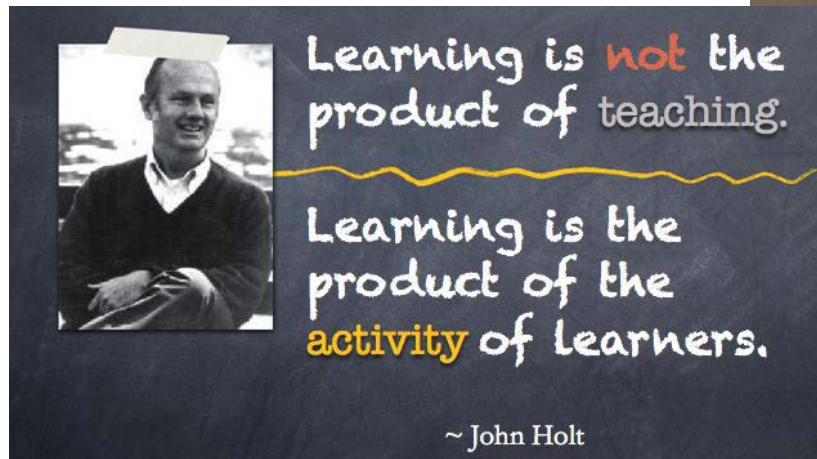
Group	Instructors
1	A/Prof Soh Wee Seng
2	Dr Sangit Sasidhar
3	Dr Henry Tan
4	Dr Ravi S/O Suppiah

+ Student Teaching Assistants (CEG2 seniors)

How Our EPP Modules Are Designed?

EPP's Way of Learning Engineering

Learn engineering through **contextualizing** the **practice of engineering** from its **principles**



Experiential Learning

Inculcate Computer Engineers' Way of Thinking

Durability?

Safety?

Size, weight constraints?

Battery life?

User interfaces?

Power constraint?



Many related design constraints...

System level dependency!

Engineers Work in Teams



We encourage **peer-to-peer** learning!

How's a Typical Week Like?



2 x 3-hr Studio

- Hands-on work
- Group discussions



1 x 2-hr Tutorial

- Student oral presentations
- Reflective learning
- Problem solving



7-hr Self-learning & Preparation

- Reading materials
- Online videos
- Studio handouts
- Tutorial problems

6 MC Module = 15 Workload Hours Every Week!

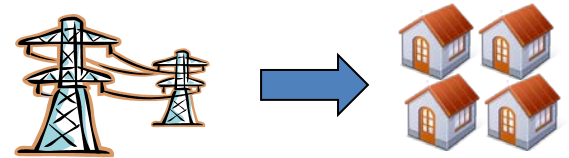
Preview of CG1111 Topics

CG1111 Topics

- Fundamental electrical engineering principles, op-amps, sensors, basic signal processing

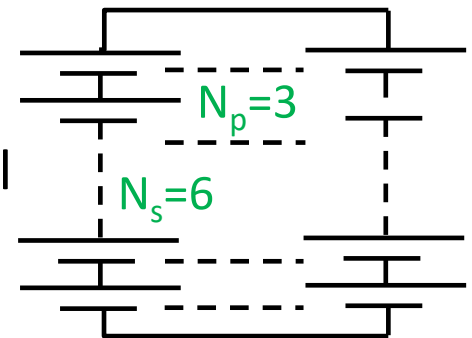
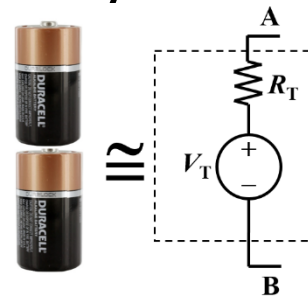
- How systems get energy?

- Energy transmission & efficiency



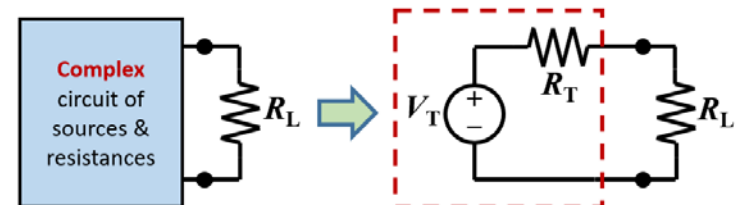
- Batteries

- Battery characteristics
 - Electrical model
 - C-rate, depth-of-discharge
 - Battery pack design: # cells in series/parallel to satisfy a system's requirement
 - Safety



CG1111 Topics

- DC circuit principles
 - Basic electrical quantities (e.g., P , V , I , R)
 - Circuit laws and principles
 - E.g., Ohm's Law, Kirchhoff's Laws, current & voltage division principles
- Circuit analysis
 - Thevenin equivalent circuit
 - Node voltage analysis



Thevenin equivalent circuit

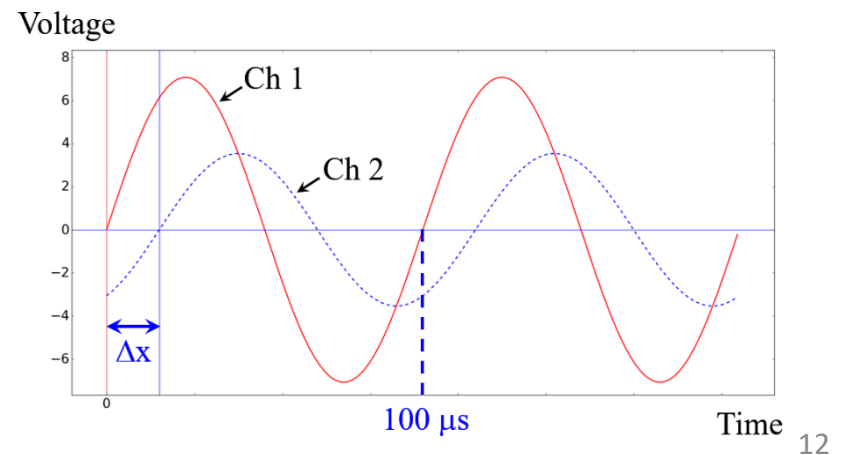
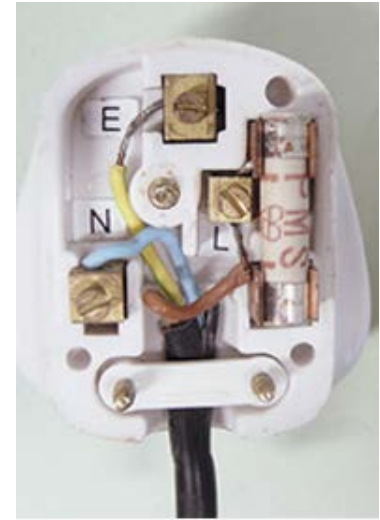
CG1111 Topics

- Energy storage elements: Capacitors & inductors
 - Applications
 - Principles (inductance, capacitance, series/parallel), energy storage capability
 - Transient behavior



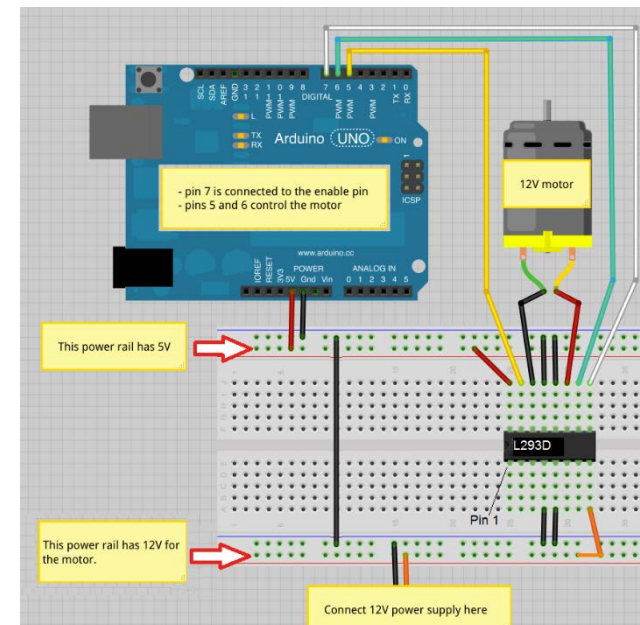
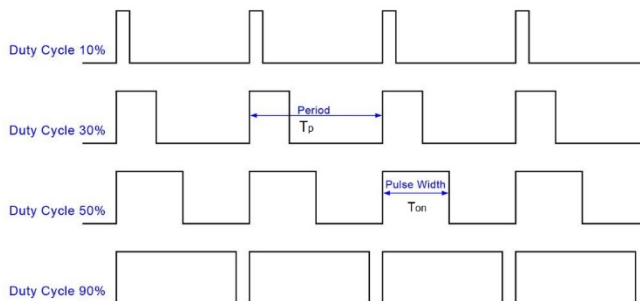
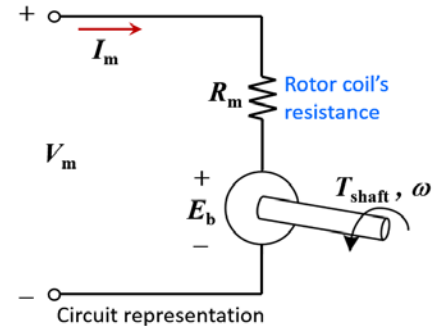
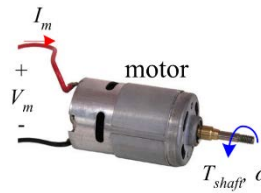
CG1111 Topics

- AC circuits
 - Properties of sinusoidal signal
 - Amplitude, RMS, frequency, angular frequency, phase
 - Circuit analysis
 - Using phasors with circuit laws
 - AC to DC conversion
 - E.g., phone charger



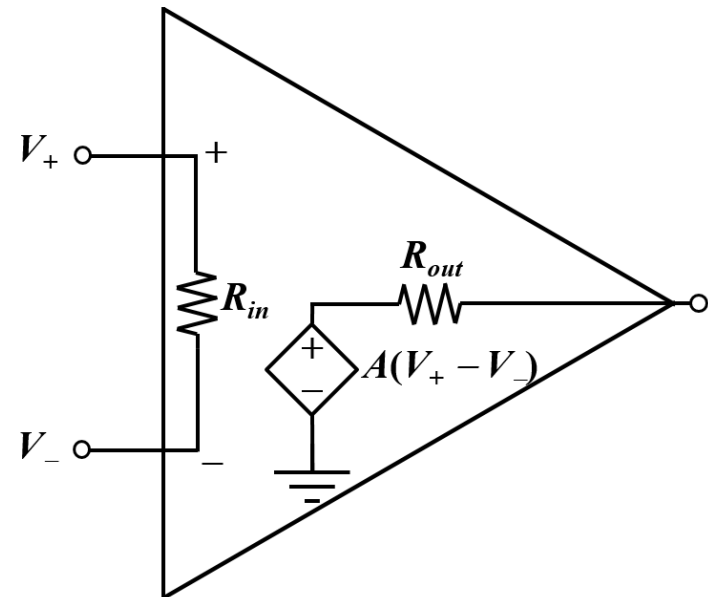
CG1111 Topics

- DC motors
 - Types of motors
 - Circuit representation of PMDC
 - Basic properties
 - Relationship between speed, voltage, current, torque
 - PWM control of motor speed



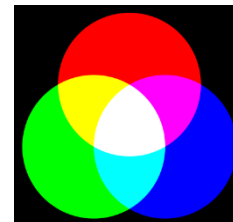
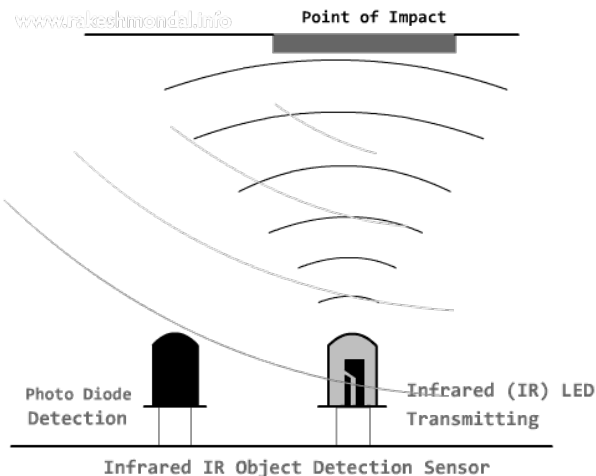
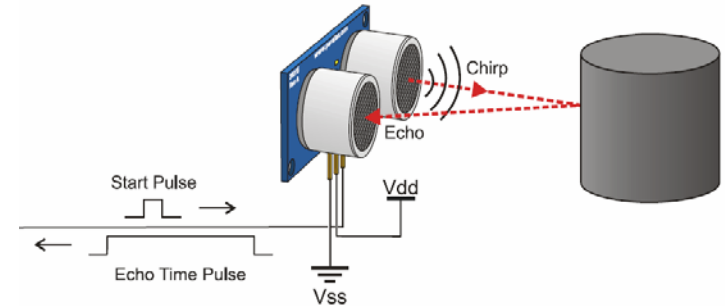
CG1111 Topics

- Operational amplifiers (Op-amps)
 - Applications
 - Amplification
 - Comparator
 - Electrical model
 - Golden rules
 - Circuit analysis



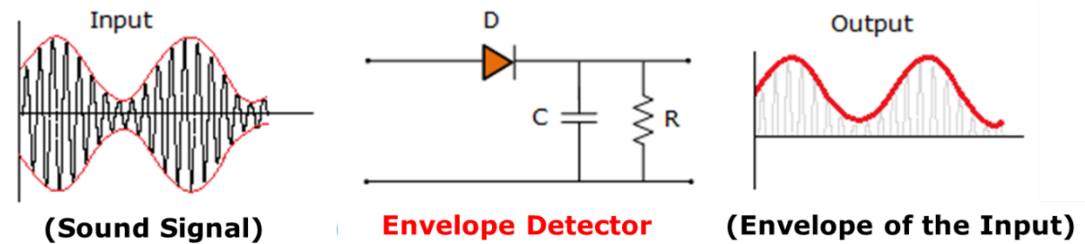
CG1111 Topics

- Sensors
 - Ultrasound, microphone
 - Photoelectric:
 - Infrared proximity sensors
 - Light, colour detection



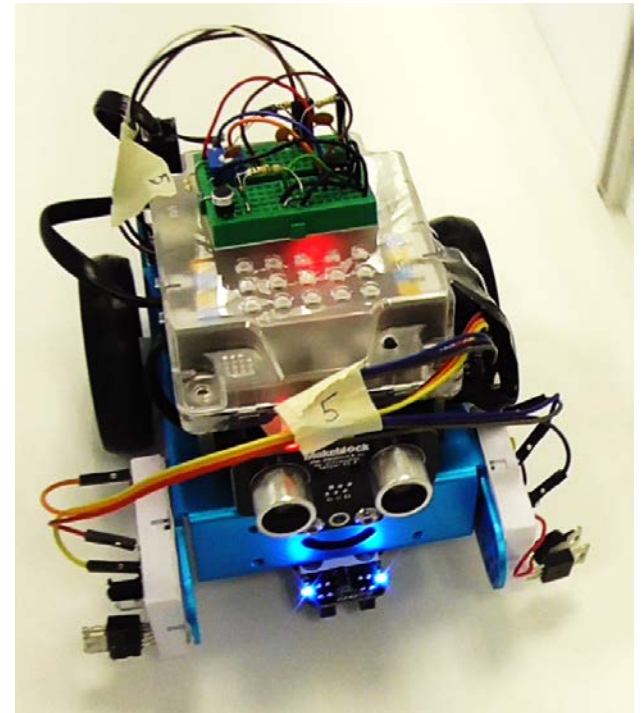
CG1111 Topics

- Signal processing
 - Continuous vs discrete signals
 - Sampling theorem, Nyquist rate & frequency
 - Aliasing (distortion)
 - Envelope detectors
 - Filters



The A-maze-ing Race Project

- To be carried out in the second half of semester
- Platform: mBot
- You will be applying many of the principles learnt in the module in your design
- Build an autonomous robotic vehicle to navigate through a maze by **solving challenges** at intermediate waypoints



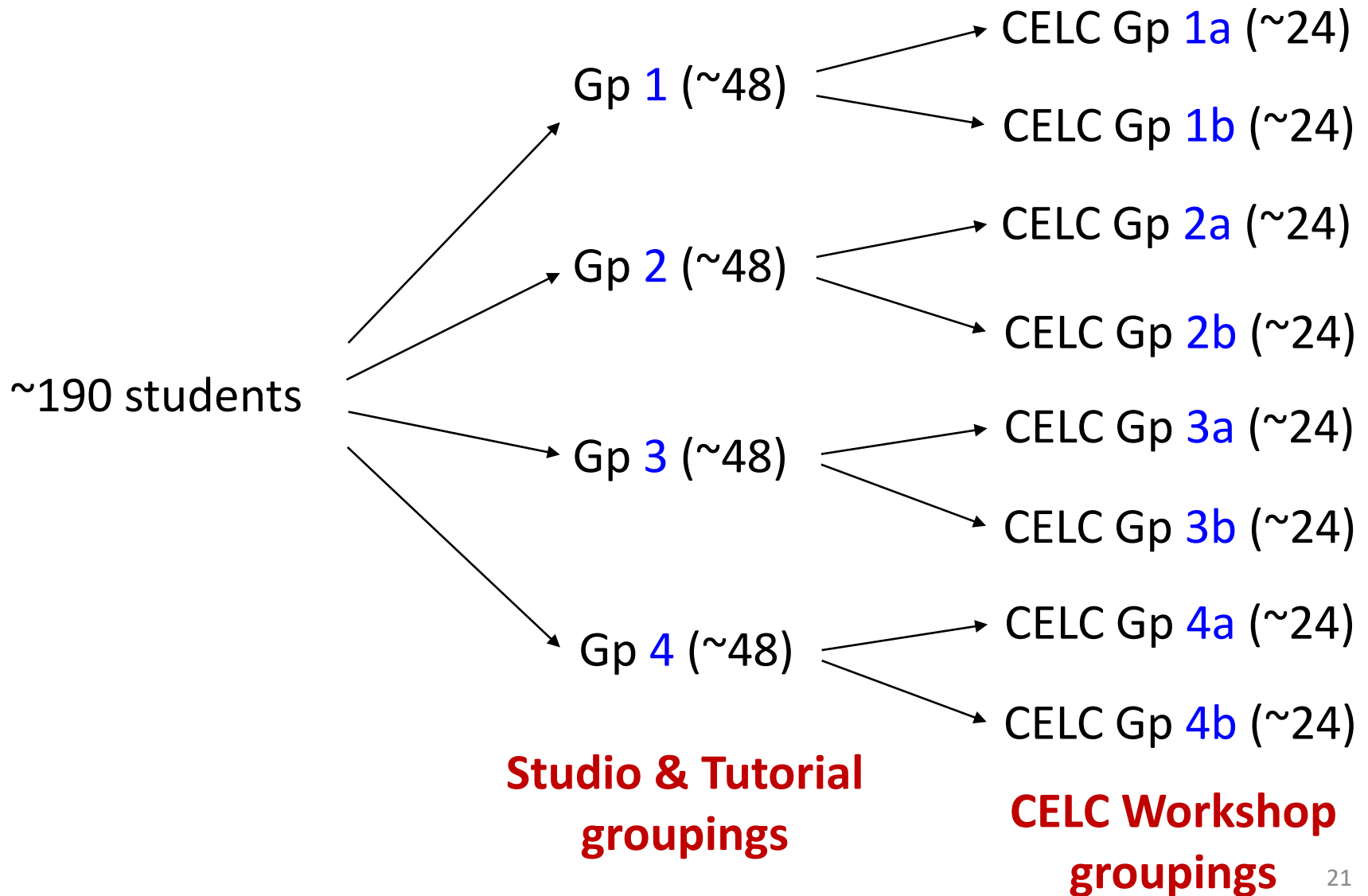
The A-maze-ing Race Project

[Video of previous year's A-maze-ing Race Project](#)

CG1112 Preview

Administrative Details

CG1111 Groupings



Studio & Tutorial Timeslots

Group	Type	Duration (hrs)	Day	Start	Finish
1	Studio 1	3	Monday	9:00	12:00
	Studio 2	3	Wednesday	9:00	12:00
	Tutorial	2	Friday	10:00	12:00
2	Studio 1	3	Monday	14:00	17:00
	Studio 2	3	Wednesday	14:00	17:00
	Tutorial	2	Friday	10:00	12:00
3	Studio 1	3	Tuesday	9:00	12:00
	Studio 2	3	Thursday	9:00	12:00
	Tutorial	2	Friday	14:00	16:00
4	Studio 1	3	Tuesday	14:00	17:00
	Studio 2	3	Thursday	14:00	17:00
	Tutorial	2	Friday	14:00	16:00

Studios: Some F2F, Others via Zoom

- If F2F, the venue is DSA Lab (E4A-04-08)



The Zoom link for each group will be provided on LumiNUS

Tutorials

- Regular tutorials start from Week 3
- All online via Zoom:

Group	Day	Start	Finish	Venue
1	Friday	10:00	12:00	Zoom
2	Friday	10:00	12:00	Zoom
3	Friday	14:00	16:00	Zoom
4	Friday	14:00	16:00	Zoom

The Zoom link for each group will be provided on LumiNUS

Workshops On Communication Skills

- 2 workshops conducted by Centre for English Language and Communication (CELC)

Workshop	Topic	Timeslot
1	Oral presentation skills (Discussion)	Week 1 Tutorial's timeslot (2 hrs) - Zoom Gp 1a/b & 2a/b: 14 Aug (Fri, 10am – 12pm) Gp 3a/b & 4a/b: 14 Aug (Fri, 2pm – 4pm)
2	Oral presentation skills (Practice)	Week 2 Tutorial's timeslot (2 hrs) - Zoom Gp 1a/b & 2a/b: 21 Aug (Fri, 10am – 12pm) Gp 3a/b & 4a/b: 21 Aug (Fri, 2pm – 4pm)

- You can find out your **sub-group** from CEG 1st Year webpage: https://ceg.nus.edu.sg/students/first_year/
- Your CELC tutor for the respective sub-group will inform you about the Zoom link.

Studio = F2F

Studio = Zoom

Weekly Schedule

Wk	Date	Studio 1	Studio 2	Tutorial
1	10 Aug - 14 Aug	No studio (Admin lecture on 11 Aug, 12-2pm)	No studio	CELC Workshop #1 (Zoom)
2	17 Aug - 21 Aug	Collect toolkit box + 1 hr 15 mins studio (1a/3a: 9am-10:15am) (1b/3b: 10:45am-12pm) (2a/4a: 2pm-3:15pm) (2b/4b: 3:45pm-5pm)	How Systems Get Energy, Battery design/sizing	CELC Workshop #2 (Zoom)
3	24 Aug - 28 Aug	DC Circuit Principles I (LED) - Graded	DC Circuit Principles II (Wheatstone Bridge)	Tutorial #1 (Zoom)
4	31 Aug - 04 Sep	DC Circuit Principles III (Thevenin equivalent) - Graded (Sub-group 'a' only)	DC Circuit Principles III (Thevenin equivalent) - Graded (Sub-group 'b' only)	Tutorial #2 (Zoom)
5	07 Sep - 11 Sep	DC Circuit Principles IV (Node voltage analysis)	Energy Storage Elements - Graded	Tutorial #3 (Zoom)
6	14 Sep - 18 Sep	AC Circuits I (Phasors)	No studio	Tutorial #4 (Zoom)
Mid-semester break (21 Sep - 27 Sep)				

Studio = F2F

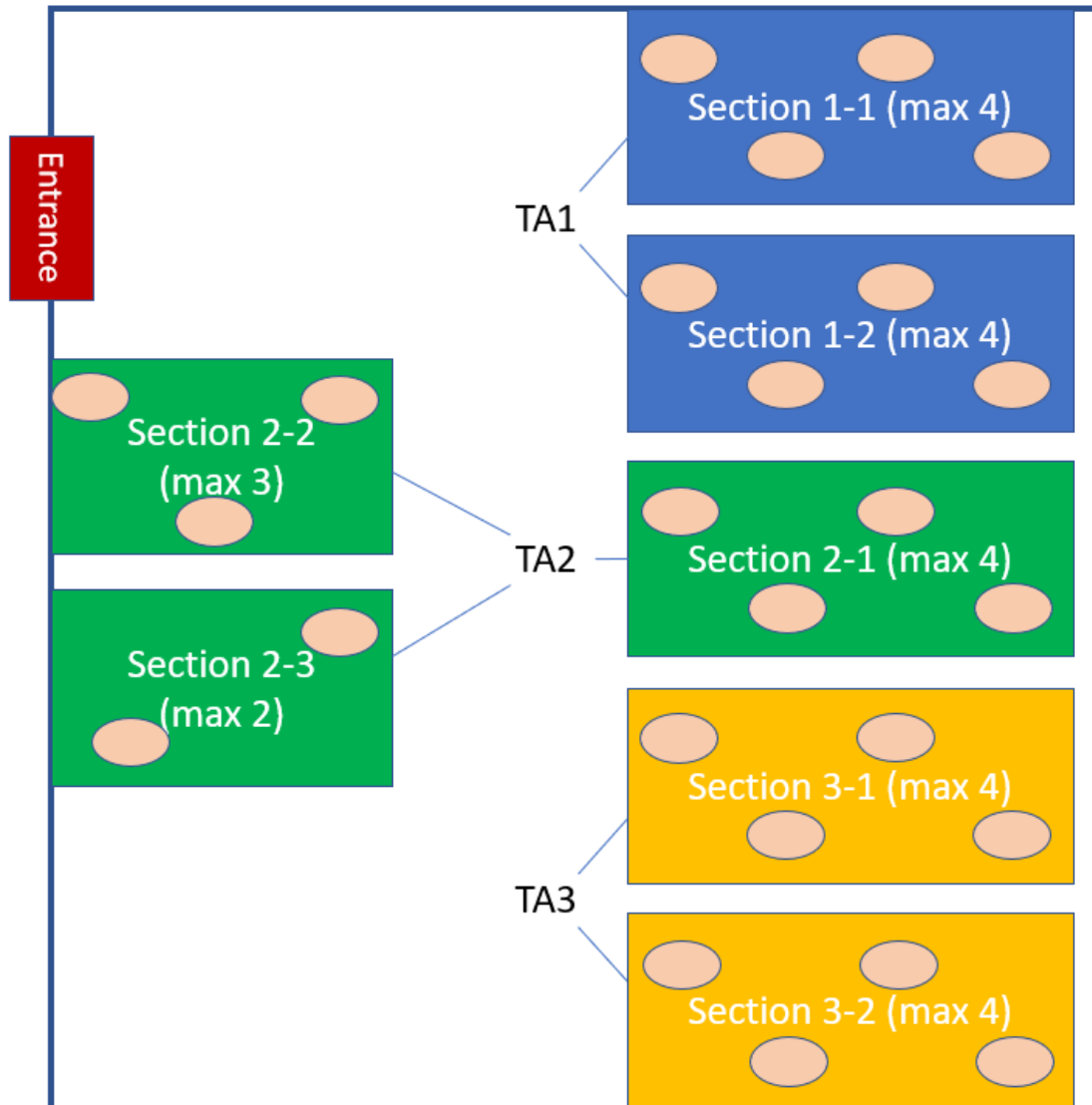
Studio = Zoom

Weekly Schedule

Wk	Date	Studio 1	Studio 2	Tutorial
7	28 Sep - 02 Oct	AC Circuits II (Transformers, Diode Bridge Rectifiers) (Sub-group 'a' only)	AC Circuits II (Transformers, Diode Bridge Rectifiers) (Sub-group 'b' only)	Tutorial #5 (Zoom)
8	05 Oct - 09 Oct	DC Motors (Motor characterization & PWM)	Operational Amplifier I (Basic Opamp Circuits)	Tutorial #6 (Zoom)
9	12 Oct - 16 Oct	Operational Amplifier II (Comparator, Active LPF) - Graded	Sensors I (Ultrasonic sensor, Microphone sensor)	Tutorial #7 (Zoom)
10	19 Oct - 23 Oct	Sensors II (Photoelectric sensors) - Graded (Sub-group 'a' only)	Sensors II (Photoelectric sensors) - Graded (Sub-group 'b' only)	Tutorial #8 (Zoom)
11	26 Oct - 30 Oct	Signal Processing I (Sampling Theorem, Nyquist Rate) - Graded	Signal Processing II (Analyzing Audio Signal, Designing LPF, Envelope Detector)	Tutorial #9 (Zoom)
12	02 Nov - 06 Nov	Project (Studio mode TBD)	Project (Studio mode TBD)	Tutorial #10 (Zoom)
13	09 Nov - 13 Nov	Project Evaluation (Studio mode TBD)	No studio	Tutorial #11 (Zoom)

TBD = To be determined

F2F Studio Seating Plan



All experiments
are **individual**
basis

Online Studios

- You will still be carrying out the **hands-on activities**
- **Live supervision** through **Zoom** by instructor & TAs during studio timeslots
- During F2F studio, you will be **collecting components** needed for **subsequent online studios** until your next F2F studio
- **Important:** **Verify** that you have all the components stated in given **checklist**. **Otherwise, you won't be able to carry out the studios!**

Toolkit Box

- You will be loaning a toolkit box from the lab for the **entire semester**
 - To be collected during your **first F2F studio** on next Mon/Tue
- Consists of:
 - BitScope Micro, digital multimeter, breadboard, wires, wire cutter, USB breakout cable, LEDs, safety goggles, variable resistor trimming tool
- **Verify** items against given **checklist**
- **Bring it** with you for **all F2F studios**

Assessments

- 100% Continual Assessment
- Letter grades will be awarded upon completion

Component	(%)
Quiz #1	15
Quiz #2	15
Project	25
Individual oral presentation	15
Critique on other students' presentations	5
Graded lab reports 6 x 5% graded lab reports (We will choose the best 5 out of 6) (2% will be deducted for absence from each non-graded studio without valid reason)	25
Total	100

Quizzes

MCQ +
Open Book

- Quiz #1:
 - 19 Sep 2020 (Saturday), 0930 hrs to 1130 hrs
 - Topics from Week 1 to 6 will be tested
- Quiz #2:
 - ~~14 Nov 2020~~
(changed to 16 Nov because 14 Nov is Deepavali)
 - 16 Nov 2020 (Monday), 0930 hrs to 1130 hrs
 - Topics from Week 7 to 11 will be tested
- Mark your calendar for the above
- Inform other modules' lecturers if they try to schedule another quiz that clashes with our quiz

Individual Oral Presentations (OP)

- Every student is required to do ONE individual OP (**5-6 mins** talk, 2 min Q&A)
- Teach your peers engineering principles/applications
- Graded by both **CELC** + **CEG** instructors
- During the first 45 mins of each **tutorial**, 5 students are scheduled to present
- Your presentation date will be made known to you this week
 - The presentation **topic** will be released to you about **11 days (on every Monday)** prior to your scheduled presentation date



Critique on Other Students' OPs

- During **each** tutorial, you must submit a critique on **at least one** presenter's OP
- Include a short summary of that OP's content
- More details on the submission procedure will be provided to you soon
- You **do not need** to do **critique** if you are presenting that day

**5% of module
grade!!**



Critique

Graded Lab Reports

- There will be **6** studios for which you need to submit an **individual** lab report for grading
 - To be submitted by the **end of studio**
 - **5% each** - we will choose the **best 5** out of **6**
 - OK to discuss, but **write in your own words**

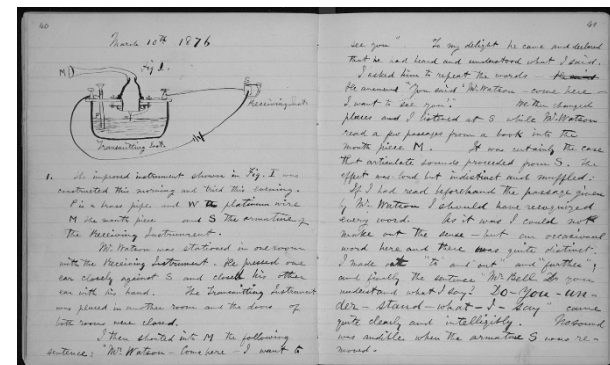
Note:

For those **studios** that **do not have graded reports**, **2% will be deducted** from your CG1111 marks if you are **absent without a valid reason**



Learning Journal

- You need to keep a “learning journal” for collecting your **observations, thoughts, calculations and experimental data** throughout the entire module
- Refer to **guidelines** for learning journal to be provided in LumiNUS
- Your TA will **monitor** your learning journal entries

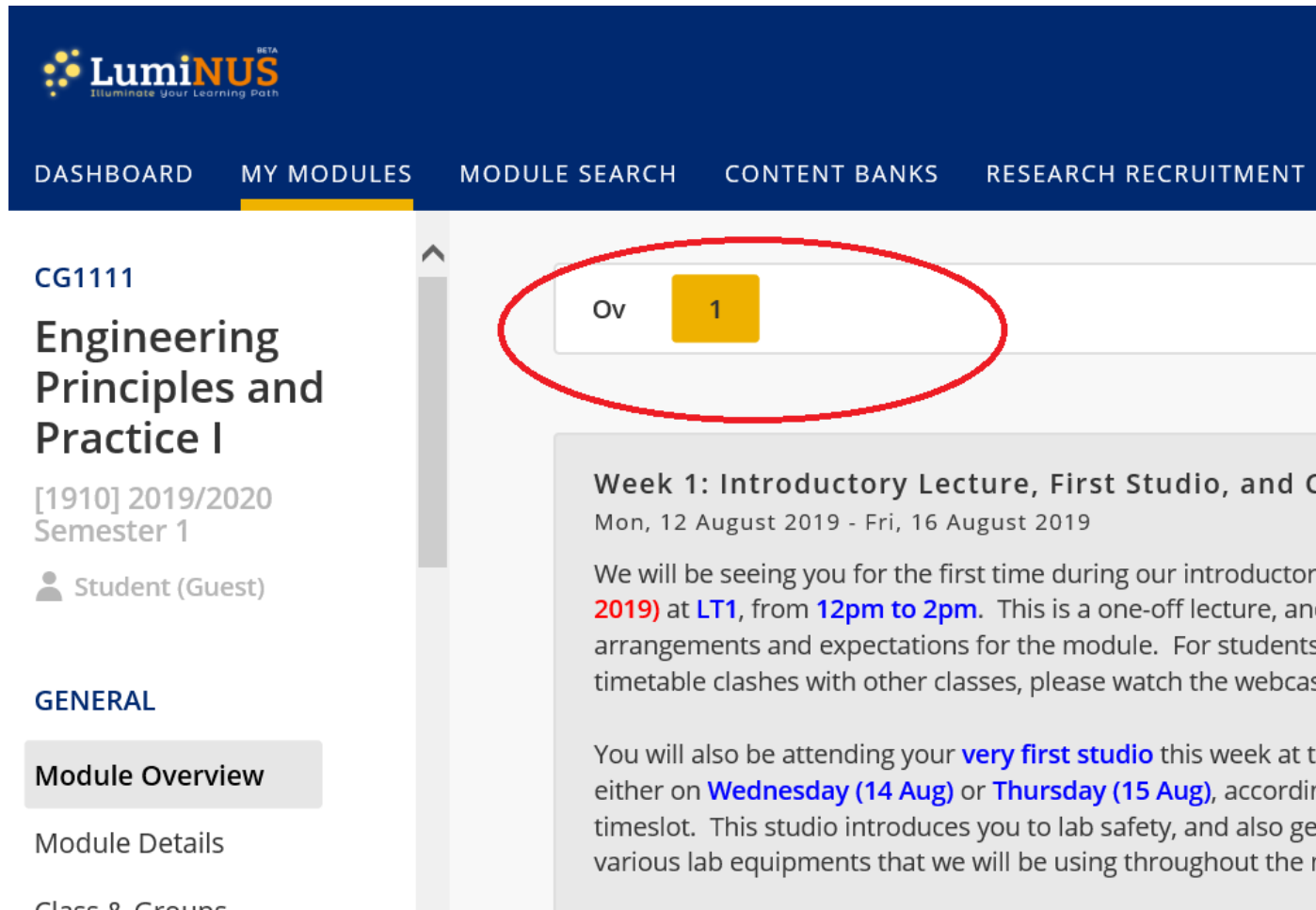


Preparation for Each Week

- Look at the **Learning Flow** for every week
- Studios:
 - Check whether it is **F2F** or **online**
 - Check what you need to prepare (go through **preparatory materials**, **videos**, **studio handout**) **before** attending the studios
- Tutorials:
 - Attempt the tutorial questions **before** attending



LumiNUS – Check Learning Flow



LumiNUS BETA
Illuminate Your Learning Path

DASHBOARD MY MODULES MODULE SEARCH CONTENT BANKS RESEARCH RECRUITMENT

CG1111
Engineering Principles and Practice I
[1910] 2019/2020 Semester 1
Student (Guest)

GENERAL

Module Overview
Module Details
Class & Groups

Ov 1

Week 1: Introductory Lecture, First Studio, and C
Mon, 12 August 2019 - Fri, 16 August 2019

We will be seeing you for the first time during our introductory **2019** at **LT1**, from **12pm to 2pm**. This is a one-off lecture, and arrangements and expectations for the module. For students timetable clashes with other classes, please watch the webcast

You will also be attending your **very first studio** this week at th either on **Wednesday (14 Aug)** or **Thursday (15 Aug)**, accordin timeslot. This studio introduces you to lab safety, and also get various lab equipments that we will be using throughout the n

Note: Don't use LumiNUS app on smartphone to check Learning Flow; it doesn't show full information

What to do next? Urgent!

- Check your **CELC Workshop** schedule for your **sub-groups** in **Week 1** and **2**:
 - [https://ceg.nus.edu.sg/wp-content/uploads/sites/3/2020/08/2010_CG1111timetable_4Aug20.pdf](https://ceg.nus.edu.sg/wp-content/uploads/sites/3/2020/08/2010_CG1111 timetable_4Aug20.pdf)
- Look out for the Zoom link from your CELC tutor for the respective sub-group
- Prior to attending CELC Workshop #1
 - **Some preparation** is required
 - Refer to materials uploaded by CELC on LumiNUS

What to do next? Urgent!

- **Studio** lessons starting next **Monday/Tuesday**
 - First studio is a **Face-to-face studio**
 - Go through the **safety videos** provided (look under our Learning Flow for Week 1 & 2)
 - Complete an **online safety quiz**:
 - <https://online.ece.nus.edu.sg/safety/quiz/v4/>
 - You need to pass it, **save the certificate as PDF**, and **upload** it to our **LumiNUS** submission folder
 - You are **not allowed to proceed with the studio** without the certificate
 - Always wear **covered shoes** and **mask** to the lab