MONASH University

Unit Guide

ECE4122
Advanced electromagnetics

Semester 2, 2017

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Unit handbook information

Synopsis

The unit evaluates the propagation of time-harmonic electromagnetic waves in wireless and guided media using Maxwell's equations. The media covered include vacuum/air, radio frequency (RF) and microwave transmission lines, metallic waveguides, planar optical waveguides and optical fibres.
The unit also explores different types of antennas that can be used to generate the electromagnetic waves. In addition to these, the unit covers concepts related to electromagnetic interference (EMI) and electromagnetic compatibility (EMC). Using these concepts, the unit explores practical problems such as interference and coupling in RF/microwave circuits and discusses solutions such as grounding, shielding and filtering. In each section of this unit, the learned theory is related to real-world applications to expand the understanding of students.

Mode of delivery

Clayton (Day)
Malaysia (Day)

Workload requirements

3 hours lectures, 3 hours laboratories/tutorials and 6 hours of private study per week.

Unit relationships

Prerequisites

ECE3121 or ECE2021

Prohibitions

ECE3022

Co-requisites

None

Chief Examiner(s)

Professor Manos Varvarigos

Unit Coordinator(s)

Name: Assoc Professor Nemai Karmakar
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Clayton/Malaysia staff contact details

Clayton campus	
Campus Coordinator	Name: Assoc Professor Nemai Karmakar Email: Nemai.Karmakar@monash.edu Building: 14 Alliance Lane, Building 72, Room: 230 Consultation hours: Appointment via e-mail or 1-2pm, Wednesdays (Clayton Campus)
Lecturer(s)	Name: Assoc Professor Nemai Karmakar Email: Nemai.Karmakar@monash.edu Building: 14 Alliance Lane, Building 72, Room: 230 Consultation hours: Appointment via email or 1-2 pm, Wednesdays (Clayton Campus)

Malaysia campus	
Campus Coordinator	Name: Assoc Professor Rajendran Parthiban Email: Rajendran.Parthiban@monash.edu Building: , Room: Consultation hours: Appointment via e-mail
Lecturer(s)	Name: Assoc Professor Rajendran Parthiban Email: Rajendran.Parthiban@monash.edu Building: , Room:

Demonstrator(s)

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Section A: For Clayton students

Academic Overview

Engineers Australia Stage 1 competencies

The Engineers Australia Policy on Accreditation of Professional Engineering Programs requires that all programs ensure that their engineering graduates develop to a substantial degree the stage 1 competencies. Listed below are the activities in this unit that will help you to achieve these competencies.

Note: that not all stage 1 competencies are relevant to each unit.

Element of competency	Indicators of attainment	Learning outcomes
1 Knowledge and skill base		
1.1 Engages with the engineering discipline at a phenomenological level, applying sciences and engineering fundamentals to systematic investigation, interpretation, analysis and innovative solution of complex problems and broader aspects of engineering practice.	**a)** Engages with the engineering discipline at a phenomenological level, applying sciences and engineering fundamentals to systematic investigation, interpretation, analysis and innovative solution of complex problems and broader aspects of engineering practice.	1,2,3,5
1.2 Develops and fluently applies relevant investigation analysis, interpretation, assessment, characterisation, prediction, evaluation, modelling, decision making, measurement, evaluation, knowledge management and communication tools and techniques pertinent to the engineering discipline.	**a)** Develops and fluently applies relevant investigation analysis, interpretation, assessment, characterisation, prediction, evaluation, modelling, decision making, measurement, evaluation, knowledge management and communication tools and techniques pertinent to the engineering discipline.	2,5
1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline.	**a)** Proficiently applies advanced technical knowledge and skills in at least one specialist practice domain of the engineering discipline.	1,3,5
1.4 Discernment of knowledge development and research directions within the engineering discipline.	**a)** Identifies and critically appraises current developments, advanced technologies,emerging issues and interdisciplinary linkages in at least one specialist practice domain of the engineering discipline.	1,2

	b) Interprets and applies selected research literature to inform engineering application in at least one specialist domain of the engineering discipline.	1,2,3
1.5 Identifies and applies systematic principles of engineering design relevant to the engineering discipline.	**a)** Identifies and applies systematic principles of engineering design relevant to the engineering discipline.	1
	b) Identifies and understands the interactions between engineering systems and people in the social, cultural, environmental, commercial, legal and political contexts in which they operate, including both the positive role of engineering in sustainable development and the potentially adverse impacts of engineering activity in the engineering discipline.	2,3
	c) Appreciates the issues associated with international engineering practice and global operating contexts.	4
	d) Is aware of the founding principles of human factors relevant to the engineering discipline.	4
	e) Is aware of the fundamentals of business and enterprise management.	5
	f) Identifies the structure, roles and capabilities of the engineering workforce.	5
1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline.	**a)** Appreciates the basis and relevance of standards and codes of practice, as well as legislative and statutory requirements applicable to the engineering discipline.	3
	c) Appreciates the social, environmental and economic principles of sustainable engineering practice.	3
	d) Understands the fundamental principles of engineering project management as a basis for planning, organising and managing resources.	4
2. Engineering application ability		
2.1 Application of established engineering methods to complex engineering problem solving.	**a)** Identifies, discerns and characterises salient issues, determines and analyses causes and effects, justifies and applies appropriate simplifying assumptions, predicts performance and behaviour, synthesises solution strategies and develops substantiated conclusions.	1

	b) Ensures that all aspects of an engineering activity are soundly based on fundamental principles - by diagnosing, and taking appropriate action with data, calculations, results, proposals, processes, practices, and documented information that may be ill-founded, illogical, erroneous, unreliable or unrealistic.	1
	c) Competently addresses engineering problems involving uncertainty, ambiguity, imprecise information and wide-ranging and sometimes conflicting technical and non-technical factors.	1
	g) Critically reviews and applies relevant standards and codes of practice underpinning the engineering discipline and nominated specialisations.	2
	h) Identifies, quantifies, mitigates and manages technical, health, environmental, safety and other contextual risks associated with engineering application in the designated engineering discipline.	2
	i) Interprets and ensures compliance with relevant legislative and statutory requirements applicable to the engineering discipline.	3
2.2 Fluent application of engineering techniques, tools and resources.	**c)** Determines properties, performance, safe working limits, failure modes, and other inherent parameters of materials, components and systems relevant to the engineering discipline.	3
	d) Applies a wide range of engineering tools for analysis, simulation, visualisation, synthesis and design, including assessing the accuracy and limitations of such tools, and validation of their results.	1,3
	e) Applies formal systems engineering methods to address the planning and execution of complex, problem solving and engineering projects.	1
	f) Designs and conducts experiments, analyses and interprets result data and formulates reliable conclusions.	3
2.3 Application of systematic engineering synthesis and design processes.	**d)** Is aware of the accountabilities of the professional engineer in relation to the 'design authority' role.	5

2.4 Application of systematic approaches to the conduct and management of engineering projects.	**c)** Accommodates relevant contextual issues into all phases of engineering project work, including the fundamentals of business planning and financial management	3
	e) Is aware of the need to plan and quantify performance over the full life-cycle of a project, managing engineering performance within the overall implementation context.	5
	f) Demonstrates commitment to sustainable engineering practices and the achievement of sustainable outcomes in all facets of engineering project work.	5
3. Professional and personal attributes		
3.2 Effective oral and written communication in professional and lay domains.	**a)** Is proficient in listening, speaking, reading and writing English	5
	b) Prepares high quality engineering documents such as progress and project reports, reports of investigations and feasibility studies, proposals, specifications, design records, drawings, technical descriptions and presentations pertinent to the engineering discipline.	5
3.3 Creative, innovative and pro-active demeanour.	**a)** Applies creative approaches to identify and develop alternative concepts, solutions and procedures, appropriately challenges engineering practices from technical and non-technical viewpoints; identifies new technological opportunities.	3
	b) Seeks out new developments in the engineering discipline and specialisations and applies fundamental knowledge and systematic processes to evaluate and report potential.	3
	c) Is aware of broader fields of science, engineering, technology and commerce from which new ideas and interfaces may be drawn and readily engages with professionals from these fields to exchange ideas.	3
3.4 Professional use and management of information.	**b)** Critically assesses the accuracy, reliability and authenticity of information.	3,5
	c) Is aware of common document identification, tracking and control procedures.	5

3.5 Orderly management of self, and professional conduct.	**a)** Demonstrates commitment to critical self-review and performance evaluation against appropriatecriteria as a primary means of tracking personal development needs and achievements.	5
	b) Understands the importance of being a member of a professional and intellectual community,learning from its knowledge and standards, and contributing to their maintenance and advancement.	5
	c) Demonstrates commitment to life-long learning and professional development.	5
	d) Manages time and processes effectively, prioritises competing demands to achieve personal,career and organisational goals and objectives.	5
	e) Thinks critically and applies an appropriate balance of logic and intellectual criteria to analysis,judgement and decision making.	5
	f) Presents a professional image in all circumstances, including relations with clients, stakeholders, as well as with professional and technical colleagues across wide ranging disciplines.	5
3.6 Effective team membership and team leadership.	**a)** Understands the fundamentals of team dynamics and leadership.	5
	b) Functions as an effective member or leader of diverse engineering teams, including those with multi-level, multi-disciplinary and multi-cultural dimensions.	5
	c) Earns the trust and confidence of colleagues through competent and timely completion of tasks.	5
	d) Recognises the value of alternative and diverse viewpoints, scholarly advice and the importance of professional networking.	5
	e) Confidently pursues and discerns expert assistance and professional advice.	5
	f) Takes initiative and fulfils the leadership role whilst respecting the agreed roles of others.	5

Teaching and learning method

The unit consists of lectures, laboratory classes and tutorial/problem solving classes.
Detailed recorded lecturers will be available for students. Students need to check these before coming to the actual lectures. The lecture sessions will predominantly consist of revisions and exercises. This approach is known as flipped learning. Tutorials are conducted based on problem-based learning approach. Laboratories and design project are also part of this unit.

Prescribed textbook for this unit is the following:

Stuart M Wentworth, Applied Electromagnetics: Early Transmission Lines Approach, John Wiley and Sons Inc, 2007

The following recommended texts could also be used:

David K. Cheng, *Fundamentals of Engineering Electromagnetics*, Addison Wesley, 1993

Guru and Hiziroglu, *Electromagnetic Field Theory Fundamentals*, Cambridge Uni. Press, 2nd Ed.

William H. Haytand John A. Buck, *Engineering Electromagnetics*, McGraw Hill, 6th Ed., 2001.

M. N. O. Sadiku, *Elements of Electromagnetics*, Oxford University Press, 3rd Ed., 2001

B. M. Notaros, *Electromagnetics*, Prentice Hall, 2011

Students can also find information on inclusive teaching practices for students with learning disabilities or mental health conditions at: www.monash.edu.au/lls/inclusivity/

Learning outcomes

On successful completion of this unit, students will be able to:

1. Apply knowledge of mathematics, physics and engineering fundamentals to solving complex problems involving plane wave propagation in various media, antennas and electromagnetic compatibility.
2. Interpret solutions to complex electromagnetic problems using mathematics, physics and Maxwell's equations.
3. Apply appropriate techniques to solve transmission line, antenna and optical fibre related practical problems.
4. Select and use appropriate software and hardware tools to complete transmission line, antenna and optical fibre related laboratory tasks.
5. Communicate technical contents related to electromagnetic theory effectively individually and in a group.

Your feedback to us

One of the formal ways students have to provide feedback on teaching and their learning experience is through the Student Evaluation of Teaching and Units (SETU) survey. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied with and areas for improvement.

Previous student evaluations of this unit

In response to previous SETU results of this unit, the following changes have been made:

Previous student evaluations of this unit

In response to the last SETU of this unit, the following changes have been made:

- ***Flipped Learning:*** Recorded lectures are available for students to watch before lectures. Students are advised to watch these and attempt relevant quizzes before attending lectures.
- ***Interactive Classes:*** Lectures will be delivered through interactive mode. Students will be asked questions and could also be asked to solve problems during lectures.
- ***Problem-based Practice Classes:*** Students will be asked to solve problems in each practical session. These sessions are used for assessment.
- ***Laboratory Classes/Design Project:*** Due to differences in facilities, the laboratory classes are different in Calyton and Malaysia. For this reason, the assessments based on these are also different. In Clayton, the following changes have been made:
    - Sufficient time will be given to complete the design project. Please note the design projects use concepts learned in laboratories.
    - The order of lecture topics have been changed to enable students to do design project better.
- ***Assessments:*** Students felt the marks allocated to continuous assessments are low. For this reason, the more marks have been given to continuous assessments in this offering.

Student feedback has highlighted the following strength(s) in this unit:

Student feedback has highlighted the following strength(s) in this unit:

- ***Laboratory Sessions:*** The Lab& practical sessions are very good and complementary to the theory covered in lectures.
- ***Software Tool:*** CST/ADS software is a very useful tool to design electromagnetic components and see the wave propagation behaviour in an understandable way.
- ***Design Project:*** Design project relates well to the theory learned and to the real world requirements. Also testing the designed antenna is really interesting.

If you wish to view how previous students rated this unit, please go to https://www.monash.edu/ups/setu/setu-results

If you wish to view how previous students rated this unit, please go to:
https://unitevaluations.connect.monash.edu.au/unitevaluations/index.jsp

Unit schedule - Clayton campus

Unit schedule - Clayton campus

Week	Lecture	Prac	Lab/Design Project (DP)	Assignment activity
1 24 July	Introduction to subject - Revision of Maxwell's equations in integral and differential forms **Text book:** Ch 1, 3, 4 & 5 (Prescribed text)	No practical class in week 1	**Lab-1** **Introduction to laboratory and laboratory safety. Introduction to CST Microwave Studio** CST MWS Lab Manual (Incl. a simple design example)	No formal assessment is undertaken in week 1 However, students are encouraged to perform two warm up activities: 1. Collect information of famous scientists in EM in 19-21st centuries 2. Collect information about contemporary technologies that apply EM theory
2 31 July	Derivation of the vector three-dimensional wave equation from Maxwell's equations. Solution of the wave equation for plane waves. Introduction of the concept of wave Impedance. **Text book:** Ch 6 (Introduction, Sections 6.1- 6.6)	Tutorial 1	**Lab-2** **Introduction to Keysight ADS** ADS Lab Manual (Incl. a simple design example)	**Pre lecture Quiz on moodle** **Prelab+In lab assessment** **Tutorial Assessment 1 open in moodle**
3 7 Aug	Wave propagation at interfaces between different media, normal and oblique incidences. **Text book:** Ch 6 (Sections 6.7 – 6.8)	Tutorial 2	**Lab-3** **Plane Waves Laboratory** **CST MWS Lab Manual on Plane Waves** (*Incl. demonstration of Maxwell's Equations videos *Showing the effect of material type,	**Pre lecture Quiz on moodle** **Prelab+In lab assessment** **Tutorial Assessment 1 submission on moodle**

			frequency, angle of incidence and polarization) **DP-1: Introduction to Design Project**	
4 14 Aug	Lumped versus distributed circuits, Voltage and current waveforms on transmission lines, Parameters describing transmission line **Text book:** Ch 2 (Introduction, Sections 2.1 - 2.5)	Tutorial 3	**Lab-4** **Transmission Line I Laboratory** **CST MWS & Keysight ADS Lab Manual on T-lines** (Incl. VSWR, Terminations, S-parameters and Power Distribution) **DP-2: Projects Allocations**	**Pre lecture Quiz on moodle** **Prelab+In lab assessment** **Tutorial Assessment 2 open in moodle**
5 21 Aug	Smith Chart and Impedance Matching **Text book:** Ch 2 (Sections 2.6, 2.7 and 2.8)	Tutorial 4	**Lab-5** **Transmission Lines II Laboratory** **CST MWS & Keysight ADS Lab Manual on T-lines** (Incl. VSWR, Terminations, S-parameters and Power Distribution)	**Pre lecture Quiz on moodle** **Prelab+In lab assessment** **Tutorial Assessment 2 submission on moodle**
6 28 Aug	Radiation and Antennas; Antenna types and basic parameters: gain, impedance and radiation patterns **Text book:** Ch 8 (Introduction and Sections 8.1 & 8.8)	Tutorial 5	**Lab-6** **Antennas** **CST manual on antennas** (Incl: Dipole, Monopole and Microstrip Patch Antenna)	**Pre lecture Quiz on Moodle** **Prelab+In lab assessment** **Tutorial Assessment 3 open in moodle**
7 4 Sep	Antenna Theory: Dipole and Loop Antennas **Text book:** Ch 8 (Introduction and Sections 8.2 & 8.3)	Tutorial 6	**Lab-7** **Antennas** **CST manual on antennas** (Incl: Dipole, Monopole and Microstrip Patch Antenna) **DP-3: Start of the Design Projects**	**Pre lecture Quiz on moodle** **Prelab+In lab assessment**
8 11 Sep	Antenna Arrays **Text book:** Ch 8 (Introduction and Sections 8.4, 8.5)	Tutorial 7	**Lab-8** **Antennas** **CST and ADS + Hands-on** **DP cont..**	**Pre lecture Quiz on moodle** **Prelab+In lab assessment** **Tutorial Assessment 3 submission on moodle**
9 18 Sep	Bounded wave propagation: propagation in rectangular waveguides;	Tutorial 8	**Lab-9** **Smith Chart and Impedance Matching** **Generating Smith Chart** using MATLAB;	**Pre lecture Quiz on moodle** **Prelab+In lab assessment**

	Waveguide modes, propagation velocity and mode impedance **Text book:** Ch 7 (Introduction and Sections 7.1 and 7.2)		Design of Matching Section in ADS and CST **DP-4: Design Project File Submission for Fabrication**	**Deadline of Design Projects File Submission for Fabrication** **Tutorial** **Assessment 4 open in moodle**
10 2 Oct	Dielectric Waveguides, Planar optical waveguides and optical fibres **Text book:** Ch 7 (Introduction and Sections 7.3 and 7.4)	Tutorial 9	**Industry Visit** (Optional) - 6th of October 2017	**Pre lecture Quiz on moodle** **Tutorial** **Assessment 4 submission on moodle**
11 9 Oct	Optical fibres: structures, wave equations, propagation equation, transverse guided modes, eigenvalue, Attenuation and dispersion properties of optical fibres, communications systems. **Text book:** Ch 8 (8.5 and 8.8)	Tutorial 10	**Lab-10 Waveguides** **CST Lab Manual** (Incl. Rectangular waveguides, Modes of propagation, Dielectric waveguides)	**Pre lecture Quiz on moodle** **Prelab+In lab assessment** **Tutorial** **Assessment 5 open in moodle**
12 16 Oct	Electromagnetic Interferences: Sources; passive circuit elements; grounding; shielding and filtering **Text book:** Ch 9 (9.1-9.4, 9.6)	Tutorial 11	**Lab - 11 Fiber Optics** **DP-5 : Project assembly and evaluation**	**Pre lecture Quiz on moodle** **Demonstration and Assessments of Projects** CST and ADS + Hands-on **Tutorial** **Assessment 5 submission on moodle**
20 Oct Semester 2 2017 ends				
30 Oct 17 Nov	Examination starts Examination ends	LINK to Assessment Policy: http://www.policy.monash.edu/policy-bank/academic/education/assessment/assessment-in-coursework-policy.html		

Assessment requirements

Assessment summary

Continuous assessment: 50%

Examination (2 hours): 50%
Students are required to achieve at least 45% in the total continuous assessment component (assignments, tests, mid-semester exams, laboratory reports) and at least 45% in the final examination component and an overall mark of 50% to achieve a pass grade in the unit. Students failing to achieve this requirement will be given a maximum of 45% in the unit.

Assessment task	Value	Due date
Quizzes	10%	Before the lecture sessions from week 2
Continuous Practical Assessment	10%	End of each theoretical topic discussed in the lectures and practical session (6 topics and 5 sessions)
Continuous Laboratory Assessment	10%	End of each laboratory session
Design Project	20%	End of Week 9 - For design files submission for fabrication / End of Week 12 - Design Project Evaluation
Examination	50%	To be advised

Hurdle requirements

Students are required to achieve at least 45% in the total continuous assessment component (quizzes, tutorials, laboratories and design project) and at least 45% in the final examination component and an overall mark of 50% to achieve a pass grade in the unit. Students failing to achieve this requirement will be given a maximum of 45% in the unit.

Assessment tasks

Assessment title: Quizzes
Mode of delivery: Answering the quizzes in moodle.
Details of task: Three quizzes will be posted in Moodle each week before the lecture sessions. Students need to complete these before coming to the lectures.
Release dates (where applicable): One working day before Tuesday, Thursday and Friday lecture sessions.
Word limit (where applicable): N/A
Due date: Before the lecture sessions from week 2
Value: 10%
Presentation requirements: Submit the answers through Moodle.
Hurdle requirements (where applicable): N/A
Individual assessment in group tasks (where applicable): N/A
Criteria for marking: How well the questions are answered
Additional remarks: Marks will be released one week after.

Assessment title: Continuous Practical Assessment
Mode of delivery: Problem solving in a group/individual and interview.
Details of task: Continuous assessment of problem solving skills based on mastering theoretical and practical understanding for each theoretical topic. Analysis and synthesis of theoretical

knowledge and practical applications of the acquired knowledge in real world contemporary problem solving and conclusions; and finally, answering the questions asked by demonstrators during the practical sessions.
Release dates (where applicable): N/A
Word limit (where applicable): N/A
Due date: End of each theoretical topic discussed in the lectures and practical session (6 topics and 5 sessions)
Value: 10%
Presentation requirements: Written solutions of practical problems
Hurdle requirements (where applicable): N/A
Individual assessment in group tasks (where applicable): N/A
Criteria for marking: How well the problems are solved, analysed and explained in relation to real world problems.
Additional remarks: Assessment will be done in the practical sessions.

Assessment title: Continuous Laboratory Assessment
Mode of delivery: Written laboratory documents and related report
Details of task: Pre-lab: This will contain 3% weightage. Prelab questions will include problem solving, short answers and LATLAB codes.

In-lab assessment: in-lab assessment includes several tasks outlined in the lab manual based on the software (CST or ADS). You need to complete them and understand the tasks and answer simple questions by the demonstrators.

Release dates (where applicable): 1 week before the scheduled lab class
Word limit (where applicable): N/A
Due date: End of each laboratory session
Value: 10%
Presentation requirements: Pre-lab and in-lab assessment.
Hurdle requirements (where applicable): N/A
Individual assessment in group tasks (where applicable): N/A
Criteria for marking: Answers of the pre-lab questions. How well the simulated and measured data are explained.
Additional remarks: N/A

Assessment title: Design Project
Mode of delivery: Written design document, design file, design reports, demonstration of final prototypes and interviews
Details of task: A group of 4 students will work in a team to design a wireless energy harvester using the theoretical knowledge, practical understanding, and simulation skills. The practical design will be transfer from CST/ADS data to printable version for PCB fabrication. The designed PCB needs to be populated with active and passive devices. Testing will be conducted in laboratory setting.
Release dates (where applicable): Week 4
Word limit (where applicable): N/A
Due date: End of Week 9 - For design files submission for fabrication / End of Week 12 - Design Project Evaluation
Value: 20%
Presentation requirements: Demonstration of working prototype and Design Project Report
Hurdle requirements (where applicable): N/A

Individual assessment in group tasks (where applicable): N/A
Criteria for marking: Interpretation of data, how well the prototype works and completeness of the report.
Additional remarks: N/A

Examination(s)

Exam title: Examination
Weighting: 50%
Length: 2 hours
Type (Open/closed book): Closed book
Hurdle requirements (where applicable): Students must achieve a mark of 45% in each of exam and continuous assessment, and an overall mark of 50% to achieve an overall pass grade.
Electronic devices allowed: See calculator related information below.
Remarks (where applicable): N/A

Calculators
A list of the Faculty of Engineering approved calculators and the process for obtaining a sticker is available online at:
http://www.eng.monash.edu.au/current-students/calculators.html

IMPORTANT: Only these listed calculators with the **authorised Monash University-Science or Monash University-Engineering STICKER** will be allowed into the examination by the invigilators.

A faculty approved calculator is permitted, only scientific calculators that are not programmable will be permitted in the examination. These calculators must be checked by the faculty and have either a Faculty of Engineering or a Faculty of Science approved sticker.

Section B: For Malaysia students

Academic Overview

Program Education Objectives
The Electrical and Computer Systems engineering discipline expects to produce graduates, who are:
1. competent in Electrical and Computer Systems engineering
2. responsible and effective global citizens
3. leaders in their chosen profession or society at large.

Program Outcomes
The Electrical and Computer Systems engineering discipline has developed a set of Program Outcomes (POs) for all of its graduates based on the competencies required by the Malaysian Engineering Accreditation Council.

Program Outcomes (POs)	Activities used in this unit to develop POs, achievement of Bloom's domains and complex problem solving
PO1 **Electrical and Computer Systems Engineering Knowledge:** Apply knowledge of mathematics, natural science, engineering fundamentals and specialisation in Electrical and Computer Systems engineering to the solution of complex engineering problems	Cognitive: Apply knowledge of mathematics, physics and engineering fundamentals in telecommunications and signal processing to solving complex problems involving plane wave propagation in various media, antennas and electromagnetic compatibility.
PO2 **Problem Analysis:** Identify, formulate, survey research literature and analyse complex Electrical and Computer Systems engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences	Cognitive: Interpret solutions to complex electromagnetic problems using mathematics, physics and Maxwell's equations.
PO3 **Design/Development of Solutions:** Design solutions for complex Electrical and Computer Systems engineering problems and design systems, components or processes that meet specified needs.	Cognitive: Psychomotor:
PO4 **Research-based Investigation:** Conduct investigations of complex Electrical and Computer Systems engineering problems using research-based knowledge and research methods including design of experiments, (analysis and interpretation of data, and synthesis of information to provide valid conclusions.	Cognitive:
PO5 **Modern Tool Usage:** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex Electrical and Computer Systems engineering problems, with an understanding of the limitations	Cognitive: Apply appropriate techniques to solve transmission line, antenna and optical fiber related practical problems. Psychomotor: Select and use appropriate software and hardware tools to complete transmission line, antenna and optical fiber related laboratory tasks.

Program Outcomes (POs)	Activities used in this unit to develop POs, achievement of Bloom's domains and complex problem solving
PO6 **Engineer and Society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex Electrical and Computer Systems engineering problems	Affective:
PO7 **Environment and Sustainability:** Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex Electrical and Computer Systems engineering problems in environmental contexts.	Cognitive: Affective:
PO8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.	Affective:
PO9 **Communication:** Communicate effectively on complex Electrical and Computer Systems engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions	Affective: Communicate technical contents related to electromagnetic theory effectively individually and in a group.
PO10 **Individual and Team work:** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings	Affective:
PO11 **Lifelong Learning:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change	Affective:
PO12 **Project Management and Finance:** Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to manage projects	Cognitive: Affective:

Teaching and learning method

The unit consists of lectures, laboratory classes and tutorial/problem solving classes.
Detailed recorded lecturers will be available for students. Students need to check these before coming to the actual lectures. The lecture sessions will predominantly consist of revisions and

exercises. This approach is known as flipped learning. Students will also be working in groups /teams in laboratory classes and tutorials. Tutorials are conducted based on problem-based learning approach.

Students can also find information on inclusive teaching practices for students with learning disabilities or mental health conditions at: www.monash.edu.au/lls/inclusivity/

Learning outcomes

On successful completion of this unit, students will be able to:

1. Apply knowledge of mathematics, physics and engineering fundamentals to solving complex problems involving plane wave propagation in various media, antennas and electromagnetic compatibility.
2. Interpret solutions to complex electromagnetic problems using mathematics, physics and Maxwell's equations.
3. Apply appropriate techniques to solve transmission line, antenna and optical fibre related practical problems.
4. Select and use appropriate software and hardware tools to complete transmission line, antenna and optical fibre related laboratory tasks.
5. Communicate technical contents related to electromagnetic theory effectively individually and in a group.

OBE requirements to learning outcomes (LOs)

The Outcome Based Education (OBE) learning outcomes in this unit are same as the handbook learning outcomes.

Relationship between unit learning outcomes and program outcomes

Relationship between Unit Learning Outcomes and Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
LO1	√											
LO2		√										
LO3					√							
LO4					√							
LO5									√			

Key

	No emphasis
√	Emphasized and assessed in the unit

Your feedback to us

One of the formal ways students have to provide feedback on teaching and their learning experience is through the Student Evaluation of Teaching and Units (SETU) survey. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied with and areas for improvement.

Previous student evaluations of this unit

In response to previous SETU results of this unit, the following changes have been made:

In response to the SETU of this unit, the following changes have been made:

- ***Flipped Learning:*** Recorded lectures are available for students to watch before lectures. Students are advised to watch these and attempt relevant quizzes before attending lectures.
- ***Interactive Classes:*** Lectures will be delivered through interactive mode. Students will be asked questions and could also be asked to solve problems during lectures.
- ***Problem-based Tutorials:*** Students will be divided into groups. Each group will be asked to solve a problem in each practical session/tutorial. These sessions are used for assessment.
- ***Teaching:*** Students wanted the lecturer to conduct the tutorials. From previous offering, this wish has been accommodated
- ***Laboratory Classes:*** Due to differences in facilities, the laboratory classes are different in Malaysia and Clayton. For this reason, the assessments based on these are also different. In Malaysia, the following changes have been made:
    - Since there were faults in the old equipment used for antenna labs, new ones have been bought. The antenna lab tasks have also been revised based on these.
    - A hardware-based lab test has been introduced in Malaysia as a replacement for design project in Clayton.
- ***Assessments:*** Students felt the marks allocated to continuous assessments are low. For this reason, the more marks have been given to continuous assessments in this offering.

Student feedback has highlighted the following strength(s) in this unit:

Student feedback has highlighted the following strength(s) in this unit:

- ***Teaching Resources:*** Students as a whole love lecture slides and tutorial resources.
- ***Teaching Method:*** Many students also like recorded lectures and flipped learning method.
- ***Organisation:*** Many students highlighted that the unit is well organised.

If you wish to view how previous students rated this unit, please go to https://www.monash.edu/ups/setu/setu-results

If you wish to view how previous students rated this unit, please go to: https://emuapps.monash.edu.au/unitevaluations/index.jsp

Unit schedule - Malaysia campus

Week	Activities	Assessment
0		No formal assessment is undertaken in week 0
1	**Lectures:** Introduction to subject - Revision of Maxwell's equations in integral and differential forms. Read Chapters 1, 3, 4 and 5 in the prescribed text.	
2	**Lectures:** Derivation of the vector three-dimensional wave equation from Maxwell's equations. Solution of the wave equation for plane waves. Introduction of the concept of wave impedance. **Tutorial:** Review of concepts from ECE2021/ECE3121 **Labs:** Introduction to laboratory and laboratory safety. Experiments 1 to 4: Cyclic through 4 weeks. Read Chapter 6 (Introduction, Sections 6.1-6.6) in the prescribed text.	Quiz answer submission Lab report
3	**Lectures:** Wave propagation at interfaces between different media, normal and oblique incidences. Parameters describing transmission lines, Voltage and current waveforms on transmission lines, Terminated transmission lines **Tutorial:** Plane waves **Labs:** Experiments 1 to 4: Cyclic through 4 weeks. Read Chapter 6 (Sections 6.7-6.8) in the prescribed text. Read Chapter 2 (Sections 2.1, 2.2, 2.3, 2.4 and 2.5) in the prescribed text.	Quiz answer submission Tutorial Presentation Lab report
4	**Lectures:** Transient analysis of transmission lines; Smith Chart and Impedance Matching. **Tutorial:** Transmission lines **Labs:** Experiments 1 to 4: Cyclic through 4 weeks. Read Chapter 2 (Sections 2.6, 2.7 and 2.8) in the prescribed text.	Quiz answer submission Tutorial Presentation Lab report

5	**Lectures:** Radiation and Antennas; Antenna types and basic parameters: gain, impedance and radiation patterns; Dipole and loop antennas **Tutorial:** Smith Chart and impedance matching **Labs:** Experiments 1 to 4: Cyclic through 4 weeks Read Chapter 8 (Sections 8.1, 8.2 and 8.8) in the prescribed text.	Quiz answer submission Tutorial Presentation Lab report
6	**Lectures:** Antenna Arrays **Tutorial:** Antennas and related parameters **Labs:** Experiments 5 to 8: Cyclic through 4 weeks Read Chapter 8 (Sections 8.3, 8.4 and 8.5) in the prescribed text.	Quiz answer submission Tutorial Presentation Lab report
7	**Lectures:** Bounded wave propagation: propagation in rectangular waveguides; Waveguide modes, propagation velocity and mode impedance. **Tutorial:** Antenna arrays **Labs:** Experiments 5 to 8: Cyclic through 4 weeks Read Chapter 7 (Sections 7.1 and 7.2) in the prescribed text.	Quiz answer submission Tutorial Presentation Lab report
8	**Lectures:** Dielectric Waveguides, Planar Optical Waveguides and Optical Fibers **Tutorial:** Rectangular waveguides **Labs:** Experiments 5 to 8: Cyclic through 4 weeks Read Chapter 7 (Sections 7.3 and 7.4) in the prescribed text.	Quiz answer submission Tutorial Presentation Lab report
9	**Lectures:** Optical fibers: structures, wave equations, propagation equation, transverse guided modes, eigenvalue, Attenuation and dispersion properties of optical fibres, communications systems. **Tutorial:** Planar optical waveguides **Labs:** Experiments 5 to 8: Cyclic through 4 weeks Read Chapter 8 (Sections 8.5-8.8) in the prescribed text.	Quiz answer submission Tutorial Presentation Lab report
10	**Lectures:** Electromagnetic Interferences, sources and passive circuit elements. **Tutorial:** Optical fibers **Labs:** Hardware test Read Chapter 9 (Sections 9.1-9.3) in the prescribed text.	Quiz answer submission Tutorial Presentation Lab online test

11	**Lectures:** Grounding; Shielding and Filtering **Tutorial:** Passive circuit elements **Labs:** Online test Read Chapter 9 (Sections 9.4-9.6) in the prescribed text.	Quiz answer submission Tutorial Presentation Lab hardware test
12	**Lectures:** Revision of concepts **Tutorial:** Grounding; shielding and filtering **Labs:** None	Tutorial Presentation
	SWOT VAC	No formal assessment is undertaken in SWOT VAC
	Examination period16	LINK to Assessment Policy: www.policy.monash.edu/policybank/academic/education/assessment/assessment-in-coursework-policy.html

Assessment Summary

Continuous assessment: 50%
Examination (2 hours): 50%
Students are required to achieve at least 45% in the total continuous assessment component (assignments, tests, mid-semester exams, laboratory reports) and at least 45% in the final examination component and an overall mark of 50% to achieve a pass grade in the unit. Students failing to achieve this requirement will be given a maximum of 45% in the unit.

Assessment task	Value	Due date
Quizzes	10%	Before each lecture session from week 2
Problem-solving in tutorials	10%	During each tutorial session from week 3
Laboratory reports	10%	End of each laboratory session from week 2
Laboratory Online Test	10%	Week 10 lab session
Laboratory hardware test	10%	Week 11 lab session
Examination (2 hours)	50%	Schedule examination day

Hurdle requirements

Students are required to achieve at least 45% in the total continuous assessment component (quizzes, tutorials, laboratories, tests) and at least 45% in the final examination component and an overall mark of 50% to achieve a pass grade in the unit. Students failing to achieve this requirement will be given a maximum of 45% in the unit.

Bloom's Taxonomy:
Three domains of educational activities have been identified under the general taxonomy known as Bloom's.

- **Cognitive**: mental skills (*Head*)
- **Affective**: growth in feelings or emotional areas (*Heart*)
- **Psychomotor**: manual or physical skills (*Hand*)

The *cognitive* domain involves knowledge and the development of intellectual skills. This includes the recall or recognition of specific facts, procedural patterns, and concepts that serve in the development of intellectual abilities and skills.

The *affective* domain includes the attitudes with which someone deals with things emotionally, such as feelings, values, appreciation, enthusiasms and motivations.

The *psychomotor* domain includes physical movement, coordination, and use of the motor-skill areas. Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution.

Key for the LO-assessment relationship table above:

Cognitive

C1	C2	C3	C4	C5	C6
Knowledge: Remembers previously learned material	**Comprehension:** Grasps the meaning of material (lowest level of understanding)	**Application:** Uses learning in new and concrete situations (higher level of understanding)	**Analysis:** Understands both the content and structure of material	**Synthesis:** Formulates new structures from existing knowledge and skills	**Evaluation:** Judges the value of material for a given purpose

Psychomotor

P1	P2	P3	P4	P5	P6	P7
Perception: Senses cues that guide motor activity	**Set:** Is mentally, emotionally and physically ready to act	**Guided Response:** Imitates and practices skills, often in discrete steps	**Mechanism:** Performs acts with increasing efficiency, confidence and proficiency	**Complete Overt Response:** Performs automatically	**Adaption:** Adapts skill sets to meet a problem situation	**Organisation:** Creates new patterns for specific situations

Affective

A1	A2	A3	A4	A5
Receiving:	**Responding:**	**Valuing:**	**Organisation:**	

Selectively attends to stimuli	Responds to stimuli	Attaches value or worth to something	Conceptualises the value and resolves conflict between it and other values	**Internalising:** Integrates the value into a value system that controls behaviour

Relationship between Assessments and OBE Learning Outcomes (LOs)

No.	Learning Outcomes (LOs)	Assessment					
		Quizzes	Tutorials	Lab	Lab Online Test	Lab Hardware Test	Final Exam
1	Apply knowledge of mathematics, physics and engineering fundamentals to solving complex problems involving plane wave propagation in various media, antennas and electromagnetic compatibility.						C6
2	Interpret solutions to complex electromagnetic problems using mathematics, physics and Maxwell's equations.	C4	C6				
3	Apply appropriate techniques to solve transmission line, antenna and optical fiber related practical problems.				C6		
4	Select and use appropriate software and hardware tools to complete transmission line, antenna and optical fiber related laboratory tasks.			P5		P6	
5			A3	A3			

	Communicate technical contents related to electromagnetic theory effectively individually and in a group						

Relationship between Assessments and Complex Problems /Activities

Assessment		Complex Problems						
		Depth of Knowledge	Range of Requirements	Depth of Analysis	Infrequent Issues	Extent of Codes	Stakeholder Involvement	Compon or Sub-problem
1	Quizzes	x	x					
2	Tutorials	x	x		x			x
3	Labs	x	x					
4	Lab online Test	x	x					
5	Lab Hardware Test	x	x					
6	Exam	x	x		x			x

Assessment requirements

Assessment tasks

Assessment title: Quizzes
Mode of delivery: Answering the quizzes before the lecture sessions.
Details of task: Three quizzes will be posted in Moodle each week before the lecture sessions. Students need to complete these before coming to the lectures.
Release dates (where applicable): One working day before lecture sessions.
Word limit (where applicable): N/A
Due date: Before each lecture session from week 2

Value: 10%
Presentation requirements: Submit the answers through Moodle.
Hurdle requirements (where applicable): This is applicable only for overall continuous assessment.
Individual assessment in group tasks (where applicable): N/A
Criteria for marking: How well the questions are answered
Additional remarks: N/A

Assessment title: Problem-Based Tutorial Session
Mode of delivery: Presenting answers during each tutorial session
Details of task: In Week 2 tutorials, students will be divided into groups. For the subsequent weeks, a problem will be given to all groups during the tutorial session. Each group can meet and discuss ways to solve the problem. One member from a selected group will present to the class on how they reached their solution, and explain the link between the solution and the theory covered in lectures. A different group and/or group member will have to present each week.
Release dates (where applicable): During each tutorial session from week 3
Word limit (where applicable): N/A
Due date: During each tutorial session from week 3
Value: 10%
Presentation requirements: One member from a selected group needs to present the solutions. Presenting member needs to change, when the group is asked to present another time.
Hurdle requirements (where applicable): This is applicable only for overall continuous assessment.
Individual assessment in group tasks (where applicable): Presenting students need to explain how they arrive at solutions. Group members are expected to participate in presenting members' discussion.
Criteria for marking: For presenting group: Groupwork 0.3%, presentation 0.3% and accuracy of presented solutions 0.4% for each relevant tutorial.

For non-presenting group: Groupwork 1% for each relevant tutorial. Total marks for 10 tutorials are 10%.

Additional remarks: N/A

Assessment title: Continuous Laboratory Assessment
Mode of delivery: Written reports at the end of each laboratory session.
Details of task: Detailed instructions for each experiment are available in the lab sheets that will be available in weeks 1 and 5. Students will do experiments for 2 hours labs each week from week 2 to week 9. They will be asked to fill in a proforma based on the lab. The demonstrator will ask questions regarding the experiment, and the way proforma is filled. The questions and marking scheme of the demonstrator will focus on experimental set up and debugging of circuits; recording of simulated and measured data; analysis and synthesis of data and conclusions.
Release dates (where applicable): Friday of weeks 1 and 5
Word limit (where applicable): N/A
Due date: End of each laboratory session from week 2
Value: 10%
Presentation requirements: Fill in the proforma and submit to the lab demonstrator.
Hurdle requirements (where applicable): This is applicable only for overall continuous assessment.
Individual assessment in group tasks (where applicable): Cooperate with others in completing the experiment and answer questions asked
Criteria for marking: Teamwork 0.3%, written communication 0.4% and explanation of measured

data 0.55% for each lab. Total marks for 8 labs is 10%.
Additional remarks: N/A

Assessment title: Laboratory Online Test
Mode of delivery: Answering the on-line questions in Moodle
Details of task: The laboratory online test will be held in your scheduled laboratory session in week 10. Students should bring their copies of the lab reports with the results recorded over the semester.
Release dates (where applicable): During week 10 lab session
Word limit (where applicable): N/A
Due date: During week 10 lab session
Value: 10%
Presentation requirements: Submit the answers through Moodle.
Hurdle requirements (where applicable): This is applicable only for overall continuous assessment.
Individual assessment in group tasks (where applicable): N/A
Criteria for marking: Understanding of each laboratory task, how well the laboratory-related questions are answered.
Additional remarks: N/A

Assessment title: Laboratory Hardware Test
Mode of delivery: Complete an assigned open-ended lab and answer questions asked in a sheet.
Details of task: The laboratory hardware test will be held in your scheduled laboratory session in week 11. Students work in their normal groups to complete this assessment. Students cannot bring any other materials to this test.
Release dates (where applicable): During week 11 lab session
Word limit (where applicable): N/A
Due date: During week 11 lab session
Value: 10%
Presentation requirements: Submit the completed sheet to the lab demonstrator.
Hurdle requirements (where applicable): This is applicable only for overall continuous assessment.
Individual assessment in group tasks (where applicable): This is group work and all members in a group will get the same mark.
Criteria for marking: How well the assigned lab is completed.
Additional remarks: N/A

Examination(s)

Exam title: Examinations
Weighting: 50%
Length: 2 hours
Type (Open/closed book): Closed book
Hurdle requirements (where applicable): Students are required to achieve at least 45% in the final examination component and an overall mark of 50% to achieve a pass grade in the unit. Students failing to achieve this requirement will be given a maximum of 45% in the unit.
Electronic devices allowed: See calculator related information below.
Remarks (where applicable): There will be an end of semester examination for this unit.

Calculators

A list of the Faculty of Engineering approved calculators and the process for obtaining a sticker is available online at:
http://www.eng.monash.edu.au/current-students/calculators.html

IMPORTANT: Only these listed calculators with the **authorised Monash University-Science or Monash University-Engineering STICKER** will be allowed into the examination by the invigilators.

A faculty approved calculator is permitted, only scientific calculators that are not programmable will be permitted in the examination. These calculators must be checked by the faculty and have either a Faculty of Engineering or a Faculty of Science approved sticker.

Section C: All students

Extensions and penalties

The due dates for the submission of assignments are given in the previous section. Please make every effort to submit work by the due dates. Students are advised to NOT assume that granting of an extension is a matter of course.

If you need an extension for any of the assignments, you must submit a written request 48-hours *before* the due time and date, and attach supportive evidence such as medical certificate.

The evidences should preferably be forwarded as an email attachment, sent to the unit coordinator. The email should be sent from your University email address with your name typed in lieu of signature.

Note that other teaching staff cannot grant extensions. Lecturer-in-charge (unit coordinator) will indicate at the time of granting the extension whether any penalty in marks will apply to the submitted work.

If an extension is granted, the approval must be attached to the assessment, where relevant.

No extensions will be given except in exceptional circumstances.

If you are late in applying for an extension or you don't have a good reason, you should still submit your laboratory reports and design project work, but 10% of the total marks available for these assessments will usually be deducted for each day late.

No assessment work will be accepted once a marked assessment work has been returned to the class.

Deferred tests and examinations may be granted in cases of extenuating personal circumstances such as serious personal illness or bereavement.

Remember, you are required to keep an up-to-date copy of all submitted assessment works to safeguard against the loss of work through accident or error.

Returning assignments

All marks will be returned through Moodle. Marked lab scripts will be returned **only** during one of the laboratory classes. Scripts will be returned **only** to the individual student groups concerned (not to their friends).

Plagiarism and collusion

Intentional plagiarism or collusion amounts to cheating under Part 7 of the Monash University (Council) Regulations.

Plagiarism: Plagiarism means taking and using another person's ideas or manner of expressing them and passing them off as one's own. For example, by failing to give appropriate acknowledgement. The material used can be from any source (staff, students or the internet, published and unpublished works).

Collusion: Collusion means unauthorised collaboration with another person on assessable written, oral or practical work and includes paying another person to complete all or part of the work. Where there are reasonable grounds for believing that intentional plagiarism or collusion has occurred, this will be reported to the Associate Dean (Education) or delegate,

Referencing requirements

N/A

To build your skills in citing and referencing, and using different referencing styles, see the online tutorial Academic Integrity: Demystifying Citing and Referencing at http://www.lib.monash.edu.au/tutorials/citing/

Assignment submission

Hard Copy Submission:

Lab reports must include a cover sheet. Please keep a copy of tasks completed for your records. Filled in proformas must be submitted in the assignment box outside lab demonstrator's room (5-7-01/51).

Online Submission: If Electronic Submission has been approved for your unit, please submit your work via the Moodle site or other; as directed by your demonstator for this unit.
Please keep a copy of tasks completed for your records.

Feedback to you

Feedback will be in the form of marks for weekly laboratory work, informal verbal feedback from tutors and lab demonstrators in laboratory and tutorial classes. Feedback on quizzes will be discussed during lectures.

Learning resources

Monash Library Unit Reading List (if applicable to the unit):
http://readinglists.lib.monash.edu/index.html

Required resources

Students generally must be able to complete the requirements of their course without the imposition of fees that are additional to the student contribution amount or tuition fees. However, students may be charged certain incidental fees or be expected to make certain purchases to support their study. For more information about this, go to Administrative Information for Higher Education Providers: Student Support, Chapter 21, Incidental Fees at: http://www.innovation.gov.au/HigherEducation/TertiaryEducation/ResourcesAndPublications/Pages/default.aspx

Other information

Policies

Monash has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and to provide advice on how they might uphold them. You can find Monash's Education Policies at: http://www.policy.monash.edu/policy-bank/academic/education/index.html

Graduate Attributes Policy

http://www.monash.edu/policy-bank/academic/education/course-governance-and-design/course-design-policy

Student Charter

http://www.monash.edu/students/policies/student-charter.html

Student Services

The University provides many different kinds of services to help you gain the most from your studies. Contact your tutor if you need advice and see the range of services available at http://www.monash.edu/students.

Malaysia students go to: http://www.monash.edu.my/Student-services/.

Monash University Library

The Monash University Library provides a range of services, resources and programs that enable you to save time and be more effective in your learning and research.
Go to http://www.monash.edu/library or the library tab in http://my.monash.edu.au portal for more information.

For Malaysia students the Library and Learning Commons, Monash University Malaysia Campus, provides a range of services and resources that enable you to save time and be more effective in your learning and research.
Go to http://www.lib.monash.edu.my or the library tab in my.monash portal for more information.

Disability Support Services

Students who have a disability, ongoing medical or mental health condition are welcome to contact Disability Support Services.

Disability Support Services also support students who are carers of a person who is aged and frail or has a disability, medical condition or mental health condition.

Disability Advisers visit all Victorian campuses on a regular basis.

- Website: monash.edu/disability
- Telephone: 03 9905 5704 to book an appointment with an Adviser;
- Email: disabilitysupportservices@monash.edu
- Drop In: Level 1, Western Annexe, 21 Chancellors Walk (Campus Centre) Clayton Campus

At Malaysia campus, for information and referral, telephone: Student Adviser, Student Community Services at 03 55146018 or, drop in at Student Community Services Department, Level 2 Building 2, Monash University Malaysia Campus.

Occupational Health and Safety

Safety procedures to be followed by students in the laboratories will be provided in the first laboratory class in week 2.