MONASH University

Unit Guide

MEC3458
Experimental project

Semester 2, 2017

Table of contents

Unit handbook information

Synopsis

Introduction to data acquisition across a range of data types, analogue-digital sampling and signal conditioning. Data acquisition and processing functions using LabView. Current data measurement technologies and equipment, acquisition methodologies used in fluid dynamics, material properties, thermodynamics, control and dynamics. Data analysis methods including error analysis, validation, spectral analysis identification and interpretation of trends. Introduction to research practices, formation and testing of hypotheses as well as experiment design and project management. Communication skills and techniques, preparation of reports and oral presentations. Occupational health and safety.

Mode of delivery

Clayton (Day)
Malaysia (Day)

Workload requirements

3 hour lectures, 3 hours practice sessions/laboratories (this may alternate with 2 hours lectures and 4 hours practice sessions) and 6 hours of private study per week

Unit relationships

Prerequisites

Must have passed 96 credit points from engineering or science

Prohibitions

None

Co-requisites

None

Chief Examiner(s)

Professor Chris Davies

Unit Coordinator(s)

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Clayton/Malaysia staff contact details

Clayton campus	
Campus Coordinator	Name: Dr Tuncay Alan Email: Tuncay.alan@monash.edu Building: 82, Room: 210 Consultation hours: Thursday 11am-1pm
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Campus Coordinator	Name: Dr Foo Ji Jinn Email: Foo.Ji.Jinn@monash.edu Building: 5, Room: 5-5-29 Consultation hours: Tutorials, Consultation outside specified times by appointment
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Introduction to data acquisition across a range data types, analogue-digital sampling and signal conditioning. Data acquisition and processing functions using LabView. Current data measurement technologies and equipment, acquisition methodologies used in fluid dynamics, material properties, thermodynamics, control and dynamics. Data analysis methods including error analysis, validation, spectral analysis identification and interpretation of trends. Introduction to research practices, formation and testing of hypotheses as well as experiment design and project

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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.	1,2,3,4,5,10,11,12
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.	1,2,3,4,5,10,11,12
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.	3,10,11,12
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.	2,3

1.5 Identifies and applies systematic principles of engineering design relevant to the engineering discipline.	**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.	6,12
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.	6,12
	b) Appreciates the principles of safety engineering, risk management and the health and safety responsibilities of the professional engineer, including legislative requirements applicable to the engineering discipline.	6,12
	d) Understands the fundamental principles of engineering project management as a basis for planning, organising and managing resources.	7
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.	7
	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.	7
	c) Competently addresses engineering problems involving uncertainty, ambiguity, imprecise information and wide-ranging and sometimes conflicting technical and non-technical factors.	7,10
	d) Investigates complex problems using research-based knowledge and research methods.	7,8,10

	e) Partitions problems, processes or systems into manageable elements for the purposes of analysis,modelling or design and then re-combines to form a whole, with the integrity and performance of the overall system as the paramount consideration.	7,11
	h) Identifies, quantifies, mitigates and manages technical, health, environmental, safety and other contextual risks associated with engineering application in the designated engineering discipline.	7,9,12
2.2 Fluent application of engineering techniques, tools and resources.	**a)** Proficiently identifies, selects and applies the materials, components, devices, systems, processes, resources, plant and equipment relevant to the engineering discipline.	7
	b) Constructs or selects and applies from a qualitative description of a phenomenon, process, system, component or device a mathematical, physical or computational model based on fundamental scientific principles and justifiable simplifying assumptions.	7
	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.	7,10,11
	f) Designs and conducts experiments, analyses and interprets result data and formulates reliable conclusions.	7,10,11
	g) Analyses sources of error in applied models and experiments; eliminates, minimises or compensates for such errors; quantifies significance of errors to any conclusions drawn.	7,10,11
	h) Safely applies laboratory, test and experimental procedures appropriate to the engineering discipline.	7,12
2.3 Application of systematic engineering synthesis and design processes.	**a)** Proficiently applies technical knowledge and open ended problem solving skills as well as appropriate tools and resources to design components, elements, systems, plant, facilities and/or processes to satisfy user requirements.	7,9,10,11,12
2.4 Application of systematic approaches to the conduct and	**a)** Contributes to and/or manages complex engineering project activity,	7

management of engineering projects.	as a member and/or as the leader of an engineering team.	
	b) Seeks out the requirements and associated resources and realistically assesses the scope, dimensions, scale of effort and indicative costs of a complex engineering project.	7
	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.	7
3. Professional and personal attributes		
3.1 Ethical conduct and professional accountability.	**a)** Demonstrates commitment to uphold the Engineers Australia - Code of Ethics, and established norms of professional conduct pertinent to the engineering discipline	7
	c) Understands the accountabilities of the professional engineer and the broader engineering team for the safety of other people and for protection of the environment.	7
3.2 Effective oral and written communication in professional and lay domains.	**a)** Is proficient in listening, speaking, reading and writing English	9
	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.	9
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.	7,8,9
	b) Seeks out new developments in the engineering discipline and specialisations and applies fundamental knowledge and systematic processes to evaluate and report potential.	9
3.4 Professional use and management of information.	**a)** Is proficient in locating and utilising information - including accessing, systematically searching,analysing,	9

	evaluating and referencing relevant published works and data; is proficient in the use of indexes, bibliographic databases and other search facilities.	
	b) Critically assesses the accuracy, reliability and authenticity of information.	9
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.	7,9
	d) Manages time and processes effectively, prioritises competing demands to achieve personal,career and organisational goals and objectives.	7,9
	e) Thinks critically and applies an appropriate balance of logic and intellectual criteria to analysis, judgement and decision making.	7,9
3.6 Effective team membership and team leadership.	**a)** Understands the fundamentals of team dynamics and leadership.	7,9
	b) Functions as an effective member or leader of diverse engineering teams, including those with multi-level, multi-disciplinary and multi-cultural dimensions.	7,9
	c) Earns the trust and confidence of colleagues through competent and timely completion of tasks.	7,9
	d) Recognises the value of alternative and diverse viewpoints, scholarly advice and the importance of professional networking.	7
	f) Takes initiative and fulfils the leadership role whilst respecting the agreed roles of others.	7

Teaching and learning method

Teaching and Learning Method

The unit takes a blended learning approach, using online lectures and activities which are explored in-depth during class time. Learning in the unit is mainly through the initial labs and group project which extends for the second half of semester and has a number of components which build to form the final project. The main learning approach is “Problem- based learning” which requires

students to be involved with the project and proactive learners. There are no right or wrong answers to many of the project questions. This does not imply that any answer is adequate. Some answers will be better than others as they achieve the criteria in a better way.

Lab class allocation

There are 2-hours of laboratory classes scheduled each week, commencing in week 2. Students must enrol in one lab class only using Allocate Plus. Students not allocated to a particular lab class will not be accepted into that session without the written consent of the unit coordinator. Once a particular session is full, no more students will be accepted, unless evidence is shown that timetabling means that is the only session possible. In this case, a swap will be arranged.

Equipment availability means that the number of students in each session must be limited.
Communication, participation and feedback

We aim to provide a learning environment in which students receive a range of ongoing feedback throughout their studies. In this unit it will take the form of group feedback via practice classes, individual feedback, peer feedback, self-comparison, verbal and written feedback, discussions in class, as well as more formal feedback related to assignment marks and grades. You are encouraged to draw on a variety of feedback to enhance their/your

Learning.

There is a significant amount of group work involved in this unit. Students will be

assigned to groups using the CATME online tool.

***CATME Online Peer Assessment:**

Group projects will use the CATME online peer assessment tool. This tool will be used to

allow team members to anonymously rate the contributions made to each team project by

both themselves and their team mates. Students will be required to complete a calibration

process which demonstrates how the system should be used. At the conclusion of each major

project they will then rate themselves and their teammates on the basis of five key criteria,

and using a behaviourally anchored scale. The individual ratings you give each person are not

viewable or shared with other team members, but will be reviewed by the teaching staff.

You will be asked to justify (via comments) why you rated particular people high or low. You

are NOT allowed to simply rate everyone the same, or have your team all give each member the same ratings. This will incur an automatic -10% penalty if you do so.

Based on these ratings a **Peer Assessment Factor (PAF)** will be calculated by the system for each team member, and then reviewed and potentially moderated by the teaching staff in light of the written comments. This factor is a number potentially between 0 and 1.1, but for the vast majority of students in well-functioning teams, it is usually between 0.9 and 1.05. This factor will be returned confidentially to students via Moodle Gradebook, and will be used to generate an individual mark for each student's project work, based on their team's mark for each of the major team projects.

Upon release of the results, CATME will send each student a link which will allow them to see, for each of the five questions an arrow indicating:

1. How they scored themselves;
2. The AVERAGE of what the team scored them personally;
3. The AVERAGE of what the team scored all team members.

CATME will also provide detailed suggestions for improvement based on where your results fall relative to the rest of the team.

For more information please visit this link: http://info.catme.org/

Learning outcomes

1. Understanding of skills and techniques required for the acquisition of optimised meaningful experimental data
2. Knowledge of the important components of experimental design
3. Overview of current technologies available for experimentation
4. Knowledge of data acquisition methods
5. Knowledge of data analysis methods
6. Appreciation for the importance and application of occupational health and safety procedures
7. Manage and execute short and medium term projects
8. Form and evaluate hypotheses
9. Communicate results using written and oral formats
10. Acquire and optimise experimental data
11. Use data analysis techniques to explore and evaluate experimental data, including error analysis
12. Use LabView to acquire and analyse experimental data Apply occupational health and safety procedures.

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 last SETU of this unit, the following changes have been made:
• More individual assessment tasks have been added.
• Students will experience activities in greater depth on both sets of lab equipment

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

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• The focus on experiment and self-teaching
If you wish to view how previous students rated this unit, please go to
https://emuapps.monash.edu.au/unitevaluations/index.jsp

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https://unitevaluations.connect.monash.edu.au/unitevaluations/index.jsp

Unit schedule - Clayton campus

Unit schedule - Clayton campus

Week	Date	Day	Time	Lecture sessions	Tuesday 9---11 or 11---1
1		Monday	0800	Lecture: Introduction to the unit	
		Wednesday	1400	Lecture: OHS: mandatory	No lab class
		Thursday	1000	Class OHS	
2		Monday	0800	Class: Spectral Analysis	

		Wednesday	1400	Class: Spectral Analysis	Lab class
		Thursday	1000	Class: Spectral Analysis	
3		Monday	0800	Class The scientific method	
		Wednesday	1400	Class Experimental design	Lab class
		Thursday	1000	Class Experimental Analysis	
4		Monday	0800	Lecture: Data Analysis	
		Wednesday	1400	Class Data Analysis	Lab class
		Thursday	1000	Class Data Analysis	
5		Monday	0800		
		Wednesday	1400		Lab class
		Thursday	1000		
6		Monday	0800		
		Wednesday	1400		Lab class
		Thursday	1000		
7		Monday	0800		
		Wednesday	1400		Lab class
		Thursday	1000		
8		Monday	0800		
		Wednesday	1400		Lab class

		Thursday	1000		
9		Monday	0800		
		Wednesday	1400		Lab class
		Thursday	1000		
				Semester break	
				Semester break	
				Semester break	
10		Monday	0800		
		Wednesday	1400		Lab class
		Thursday	1000		
11		Monday	0800		
		Wednesday	1400		Lab class
		Thursday	1000		
12		Monday	0800		
		Wednesday	1400		Lab class
		Thursday	1000		

Assessment Summary				
Assessment Task	Value	Due Date		
Assignment: EO Online (individual)	3%	Midday Wednesday Week 2		
Assignment: Experimental design and analysis (individual)	3%	Midday Friday Week 3		
Project proposal: first lab (group report)	10%	Prior to your lab session Week 4		
Assignment: Error bars (individual)	3%	Midday Friday Week 5		
Project report: first lab (group report)	25%	Prior to your lab Week 7		
	10%			

Project proposal: second lab (group report)		Prior to your lab session Week 9		
Assignment: OHS (individual)	6%	Midday Friday Week 11		
Project Final presentation (group activity)	15%	Lab session week 12		
Project final report (group report)	25%	Report midday Friday Week 12		

Assessment requirements

Assessment summary

Continuous assessment: 100%

Assessment task	Value	Due date
see assessment summary table above	see assessment summary table above	see assessment summary table above

Assessment tasks

Assessment title: see assessment summary table above
Mode of delivery: see assessment summary table above
Details of task: see assessment summary table above
Release dates (where applicable): n/a
Word limit (where applicable): n/a
Due date: see assessment summary table above
Value: see assessment summary table above
Presentation requirements: see assessment summary table above
Hurdle requirements (where applicable): see assessment summary table above
Individual assessment in group tasks (where applicable): see assessment summary table above
Criteria for marking: see assessment summary table above
Additional remarks: see assessment summary table above

Section B: For Malaysia students

Academic Overview

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

Program Outcomes
The Mechanical Engineering 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 **Mechanical Engineering Engineering Knowledge:** Apply knowledge of mathematics, natural science, engineering fundamentals and specialisation in Mechanical Engineering engineering to the solution of complex engineering problems	Cognitive: N/A
PO2 **Problem Analysis:** Identify, formulate, survey research literature and analyse complex Mechanical Engineering engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences	Cognitive: Theoretical lecture material and laboratory exercises. Technical content of unit includes a range of important engineering experiments, the use of a variety of sensors and recording equipment and the study of experimental procedures.
PO3 **Design/Development of Solutions:** Design solutions for complex Mechanical Engineering engineering problems and design systems, components or processes that meet specified needs.	Cognitive: The Final Project is most relevant In groups of about 3 students will generate an idea for a project, devise a hypothesis to be tested, devise experimental plan, write it up and orally present it. Once the project is approved students will conduct the experiment and give presentation of results before peers and academics, and provide formal report. Psychomotor: N/A
PO4 **Research-based Investigation:** Conduct investigations of complex Mechanical Engineering 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: The final project (described above) satisfies this objective.
PO5 **Modern Tool Usage:** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex	Cognitive: N/A Psychomotor: N/A

Program Outcomes (POs)	Activities used in this unit to develop POs, achievement of Bloom's domains and complex problem solving
Mechanical Engineering engineering problems, with an understanding of the limitations	
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 Mechanical Engineering engineering problems	Affective: Discussion of future trend in experimental issues. Discussion of future trend in experimental issues and group work involved.
PO7 **Environment and Sustainability:** Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex Mechanical Engineering engineering problems in environmental contexts.	Cognitive: N/A Affective: N/A
PO8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.	Affective: N/A
PO9 **Communication:** Communicate effectively on complex Mechanical Engineering 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: Oral presentation, written reports and team work.
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: N/A
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: N/A
PO12 **Project Management and Finance:** Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to manage projects	Cognitive: N/A Affective: All work in this unit is done in groups and the final project will particularly satisfy this requirement. The tools learnt in this Unit will lead to lifelong abilities to carry out experimentation. Major project in which the task is managed on a limited budget.

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Learning.

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***CATME Online Peer Assessment (Optional):**

Group projects will use the CATME online peer assessment tool. This tool will be used to allow team members to anonymously rate the contributions made to each team project by both themselves and their team mates. Students will be required to complete a calibration process which demonstrates how the system should be used. At the conclusion of each major project they will then rate themselves and their teammates on the basis of five key criteria, and using a behaviourally anchored scale. The individual ratings you give each person are not viewable or shared with other team members, but will be reviewed by the teaching staff. You will be asked to justify (via comments) why you rated particular people high or low. You are NOT allowed to simply rate everyone the same, or have your team all give each member the same ratings. This will incur an automatic -10% penalty if you do so.

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Learning outcomes

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4. Knowledge of data acquisition methods
5. Knowledge of data analysis methods
6. Appreciation for the importance and application of occupational health and safety procedures
7. Manage and execute short and medium term projects
8. Form and evaluate hypotheses
9. Communicate results using written and oral formats
10. Acquire and optimise experimental data
11. Use data analysis techniques to explore and evaluate experimental data, including error analysis
12. Use LabView to acquire and analyse experimental data Apply occupational health and safety procedures.

OBE requirements to learning outcomes (LOs)

Learning Outcomes (LOs) for Outcome Based Education (OBE) requirements
(LO1) Understanding the skills and techniques required for acquisition of optimized meaningful experimental data.
(LO2) Evaluate important components of experimental design and current technologies available for experimentation.
(LO3) Develop knowledge of data acquisition methods and data analysis methods.
(LO4) Form and evaluate hypotheses.
(LO5) Determine optimised experimental data and use data analysis techniques to explore and evaluate including error analysis.
(LO6) Use LabView to acquire and analyse experimental data.
(LO7) Apply occupational health and safety procedures.
(LO8) Manage and execute short and medium term projects.
(LO9) Develop oral and written communication skills.

Relationship between unit learning outcomes and program outcomes

Relationship between unit learning outcomes and program outcomes

Learning Outcomes (LO)	Program Outcomes (PO) and Bloom's Domains													
	PO1	PO2	PO3		PO4	PO5		PO6	PO7		PO8	PO9	PO10	PO1
	C	C	C	P	C	C	P	A	C	A	A	A	A	A
Understanding the skills and techniques required for acquisition of optimized meaningful experimental data. Evaluate important components of experimental design and current														

1	technologies available for experimentation.		6, 7, 8, 9, 10												
2	Develop knowledge of data acquisition methods and data analysis methods. Form and evaluate hypotheses.			11											
3	Determine optimised experimental data and use data analysis techniques to explore and evaluate including error analysis. Use LabView to acquire and analyse experimental data.					12, 13, 14, 15, 16									
4	Apply occupational health and safety procedures.								25						
5	Develop oral and written communication skills.												31, 32, 33, 34		
6	Manage and execute short and medium term projects.														

Program Outcomes (PO)

PO1	Engineering Knowledge	Apply knowledge of (1) mathematics, (2) natural science, (3) engineering
PO2	Problem Analysis	(6) Identify, (7) formulate, (8) survey research literature and (9) analyze c natural sciences and engineering sciences

PO3	Design /Development of solutions	Design solutions for (11) complex Mechanical engineering problems and
PO4	Investigation	Conduct investigations of complex Mechanical engineering problems usi interpretation of data, and (16) synthesis of information to provide valid c
PO5	Modern tool usage	(17) Create, (18) select and (19) apply appropriate techniques, resources problems, with an (22) understanding of the limitations
PO6	Engineer and society	Apply reasoning informed by contextual knowledge to assess (23) societ engineering practice and solutions to complex Mechanical engineering p
PO7	Environment and sustainability	Understand and evaluate the (28) sustainability and impact of profession
PO8	Ethics	(30) Apply ethical principles and commit to professional ethics and respo
PO9	Communication	Communicate effectively on complex Mechanical engineering activities w reports and design documentation, (32) make effective presentations, an
PO10	Individual and team work	Function effectively as an (35) individual, and as a (36) member or leade
PO11	Lifelong learning	Recognize the need for, and have the preparation and ability to engage i
PO12	Project management and finance	Demonstrate knowledge and understanding of (38) engineering manage

Complex Problems (CP)

Attribute Code	Attribute Description	Complex Engineering Problems have characteristic WP1 and some or all of WP2 to WP7:
WP1	Depth of Knowledge Required	Cannot be resolved without in-depth engineering knowledge at the level of one or more of WK3, WK4, WK5, WK6 or WK8 which allows a fundamentals-based, first principles analytical approach
WP2	Range of conflicting requirements	Involve wide-ranging or conflicting technical, engineering and other issues
WP3	Depth of analysis required	Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models
WP4	Familiarity of issues	Involve infrequently encountered issues
WP5	Extent of applicable codes	Are outside problems encompassed by standards and codes of practice for professional engineering
	Extent of stakeholder involvement and	

WP6	conflicting requirements	Involve diverse groups of stakeholders with widely varying needs
WP7	Interdependence	Are high level problems including many component parts or sub-problems

Complex Activities (CA)

Attribute	Attribute Description	Complex Activities
Preamble		Complex activities means (engineering) activities or projects that have some or all of the following characteristics:
EA1	Range of resources	Involve the use of diverse resources (and for this purpose resources includes people, money, equipment, materials, information and technologies)
EA2	Level of interactions	Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues
EA3	Innovation	Involve creative use of engineering principles and research-based knowledge in novel ways
EA4	Consequences to society and the environment	Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation
EA5	Familiarity	Can extend beyond previous experiences by applying principles-based approaches

Knowledge Profiles (KP)

Attribute Code	Attribute Description
WK1	A systematic, theory-based understanding of the natural sciences applicable to the discipline
WK2	Conceptually-based mathematics, numerical analysis, statistics and formal aspects of computer and information science to support analysis and modelling applicable to the discipline
WK3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
WK4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline
WK5	Knowledge that supports engineering design in a practice area
WK6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline

WK7	Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the professional responsibility of an engineer to public safety; the impacts of engineering activity: economic, social, cultural, environmental and sustainability
WK8	Engagement with selected knowledge in the research literature of the discipline

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:

Grouping will be limited to 4-5 students per group.

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

(1) Allowing students to have first-hand experience of a research project.

(2) Experimental topic was very interesting and fun.

(3) New knowledge and experimenting new topics.

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	Date	Day	Time	Lecture	Remark
1		Monday Tuesday Thursday	17:00 09:00 10:00	Introduction to the unit & data acquisition	Forming of group for labs and research projects
2		Monday Tuesday Thursday	17:00 09:00 10:00	Risk Management	Lab (report submit after 2 weeks, hard copy and online submission)
3		Monday Tuesday Thursday	17:00 09:00 10:00	Data sampling & digital signal	Lab (report submit after 2 weeks, hard copy and online submission)
4		Monday Tuesday Thursday	17:00 09:00 10:00	Error classification & uncertainty analysis	Lab (report submit after 2 weeks, hard copy and online submission)
5	21/8 25/8	Monday Tuesday Thursday Monday Friday	17:00 09:00 10:00 12:00 10:00	Spectral analysis **Projects released & students selection** **Lecturers selection**	Lab (report submit after 2 weeks, hard copy and online submission) Moodle Moodle
6	1/9	Monday Tuesday Thursday Friday	17:00 09:00 10:00	Research theory **Research proposal submission**	Hard copy and online submission
7		Monday Wednesday Thursday Friday		**Research Proposal Presentation during respective lab hours**	Online submission (before presentation)
8				Conduct research project	
9				Conduct research project	
***	Semester	Break	***	***	***

10				Conduct research project	
11				Conduct research project	
12	20/10	Friday Monday Wednesday Thursday Friday	17:00	**Final report submission** **Research Presentation during respective lab hours**	Hard copy and online submission Online submission (before presentation)

Assessment Summary

Continuous assessment: 100%

Assessment task	Value	Due date
Lab 1 report: Free & Forced Heat Convection	11 /3%	Two weeks (hard copy and online submission)
Lab 2 report: Performance of Francis Turbine	11 /3%	Two weeks (hard copy and online submission)
Lab 3 report: Performance of Pelton Turbine	11 /3%	Two weeks (hard copy and online submission)
Lab 4 report: Cantilevered Beam Vibration	11%	Two weeks (hard copy and online submission)
Assignment 1: Risk Assessment	8	Two weeks (hard copy and online submission)
Research Proposal (written & oral presentation)	20%	Week 6, 7 (hard copy and online submission)
Final Report (written & oral presentation)	50%	Week 12 (hard copy and online submission)

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: Selectively attends to stimuli	**Responding:** Responds to stimuli	**Valuing:** Attaches value or worth to something	**Organisation:** 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)

Assessment		Learning Outcomes												Open-ended Labs
		LO1	LO2	LO3	LO4	LO5	LO6							
1	Lab 1 report: Free & Forced Heat Convection	C3, P2		C3										
2	Lab 2 report: Performance of Francis Turbine	C3, P2		C3										
3	Lab 3 report: Performance of Pelton Turbine	C3, P2		C3										
4	Lab 4 report: Cantilevered Beam Vibration	C3, P2		C3										
5	Assignment 1: Risk Assessment				C3, A2									
6	Submission: Research Proposal (written & oral presentation)	C3, P2	C3, P2	C3	C3	C3	C3							x
7	Submission: Final Report	C3, P2	C3, P2	C3	C3	C3	C3							x

	(written & oral presentation)													

Relationship between Assessments and Complex Problems /Activities

Assessment		Complex Problems (CP)							Complex Activities (CA)				
		WP1	WP2	WP3	WP4	WP5	WP6	WP7	EA1	EA2	EA3	EA4	EA5
1	Lab 1 report: Free & Forced Heat Convection	x			x								
2	Lab 2 report: Performance of Francis Turbine	x			x								
3	Lab 3 report: Performance of Pelton Turbine	x			x								
4	Lab 4 report: Cantilevered Beam Vibration	x			x								
5	Assignment 1: Risk Assessment				x								
6	Submission: Research Proposal	x	x	x					x	x	x		

	(written & oral presentation)												
7	Submission: Final Report (written & oral presentation)	x	x	x					x	x	x		

Assessment requirements

Assessment tasks

Assessment title: Laboratory reports x 4
Mode of delivery: Laboratory
Details of task: Please see the document ReportTemplate.doc posted on VLE for report writing instructions and the marking scheme. Each individual laboratory exercise has its own set of instructions that are also posted on VLE or provided.
Release dates (where applicable): -
Word limit (where applicable): -
Due date: Two weeks
Value: 11% x 2
Presentation requirements: -
Hurdle requirements (where applicable): -
Individual assessment in group tasks (where applicable): -
Criteria for marking: -
Additional remarks: -

Assessment title: Assignments: Risk Assessment
Mode of delivery: Lecture/assignment
Details of task: A document describing the requirements for the assignment will be posted on VLE or given by the lecturers.
Release dates (where applicable): -
Word limit (where applicable): -
Due date: Two weeks
Value: 8% x 1
Presentation requirements: -
Hurdle requirements (where applicable): -
Individual assessment in group tasks (where applicable): -
Criteria for marking: -
Additional remarks: -

Assessment title: Research proposal (written & oral presentation)

Mode of delivery: Group research project.
Details of task: A document describing the requirements for the research proposal will be posted on VLE or provided. Both the written and oral tasks will be completed as a group.
Release dates (where applicable): Week 4-5
Word limit (where applicable): -
Due date: Two weeks
Value: 20%
Presentation requirements: 10 minutes presentation and 5 minutes Q&A, group presentation.
Hurdle requirements (where applicable): -
Individual assessment in group tasks (where applicable): -
Criteria for marking: -
Additional remarks: -

Assessment title: Project (written & oral presentation)
Mode of delivery: Group research project.
Details of task: A document describing the requirements for the project will be posted on VLE or provided. Both the written and oral tasks will be completed as a group.Week
Release dates (where applicable): Week 4-5
Word limit (where applicable): 50 pages
Due date: Week 12, Friday
Value: 50%
Presentation requirements: 15 presentation and 5 minutes Q&A. Presenters are not allowed to present twice, of which including the proposal presentation.
Hurdle requirements (where applicable): -
Individual assessment in group tasks (where applicable): -
Criteria for marking: -
Additional remarks: -

Section C: All students

Extensions and penalties

University and faculty policy on assessment

Due date and extensions

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

Note that other lecturers 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 assignment.

Late assignment

If you are late in applying for an extension or you don't have a good reason, you should still submit the work, but 10% of the total marks available for that assessment component will usually be deducted for each day late.

No assignment will be accepted once an assignment 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 assignments to safeguard against the loss of work through accident or error.

Return dates

Students can expect assignments to be returned within two weeks of the submission date or after receipt, whichever is later.

Assessment for the unit as a whole is in accordance with the provisions of the Monash University Education Policy at:

http://www.policy.monash.edu/policybank/academic/education/assessment/index.html

Resubmission of assignments

Returning assignments

Any hardcopy assignments are to be returned lecture or practice classes

Resubmission of assignments

Assignments can only be resubmitted with the approval of the lecturer.

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

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: www.policy.monash.edu.au/policy-bank/academic/education/index.html

Key educational policies include:

- Plagiarism;
- Assessment in Coursework Programs;
- Special Consideration;
- Grading Scale;
- Discipline: Student Policy;
- Academic Calendar and Semesters;
- Orientation and Transition; and
- Academic and Administrative Complaints and Grievances Policy.

Graduate Attributes Policy
http://www.policy.monash.edu/policy-bank/academic/education/management/monash-graduate-attributes-policy.html

All Monash Occupational Health & Safety Policies, procedures and Guidelines are available on the OHS website (http://www.monash.edu.my/ohse/)

The OHS website has information on: Occupational Health and Safety Policy at Monash, Emergency Guidelines for the Sunway Campus, Contacts, Emergency Hotline Numbers, List of Marshals and First Aiders.

If you see something dangerous or hazardous on campus or if you are hurt during working hours, please report this to your lecturer / supervisor or call the emergency number 46333.

For all emergencies on Sunway Campuses, please dial +603 5514 46333.

Student Services

The University provides many different kinds of services to help you gain the most from your studies. Contact your lecturer or tutor if you need adviceand see the range of services available at http://www.monash.edu.my/Student-services/

Monash University Library

Suggested Change: The Library and Learning Commons, Monash University Sunway 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 Liaison Unit

Suggested Change: Academic support services may be available for students who have a disability or medical condition. Registration with the Disability Liaison Unit is required. Further information is available as follows.

- Website: http://monash.edu/equity-diversity/disability/index.html;
- For information and referral, telephone: Sudent Adviser, Student Community Services at 03 55146018; or drop In: Student Community Services Department, Level 2 Building 2, Monash University, Sunway Campus.
- Email:dlu@monash.edu(Disability Liaison Unit, Monash University Australia)

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:

Hard copy submission: Assignments must include a cover sheet. The coversheet is accessible via the Monash portal page located at http://my.monash.edu.au under the heading 'Learning and teaching tools.' Please keep a copy of tasks completed for your records. Any hardcopy assignments are to be submitted via the mailbox/pigeon hole of Dr. Foo Ji Jinn (level 5, building 5).

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.

Online Submission: If Electronic Submission has been approved for your unit, please submit your work view the VLE site for this unit, which you can access via links in the my.monash portal.

Feedback to you

By submitting written comments you are assisting your Faculty to implement best teaching practices. The Faculty is committed to continually improving the student learning experience.

Monash is committed to excellence in education and regularly seeks feedback from students, employers and staff. Moreover, continuous improvement of students' learning is a big concern in Faculty of Engineering. One of the key formal ways students have to provide feedback is through SETU, Student Evaluation of Teacher and Unit. The University's student evaluation policy requires that every unit is evaluated each year. Students are strongly encouraged to complete the surveys. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied and areas for improvement.

For more information on Monash's educational strategy, and on student evaluations, see:

http://www.monash.edu.au/about/monash-directions/directions.html

http://www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html

For your part, you have a responsibility to ensure that your comments are constructive and respectful and that you recognize the important professional responsibility that Student Evaluation offers. If you wish to view how previous students rated the units they had, please go to: https://emuapps.monash.edu.au/unitevaluations/index.jsp

In addition to SETU, in this unit, an informal Student Evaluation of Teacher and Unit (iSETU) will be conducted at the end of week 2, and 8 in which students will be invited to fill feedback forms to give their comments on the quality of the lectures and tutorials. These feedbacks are absolutely anonymous and effectively can help lecturer and tutor to reorganise the teaching materials and methods to improve the students' learning experience. After each round of iSETU, a report and a list of actions planned to be taken for the remaining lectures and tutorials will be announced to the students in the next following week after receiving the feedbacks.

Previous Student Evaluations of this Unit

This unit has been completely restructured based on students' comments. If you wish to view how previous students rated this unit, please go to: https://emuapps.monash.edu.au/unitevaluations/index.jsp

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.