

Unit Guide

ENG1005 Engineering mathematics Semester 2, 2017

Handbook link:

<http://monash.edu.au/pubs/2017handbooks/units/ENG1005.html>

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Unit handbook information

Synopsis

Vector algebra and geometry: equations of lines and planes. Linear algebra: matrix operations, up to 3x3 systems of linear equations, eigenvalues and eigenvectors. Calculus: improper integrals, integration by parts. Sequences and series: fundamentals of convergence, Taylor series, use in error analysis. Ordinary differential equations: first order, second order with constant coefficients, repeated roots, simple non-homogeneous cases. Laplace transforms: elementary functions, inversion by tables; shifting; derivatives, applications to ODEs. Multivariable calculus: partial derivatives, gradient and directional derivatives, maxima and minima.

Mode of delivery

Clayton (Day)
Malaysia (Day)

Workload requirements

Three 1-hour lectures (or equivalent), one 2-hour practice class and 7 hours of private study per week

Unit relationships

Prerequisites

VCE Specialist Mathematics or ENG1090 (or equivalent)

Prohibitions

ENG1091, MTH1030, MTH1035

Co-requisites

None

Chief Examiner(s)

[Dr Leo Brewin](#) (Sem 1 and 2, Malaysia October intake 2017)

Unit Coordinator(s)

[Dr Leo Brewin](#), [Dr John Head](#) (Clayton - Sem 1)

[Dr Leo Brewin](#) (Clayton - Sem 2)

[Associate Professor Lan Boon Leong](#) (Malaysia Sem 1 and 2)

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Academic overview

Learning outcomes

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

1. Evaluate cross products of vectors, and use vectors to represent lines and planes.
2. Perform matrix algebra.
3. Solve up to 3x3 systems of linear equations and find eigenvalues and eigenvectors.
4. Use hyperbolic functions.
5. Evaluate improper integrals of elementary functions and use integration by parts.
6. Appreciate convergence of numeric and power series, construct Taylor series and estimate errors in numerical approximations .
7. Solve first order ordinary differential equations, including by separable variables and integrating factors.
8. Solve second order linear differential equations with constant coefficients.
9. Use differential equations to model simple engineering problems.
10. Evaluate and invert Laplace transforms and use them to solve ordinary differential equations.
11. Calculate partial derivatives, use the gradient vector to find directional derivatives, and find extreme values of two-variable functions.
12. Express and explain mathematical techniques and arguments clearly in words.

Teaching approach

In the first week of the semester there will be just three one-hour lectures. For the remainder of the semester (weeks 2 to 12) there will be three one-hour lectures plus one two hour tutorial (also known as a support, practice or laboratory class). Lectures will be recorded and will be available online through the Echo 360 Learning Capture system. Every effort will be made to ensure that all lectures are recorded but on rare occasions technical issues may cause the recording to fail. Students are expected to attend one 2-hour support class per week during weeks 2 to 12 of the semester. The support classes are intended to help students gain mastery of the material by working through set exercises with the assistance of other students and the class tutor.

Feedback to you

We will provide feedback in a number of ways, including

Assignments and quizzes.

Always look through the marked assignments and quizzes, and read the comments given by your tutor either written on the assignment itself or in class to the whole group. Always ask if there is something that it is not clear to you. All topics included in the assignments will be covered in the final exam, therefore it is important that if you lost marks in a particular question that you find out what you did wrong to avoid making the same mistake again in the exam!

Tutorials.

Tutorials are the best place to get feedback from both the tutor and your peers. Take the weekly problem sets seriously, and clarify anything that you are unsure about. Many questions included in the problem sets are from previous exams and they will give you an idea of what will be included in your exam.

Assistance outside scheduled classes.

You can always seek help from the tutors in the Mathematics Learning Centre, located in room G24, 9 Rainforest Walk (Building 28). The MLC is open from 11am to 2pm Monday to Friday from week 2 until the end of exams in each semester.

Sample exam.

Towards the end of the semester a sample exam, with solutions, will be released on Moodle. Work through the exam, and check through the solutions only once you finished your attempt.

Assessment summary

Weekly assignments or quizzes: 40%

Final examination (3 hours): 60%

Students are required to achieve at least 45% in the total continuous assessment component 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	Value	Due in week
Quiz 1	2%	2
Quiz 2	2%	4
Quiz 3	2%	6
Quiz 4	2%	8
Quiz 5	2%	10
Assignment 1	6%	3
Assignment 2	6%	5
Assignment 3	6%	7
Assignment 4	6%	9
Assignment 5	6%	11

It is strongly recommended that students take a copy of the final version of their assignments prior to its submission, for example with their phone or using a scanner. **Note: Some support classes will fall on public holidays.** Students in these classes will be allowed to hand their assignment either to the unit-coordinator or to any tutor **before the public holiday**. Student's with quizzes scheduled for a public holiday will have their mark for that quiz computed as the average for their remaining quizzes.

Students who have attempted this unit previously must complete all assessment tasks again. No marks can be carried across from a previous enrolment in the unit.

Assignments and quizzes.

There will be five assignments each worth 6% plus five quizzes each worth 2% (for a total of 40%). The quizzes will be run during the support class and will take about 20 minutes to complete.

In order to get full marks for the assignments you must not only get the correct answer (what a surprise) you will also be expected to provide clear explanations as to how you arrived at your answers. You will need to use, where appropriate, proper English sentences (this does not include sms, txt or emojis) and you should employ correct mathematical terminology and pay due care to how you present your answers. Marks will be deducted for sloppy presentations.

Examples of what we expect (and examples of what we hope never to see) can be found on the unit web site.

You are not required to use a word processor to prepare your assignments. Neat hand written submissions will be perfectly acceptable.

Assignment submission.

There is only one way to submit your assignments for this unit: **you must hand them to your tutor during your tutorial in the week that the assignment is due.** The submission dates are clearly stated on each assignment. All five assignments will be available at least two weeks before the due date. This should give every student ample opportunity to complete each assignment by the due date.

If you have any reason why you are unable to submit your assignment by the due date you must contact your campus coordinator **before** the due date. In all other cases late penalties will apply as set out in the Faculty of Science policy (see below).

Assignments submitted by e-mail will not be accepted.

Assignment cover sheet. In accordance with school and university policy, all assignments must include a signed cover sheet. The School of Mathematical Sciences cover sheet can be downloaded from the unit website on Moodle. For Clayton students, hard copies of cover sheets are often available from the School Enquiries Office on the fourth floor of the mathematics building (near the lifts).

Submitting late assignments. The Faculty of Science has a strict policy on late submission of work. It stipulates that late assignments will normally be penalised at 10% of the maximum mark per calendar day until one week after the due date, after which a zero mark is awarded. Note in particular the use of **calendar days**. This means that all seven days of the week, including holidays, will be used when counting how many days have lapsed after the due date. It is part of your learning experience at Monash to properly plan your time to meet the given deadlines.

If you know in advance that you may have difficulty in meeting a deadline please contact your campus coordinator as soon as possible **before** the due date. Only in exceptional circumstances will extensions be given **after** the due date has passed.

Tutors are **not authorised** to approve extensions to deadlines.

Return of marked work. Where possible marked assessments will be returned to you at your next support class following the week in which the assessment was due. Your marks will also be posted on the Grade Book on Moodle at around the same time and you should check these have been recorded correctly. If any of them have been entered incorrectly you must query them with your tutor in a timely manner. (If work is consistently being handed back late to you, or your marks are not posted on Moodle within a week of receiving your marked work, please advise the Unit Coordinator.) If you are unable to collect your work at the usual class, please ask your tutor at the next class. Any uncollected work after the end of semester can be retrieved from the Unit Coordinator up until the end of the examination period.

If you believe that an error has been made in the marking of any assessment, for example missed working or a mistake in the addition, you should discuss that with your tutor initially. If you are not satisfied with their response you should contact your campus coordinator to arrange a meeting.

Examination(s)

The final exam will run for three hours and will contain between 8 and 12 questions. Each question may contain many parts. A sample exam with solutions will be made available on the unit web site during the semester.

No calculators, textbooks or notes of any kind will be allowed in the exam. A basic formula sheet will be provided with the exam and a copy will be available on the unit web site later in the semester.

The final unit mark will be sum of the marks for works submitted during the semester, worth a total of 40%, and the final exam, worth 60%.

Students are required to achieve at least 45% in the total continuous assessment component 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.

Applications for special consideration

Students with a valid reason for late submission of an assignment must show the Chief Examiner the originals (and provide a copy) of appropriate documentation within two working days of the normal deadline for that piece of work. This application must be submitted directly to the Chief Examiner in room 317 (or slip them under the door if there is nobody in the office at that time). The Chief Examiner will advise you of the outcome of the application by email.

See also <http://www.monash.edu.au/exams/special-consideration.html> for university information.

Unit schedule

The table below shows the planned schedule of activities and assessment for this unit but from time to time it may be necessary to adjust this for operational reasons. Please listen for announcements in lectures and/or check official announcements on Moodle regularly.

Please note that the references in the following table refer to the 5th edition of *Modern Engineering Mathematics* by Glyn James.

Week	Topic	Lectures	Reference
	Single variable calculus		
1	Integration	1.0	(8.8.4,12)
	Hyperbolic functions	0.5	(2.7.4-5,8.3.12,8.8.10)
	Improper integrals	1.5	(9.2)
2	Sequences and series	1.5	
	Taylor series, Euler's method	1.5	(9.4.1,10.6.1-2)
	Coordinate geometry and vectors		
3	Vectors in 3d space	1	(4.2.8,4.2.10)
	Lines and planes in 3d space	2	(4.3.3)
4	Curves and surfaces in 3d space	2	
	Matrices		
	Systems of equations	1	(5.5.2)
5	Gaussian elimination	1	
	Matrices	1	(5.2)
	Matrix determinant and inverse	1	(5.4)
6	Eigenvalues and eigenvectors	1	(5.7.1-2)
	Ordinary differential equations		
	Introductions to ODEs	1	(10.2-3)
	Separable first order ODEs	1	(10.5.3,10.5.9)
7	The integrating factor	1	(10.5.9,10.4.2-3)
	Homogeneous 1st order ODEs	1	(10.9.1)
	Non-homogeneous 2nd order ODEs	1	(10.9.3)

Week	Topic	Lectures	Reference
8	Application of ODEs	1	(10.10)
	Integral transforms		
	Laplace transforms	1	(11.2)
	Inverse Laplace transform pt.1	1	(11.2.7-9)
9	Inverse Laplace transform pt.2	1	(11.2.7-9)
	Solving ODEs by Laplace transforms	2	(11.3,8.8.8,11.4)
10	Laplace transforms of integrals	1	
	Multivariable Calculus		
	Functions of two variable	1/2	(9.6.1)
	Two dimensional surfaces	1/2	
	Partial differentiation	1	(9.6.2)
11	Directional derivatives	1	(9.6.3)
	Differentiation in spherical and polar coordinates	1	
	Tangent planes, local approximations	1	(9.7.1)
12	Maxima and minima in 2 dimensions	1	(9.7.2)
	Revision	2	

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 2017 there will be five mini-quizzes introduced in the sport classes. This was a common request from the SETU surveys of 2016.

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

Unit resources

Learning resources

Text book.

The prescribed textbook for this unit is *Modern Engineering Mathematics* by Glyn James. You can purchase this from the Monash bookstore and there are a limited number of copies in the library.

Please note that there is also an advanced version *Advanced Modern Engineering Mathematics* by the same author but it is not appropriate for this unit. Please make sure you obtain the correct version *Modern Engineering Mathematics*.

Lecture notes.

Detailed lecture notes will be available only in PDF form through Moodle. Printed notes will not be provided. All unit information, assignments, exercises, marks and all announcements will be made available through Moodle. Lectures will be recorded and will be available online through the Echo 360 Learning Capture system. Every effort will be made to ensure that all lectures are recorded but on rare occasions technical issues may cause the recording to fail.

Support classes.

Support classes (also known as laboratory classes and tutorials) will begin in week 2 and run through to week 12 (i.e., a total of 11 support classes). Each class will run for 2 hours during which time students will have the opportunity to work on set exercises, to discuss problems and solutions with other students and to seek assistance from the tutor.

Students will be allocated to one of the support classes by a program known as *Allocate+*. This can be accessed from the web page <http://www.monash.edu/timetables/login>. Note that changes to your allocated supported class can only be made by you (**the unit coordinator can not make changes on your behalf**). Changes can be made through the *Allocate+* web page and will be accepted only in the first two weeks of the semester.

Mathematics learning centre.

The School of Mathematical Sciences also operates a Mathematics Learning Centre, to provide additional assistance to students who are encountering difficulties with lecture material and exercises in any of their first and second-year mathematics units (including ENG1005).

The Mathematics Learning Centre (MLC) is located in Room G24 on the ground floor of Building 28 at the Clayton campus and it is open from week 2 to the end of exams daily from 11am--2pm. No appointment is necessary.

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, refer to the Higher Education Administrative Information for Providers, Chapter 18, Incidental Fees at <http://education.gov.au/help-resources-providers>

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>

<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 <http://www.lib.monash.edu.my/> or the library tab in <http://my.monash.edu> 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

For students at Malaysia campus, please contact the Student Wellbeing and Activities Office located in Building 2, Level 2, Room 2238.

<http://www.monash.edu.my/student-services/wellbeing-and-activities/disability-support>

Plagiarism, cheating and collusion

Monash University has strict policies on plagiarism, cheating and collusion, and the penalties can be severe. Full details of the policy can be found at:

<http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-academic-integrity-policy.html>

Extensions and penalties

Late assignment submissions for this unit may be accepted but will be penalised at 10% of the maximum mark per calendar day (or part thereof), in accordance with the Faculty of Science Penalty for late submission of work for assessment policy at <http://intranet.monash.edu.au/science/staff/education/policies-procedures/late-submission.html>.

If the assignment is submitted after any students have received back their marked work, or once any sample solutions have been published on Moodle, then it may be marked for feedback purposes, but no marks will be recorded for that piece of assessment.

For information on the appropriate method of submission of late assessed work for this unit, and/or how a Special Consideration application should be submitted, please see the information outlined under **Important unit information** in this unit guide. In case of doubt, please contact the Unit Coordinator of the unit in a timely manner.

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