Unit Outline

MATH2006 Mathematics and Statistics
Semester 1, 2016

Unit study package code: MATH2006
Mode of study: Internal
Tuition pattern summary: Note: For any specific variations to this tuition pattern and for precise information refer to the Learning Activities section.
Lecture: 2 x 1 Hours Weekly
Tutorial: 1 x 1 Hours Weekly
Workshop: 1 x 1 Hours Weekly
This unit does not have a fieldwork component.
Credit Value: 25.0
Pre-requisite units:

307535 (v.0) Engineering Mathematics 110 or any previous version
OR
MATH1000 (v.0) Engineering Mathematics Specialist 1 or any previous version
OR
307536 (v.0) Engineering Mathematics 120 or any previous version
OR
MATH1002 (v.0) Engineering Mathematics 1 or any previous version
OR
10926 (v.0) Mathematics 103 or any previous version
OR
MATH1004 (v.0) Mathematics 1 or any previous version
AND

307537 (v.0) Engineering Mathematics 130 or any previous version
OR
MATH1001 (v.0) Engineering Mathematics Specialist 2 or any previous version
OR
307538 (v.0) Engineering Mathematics 140 or any previous version
OR
MATH1003 (v.0) Engineering Mathematics 2 or any previous version
OR
7492 (v.0) Mathematics 104 or any previous version
OR
MATH1011 (v.0) Mathematics 2 or any previous version

Co-requisite units: Nil
Anti-requisite units: Nil
Result type: Grade/Mark
Approved incidental fees: Information about approved incidental fees can be obtained from our website.
Visit fees.curtin.edu.au/incidental_fees.cfm for details.

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Learning Management System:  [Blackboard](lms.curtin.edu.au)
Acknowledgement of Country

We respectfully acknowledge the Indigenous Elders, custodians, their descendants and kin of this land past and present.

Syllabus

This unit will cover the mathematical framework for modelling phenomenon in engineering and science in general. Students will acquire practical skills in developing mathematical equations for engineering process, solve equations, compute various probabilities of interest for decision making. Topics covered include; functions of two or more variables; Fourier series; exploratory data analysis; discrete and continuous probability distribution; normal distribution; random sampling; central limit theorem; confidence intervals and hypothesis tests for single mean and two means; checking assumptions; correlation and simple linear regression. Where appropriate students will use Maple, SPSS or Excel for computing.

Introduction

This unit provides a firm foundation in mathematics and statistics and to enhance the student’s problem solving skills in engineering context.

Unit Learning Outcomes

All graduates of Curtin University achieve a set of nine graduate attributes during their course of study. These tell an employer that, through your studies, you have acquired discipline knowledge and a range of other skills and attributes which employers say would be useful in a professional setting. Each unit in your course addresses the graduate attributes through a clearly identified set of learning outcomes. They form a vital part in the process referred to as assurance of learning. The learning outcomes tell you what you are expected to know, understand or be able to do in order to be successful in this unit. Each assessment for this unit is carefully designed to test your achievement of one or more of the unit learning outcomes. On successfully completing all of the assessments you will have achieved all of these learning outcomes.

Your course has been designed so that on graduating we can say you will have achieved all of Curtin’s Graduate Attributes through the assurance of learning process in each unit.

<table>
<thead>
<tr>
<th>On successful completion of this unit students can:</th>
<th>Graduate Attributes addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Understand and apply the fundamental concepts of functions of two or more variables in engineering and science context; demonstrate basic skills in formulating and evaluating double integrals</td>
<td>🔢💡📊</td>
</tr>
<tr>
<td>2 Solve ordinary differential equations using Laplace Transform and solve linear systems of ordinary differential equations</td>
<td>🔢💡📊</td>
</tr>
<tr>
<td>3 Select and use appropriate analytical tools for the design process in mining engineering; apply statistical methods for exploring, summarising and presenting different types of data</td>
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</tr>
<tr>
<td>4 Perform modelling using various distributions and calculate related probabilities and expected values; perform probability calculations associated with bivariate distributions and evaluate co-variance and correlation</td>
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</tr>
<tr>
<td>5 Apply various statistical test construct linear regression models; perform predictions and construct confidence intervals for decision making</td>
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</tr>
</tbody>
</table>
Curtin’s Graduate Attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply discipline knowledge</td>
<td>Thinking skills (use analytical skills to solve problems)</td>
</tr>
<tr>
<td>Communication skills</td>
<td>Technology skills</td>
</tr>
<tr>
<td>International perspective</td>
<td>Cultural understanding (value the perspective of others)</td>
</tr>
<tr>
<td></td>
<td>Professional Skills (work independently and as a team)</td>
</tr>
<tr>
<td></td>
<td>(plan own work)</td>
</tr>
</tbody>
</table>

Find out more about Curtin’s Graduate attributes at the Office of Teaching & Learning website: ctl.curtin.edu.au

Learning Activities

There are two hours of lectures, one hour of workshop and a one-hour tutorial per week throughout the semester. Blackboard will be used for: announcements, accessing teaching and learning materials, etc. Each student enrolled in the unit has access to Mathematics and Statistics 231 Blackboard.

The unit Lecture Notes will be published on Blackboard. The topics of the lectures are given in the Unit Study Calendar (end of the document). The Weekly Exercise Sets will be published in Blackboard. The exercises are from the recommended textbooks.

There will be consultation time every week. Each student can come and discuss in person with the lecturer/tutor problems relevant to the material taught.

Learning Resources

Other resources

You might want to purchase the following textbooks in order to complete this unit.

Part I Selected Topics in Mathematics


Part II Introduction to Statistics


You do not have to purchase the following textbooks but you may like to refer to them.

- Stewart, J., Student Solutions Manual. Multivariable calculus. (available in Robertson Library; provides completely worked-out solutions to all odd-numbered exercises).
### Assessment

**Assessment schedule**

<table>
<thead>
<tr>
<th>Task</th>
<th>Value %</th>
<th>Date Due</th>
<th>Unit Learning Outcome(s) Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Test/Computing Quiz 1</td>
<td>15 percent</td>
<td><strong>Week:</strong> 6 (Begin 4 April) <strong>Day:</strong> TBA <strong>Time:</strong> TBA</td>
</tr>
<tr>
<td>2.</td>
<td>Test/Computing Quiz 2</td>
<td>15 percent</td>
<td><strong>Week:</strong> 13 (Begin 23 May) <strong>Day:</strong> TBA <strong>Time:</strong> TBA</td>
</tr>
<tr>
<td>3.</td>
<td>E-Test</td>
<td>20 percent</td>
<td><strong>Week:</strong> Selected Teaching Weeks, Check BB <strong>Day:</strong> Check BB for completion time frame <strong>Time:</strong> Check BB for completion time frame</td>
</tr>
<tr>
<td>4.</td>
<td>Examination</td>
<td>50 percent</td>
<td><strong>Week:</strong> Examination Week Sem1, 2016 <strong>Day:</strong> Check Examination Timetable Sem1, 2016 <strong>Time:</strong> Check Examination Timetable Sem1, 2016</td>
</tr>
</tbody>
</table>

### Detailed information on assessment tasks

1. The material to be tested includes all of the material covered in the first three teaching weeks namely Functions of Two or More variables, and Double/Triple Integrals.

2. The material to be tested includes all of the material covered in weeks nine, ten and eleven namely Exploratory Statistics, Probability distributions, and the Normal distribution.

3. There are on-line quizzes (worth 20%). The due date for each quiz is given on the quiz itself. You can access these quizzes through the [Mathematics and Statistics](#) section of Blackboard: click on Online Quizzes. This is a link to the (AiM) web server that hosts the quizzes. Each quiz tests any work covered up to the week before its due date. Another link in the menu in Blackboard is Online Quiz Info (easy-to-navigate information describing how the AiM (Online) Quizzes work; please read this before you attempt any of the quizzes. Note that if Blackboard is down the online quizzes may be accessed directly via [http://aim04.curtin.edu.au](http://aim04.curtin.edu.au).

   Any queries regarding the quizzes may be emailed to [maths-aim@lists.curtin.edu.au](mailto:maths-aim@lists.curtin.edu.au) (there are links within AiM for this). Please make the subject of such queries something like: **M&S Quiz 4 Qn 3**. Dr Greg Gamble (room 314.353) will promptly respond to your queries. Most responses will also be blogged at a page that is accessible from the AiM homepage. So, you should check the blog in case someone else has had a similar query to the one you were about to pose and the response given also helps you. (Unfortunately, the Discussion Board forum for this has become impractical, and has been discontinued.) Note that your AiM Online quiz password is not the same as your OASIS/Blackboard password (read [Online Quiz Info!](#)).

4. Two hour end of semester examination
Pass requirements
Achieve a grade/mark greater than or equal to 5/50

Fair assessment through moderation
Moderation describes a quality assurance process to ensure that assessments are appropriate to the learning outcomes, and that student work is evaluated consistently by assessors. Minimum standards for the moderation of assessment are described in the Assessment and Student Progression Manual, available from policies.curtin.edu.au/policies/teachingandlearning.cfm

Late assessment policy
This ensures that the requirements for submission of assignments and other work to be assessed are fair, transparent, equitable, and that penalties are consistently applied.

1. All assessments students are required to submit will have a due date and time specified on this Unit Outline.
2. Students will be penalised by a deduction of ten percent per calendar day for a late assessment submission (e.g. a mark equivalent to 10% of the total allocated for the assessment will be deducted from the marked value for every day that the assessment is late). This means that an assessment worth 20 marks will have two marks deducted per calendar day late. Hence if it was handed in three calendar days late and given a mark of 16/20, the student would receive 10/20. An assessment more than seven calendar days overdue will not be marked and will receive a mark of 0.

Assessment extension
A student unable to complete an assessment task by/on the original published date/time (e.g. examinations, tests) or due date/time (e.g. assignments) must apply for an assessment extension using the Assessment Extension form (available from the Forms page at students.curtin.edu.au/administration/) as prescribed by the Academic Registrar. It is the responsibility of the student to demonstrate and provide evidence for exceptional circumstances beyond the student’s control that prevent them from completing/submitting the assessment task.

The student will be expected to lodge the form and supporting documentation with the unit coordinator before the assessment date/time or due date/time. An application may be accepted up to five working days after the date or due date of the assessment task where the student is able to provide an acceptable explanation as to why he or she was not able to submit the application prior to the assessment date. An application for an assessment extension will not be accepted after the date of the Board of Examiners’ meeting.

Deferred assessments
If your results show that you have been granted a deferred assessment you should immediately check your OASIS email for details.

Deferred examinations/tests will be held from 18/07/2016 to 22/07/2016. Notification to students will be made after the Board of Examiners’ meeting via the Official Communications Channel (OCC) in OASIS.

Supplementary assessments
Supplementary assessments, if granted by the Board of Examiners, will have a due date or be held between 18/07/2016 and 22/07/2016. Notification to students will be made after the Board of Examiners’ meeting via the Official Communications Channel (OCC) in OASIS.

It is the responsibility of students to be available to complete the requirements of a supplementary assessment. If your results show that you have been granted a supplementary assessment you should immediately check your OASIS email for details.

Referencing style
The referencing style for this unit is Chicago.
More information can be found on this style from the Library web site: http://libguides.library.curtin.edu.au/referencing.

Copyright

© Curtin University. The course material for this unit is provided to you for your own research and study only. It is subject to copyright. It is a copyright infringement to make this material available on third party websites.

Academic Integrity (including plagiarism and cheating)

Any conduct by a student that is dishonest or unfair in connection with any academic work is considered to be academic misconduct. Plagiarism and cheating are serious offences that will be investigated and may result in penalties such as reduced or zero grades, annulled units or even termination from the course.

Plagiarism occurs when work or property of another person is presented as one’s own, without appropriate acknowledgement or referencing. Submitting work which has been produced by someone else (e.g. allowing or contracting another person to do the work for which you claim authorship) is also plagiarism. Submitted work is subjected to a plagiarism detection process, which may include the use of text matching systems or interviews with students to determine authorship.

Cheating includes (but is not limited to) asking or paying someone to complete an assessment task for you or any use of unauthorised materials or assistance during an examination or test.

From Semester 1, 2016, all incoming coursework students are required to complete Curtin’s Academic Integrity Program (AIP). If a student does not pass the program by the end of their first study period of enrolment at Curtin, their marks will be withheld until they pass. More information about the AIP can be found at: https://academicintegrity.curtin.edu.au/students/AIP.cfm

Refer to the Academic Integrity tab in Blackboard or academicintegrity.curtin.edu.au for more information, including student guidelines for avoiding plagiarism.

Information and Communications Technology (ICT) Expectations

Curtin students are expected to have reliable internet access in order to connect to OASIS email and learning systems such as Blackboard and Library Services.

You may also require a computer or mobile device for preparing and submitting your work.

Be able to use

- a scientific calculator
- ICT technology to navigate through Blackboard and use its communication features
- Follow commands on operating different software in windows operating system.

For general ICT assistance, in the first instance please contact OASIS Student Support: oasisapps.curtin.edu.au/help/general/support.cfm

For specific assistance with any of the items listed below, please contact The Learning Centre: life.curtin.edu.au/learning-support/learning_centre.htm

- Using Blackboard, the I Drive and Back-Up files
- Introduction to PowerPoint, Word and Excel

Additional information

Enrolment

It is your responsibility to ensure that your enrolment is correct - you can check your enrolment through the eStudent option on OASIS, where you can also print an Enrolment Advice.
Student Rights and Responsibilities

It is the responsibility of every student to be aware of all relevant legislation, policies and procedures relating to their rights and responsibilities as a student. These include:

- the Student Charter
- the University’s Guiding Ethical Principles
- the University’s policy and statements on plagiarism and academic integrity
- copyright principles and responsibilities
- the University’s policies on appropriate use of software and computer facilities

Information on all these things is available through the University’s “Student Rights and Responsibilities” website at: students.curtin.edu.au/rights.

Student Equity

There are a number of factors that might disadvantage some students from participating in their studies or assessments to the best of their ability, under standard conditions. These factors may include a disability or medical condition (e.g. mental illness, chronic illness, physical or sensory disability, learning disability), significant family responsibilities, pregnancy, religious practices, living in a remote location or another reason. If you believe you may be unfairly disadvantaged on these or other grounds please contact Student Equity at eesi@curtin.edu.au or go to http://eesj.curtin.edu.au/student_equity/index.cfm for more information.

You can also contact Counselling and Disability services: http://www.disability.curtin.edu.au or the Multi-faith services: http://life.curtin.edu.au/health-and-wellbeing/about_multifaith_services.htm for further information.

It is important to note that the staff of the university may not be able to meet your needs if they are not informed of your individual circumstances so please get in touch with the appropriate service if you require assistance. For general wellbeing concerns or advice please contact Curtin’s Student Wellbeing Advisory Service at: http://life.curtin.edu.au/health-and-wellbeing/student_wellbeing_service.htm

Recent unit changes

Students are encouraged to provide unit feedback through eVALUate, Curtin’s online student feedback system. For more information about eVALUate, please refer to evaluate.curtin.edu.au/info/.

To view previous student feedback about this unit, search for the Unit Summary Report at https://evaluate.curtin.edu.au/student/unit_search.cfm. See https://evaluate.curtin.edu.au/info/dates.cfm to find out when you can eVALUate this unit.

Recent changes to this unit include:

As per students responses, arrangements have been made to provide feedback on student learning.

No changes are made to the unit.
**Program calendar**


Note, the schedule below is a guide only.

<table>
<thead>
<tr>
<th>Week</th>
<th>Begin Date</th>
<th>Lecture Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.</td>
<td>22 Feb</td>
<td>Orientation Week</td>
</tr>
</tbody>
</table>
| 1.   | 29 Feb     | PART I. SELECTED TOPICS IN MATHEMATICS
|      |            | Functions of Two or More Variable (S 15.1)
|      |            | Functions of two variables (revisited); definition, domain, range, regions (interior and boundary, closed and open, bounded and unbounded), representations - level curves, surfaces in space.
|      |            | Functions of three or more variables (revisited); definition, domain, range, level surfaces. |
| 2.   | 7 Mar      | Cylinders and quadric surfaces: sketching (S 13.6).
|      |            | Digression: Conic sections.
|      |            | Double Integral
|      |            | Double integrals: definition, some properties (S 16.1).
|      |            | Double integrals over rectangular regions (S 16.2): iterated (repeated) integrals, change of order of integration (Fubini’s Theorem), and evaluation. |
| 3.   | 14 Mar     | Double Integrals
|      |            | Double integrals over general regions (S 16.3): type 1 and type 2 regions, change of order of integration (Fubini’s Theorem - stronger form), properties, evaluation. 
|      |            | Double integrals in polar form (S 16.4): polar coordinates conversion formulas, polar regions, definition of double integrals in polar form, evaluation.
|      |            | Some applications (S 16.5): area, average value, mass and electric charge of thin plates, first moments, centre of mass, moments of inertia.
|      |            | Triple integrals
|      |            | Triple integrals in rectangular coordinates regions in space (S 16.6) |
| 4.   | 21 Mar     | The Laplace Transform
|      |            | The Laplace transform (N 7.2-7.3): definition, Laplace transforms of some basic functions, operational properties.
|      |            | The inverse Laplace transform (N 7.4): definition, operational properties, partial fraction decomposition method.
|      |            | Solving ordinary differential equations (N 7.5): initial value problems, the method of Laplace transform. |
| 5.   | 28 Mar     | Tuition Free Week (includes Easter) |
| 6.   | 4 Apr      | TEST 1
|      |            | Linear Systems of Ordinary Differential Equations
|      |            | Basic theory of linear systems (N 9.4): some terminology and notation, homogeneous system, superposition principle, linear dependence and linear independence, test for linear independence, fundamental set of solutions, general solution, fundamental matrix and its properties. |
| 7.   | 11 Apr     | Linear Systems of Ordinary Differential Equations
|      |            | Eigenvalues and eigenvectors of matrices (N 9.5).
<p>|      |            | General solution to homogeneous linear systems with constant coefficients (N 9.5): a preview, |</p>
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.</td>
<td>18 Apr</td>
<td>Tuition Free Week</td>
</tr>
<tr>
<td>9.</td>
<td>25 Apr</td>
<td><strong>PART II. INTRODUCTION TO STATISTICS</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Exploratory statistics</strong> (J 1.1; J 2.3-2.6, J 3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Overview of Statistics. Exploratory data analysis: descriptive statistics, box plot, outliers detection, presentation of bivariate data.</td>
</tr>
<tr>
<td>10.</td>
<td>2 May</td>
<td><strong>Probability distributions</strong> (W5.1-5.6; W6.1-6.10)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Discrete and continuous probability distributions for modeling real life situations. Introduction to SPSS.</td>
</tr>
<tr>
<td>11.</td>
<td>9 May</td>
<td><strong>The Normal Distribution</strong> (J 6.1-6.4; J 7.1-7.2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Normal Distribution: tests for normality, random sampling, Central Limit Theorem, sampling distribution of the mean.</td>
</tr>
<tr>
<td>12.</td>
<td>16 May</td>
<td><strong>Estimation &amp; Hypothesis Testing - one sample</strong> (J 8.1-8.5; J 9.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Confidence interval and hypothesis test for the mean: Type I &amp; II errors and hypothesis, sample size estimation. Inference for a single mean, Hypothesis testing using SPSS, Checking assumptions.</td>
</tr>
<tr>
<td>13.</td>
<td>23 May</td>
<td><strong>TEST 2</strong> Estimation &amp; Hypothesis Testing - two samples** (J 10.1-10.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inference for the Mean using the Paired t-test and independent samples t-test: Tests using SPSS and validation of underlying assumptions.</td>
</tr>
<tr>
<td>14.</td>
<td>30 May</td>
<td><strong>Bivariate data</strong> (J 3.2-3.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bivariate Data Analysis: correlation, simple linear regression.</td>
</tr>
<tr>
<td>15.</td>
<td>6 Jun</td>
<td>Study Week</td>
</tr>
<tr>
<td>16.</td>
<td>13 Jun</td>
<td>Examinations</td>
</tr>
<tr>
<td>17.</td>
<td>20 Jun</td>
<td>Examinations</td>
</tr>
</tbody>
</table>