# Unit Outline

**MATH1003 Engineering Mathematics 2**  
**Semester 2, 2016**

<table>
<thead>
<tr>
<th>Unit study package code:</th>
<th>MATH1003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode of study:</td>
<td>Internal</td>
</tr>
<tr>
<td>Tuition pattern summary:</td>
<td>Note: For any specific variations to this tuition pattern and for precise information refer to the Learning Activities section.</td>
</tr>
<tr>
<td></td>
<td>Lecture: 3 x 1 Hours Weekly</td>
</tr>
<tr>
<td></td>
<td>Computer Laboratory: 1 x 2 Hours Fortnightly</td>
</tr>
<tr>
<td></td>
<td>Workshop: 1 x 2 Hours Fortnightly</td>
</tr>
<tr>
<td></td>
<td>This unit does not have a fieldwork component.</td>
</tr>
<tr>
<td>Credit Value:</td>
<td>25.0</td>
</tr>
</tbody>
</table>
| Pre-requisite units:            | 307536 (v.0) Engineering Mathematics 120 or any previous version  
|                                 | OR 10926 (v.0) Mathematics 103 or any previous version  
|                                 | OR 307535 (v.0) Engineering Mathematics 110 or any previous version  
|                                 | OR MATH1002 (v.0) Engineering Mathematics 1 or any previous version  
|                                 | OR MATH1004 (v.0) Mathematics 1 or any previous version  
|                                 | OR MATH1000 (v.0) Engineering Mathematics Specialist 1 or any previous version  
|                                 | AND 307808 (v.0) Bachelor of Engineering (Honours) or any previous version  
|                                 | OR 307020 (v.0) Bachelor of Engineering (Civil and Construction Engineering), Bachelor of Science (Mining) or any previous version  
|                                 | OR 132210 (v.0) Bachelor of Engineering (Electronic and Communication Engineering), Bachelor of Science (Computer Science) or any previous version  
|                                 | OR 132010 (v.0) Bachelor of Engineering (Computer Systems Engineering), Bachelor of Science (Computer Science) or any previous version  
|                                 | OR 303763 (v.0) Bachelor of Engineering (Chemical Engineering), Bachelor of Science (Chemistry) or any previous version  
|                                 | OR 304168 (v.0) Bachelor of Engineering (Chemical Engineering), Bachelor of Science (Extractive Metallurgy) or any previous version  
|                                 | OR |
311721 (v.0) Bachelor of Engineering, Bachelor of Commerce or any previous version
OR
BH-ENGR (v.0) Bachelor of Engineering (Honours) or any previous version
OR
BB-CCEMIN (v.0) Bachelor of Engineering (Civil and Construction Engineering), Bachelor of Science (Mining) or any previous version
OR
BB-ECECMP (v.0) Bachelor of Engineering (Electronic and Communication Engineering), Bachelor of Science (Computer Science) or any previous version
OR
BB-CSECMP (v.0) Bachelor of Engineering (Computer Systems Engineering), Bachelor of Science (Computer Science) or any previous version
OR
BB-CENCHM (v.0) Bachelor of Engineering (Chemical Engineering), Bachelor of Science (Chemistry) or any previous version
OR
BB-CENEXM (v.0) Bachelor of Engineering (Chemical Engineering), Bachelor of Science (Extractive Metallurgy) or any previous version
OR
BB-ENGCOM (v.0) Bachelor of Engineering, Bachelor of Commerce or any previous version

Co-requisite units: Nil

Anti-requisite units: 307537 (v.0) Engineering Mathematics 130 or any previous version
AND
MATH1001 (v.0) Engineering Mathematics Specialist 2 or any previous version

Result type: Grade/Mark

Approved incidental fees: Information about approved incidental fees can be obtained from our website. Visit fees.curtin.edu.au/incidental_feescfm for details.

Unit coordinator:

Volker Rehbock

Phone: +61 9266 3486
Email: V.Rehbock@curtin.edu.au
Location: Building: 314 - Room: 354
Consultation times: Mon/Wed/Fri 6.30am to 2pm unless I am teaching

Teaching Staff:

Volker Rehbock

Phone: +61 9266 3486
Email: V.Rehbock@curtin.edu.au
Location: Building: 314 - Room: 354

Administrative contact:

Naomi Mockford

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Email: n.mockford@curtin.edu.au
Acknowledgement of Country
We respectfully acknowledge the Indigenous Elders, custodians, their descendants and kin of this land past and present.

Syllabus
Geometric vectors; Vector operations; Scalar products; Orthogonal vectors and projections; Cross product; Equations of lines; Distance between a point and a line and between lines; Equations of planes; Distance from a point to a plane; Euclidean Vector Spaces; Subspaces; Basis and Dimension; Inverse trigonometric functions, Hyperbolic functions and their inverses. Standard integral formulae. Integration by parts. Partial fractions. Applications of integration: volumes of revolution, lengths of curves, surfaces of revolution, moments and centres of mass, work done by a force, mean and RMS values. Parametrized curves. Numerical integration: Trapezoidal Rule, Simpson’s Rule. Functions of two and three variables; Vector Valued Functions; Partial derivatives; Total differential and approximations; Differential Equations; Direction fields; Linear and separable 1st order Ordinary Differential Equations (ODEs); Applications; Numerical solutions of 1st order ODEs: Euler, Improved Euler and Runge-Kutta Methods; Homogeneous 2nd order linear ODEs with constant coefficients; Method of undetermined coefficients; Method of variation of parameters; Applications.

Introduction
This unit covers more advanced techniques of single variable calculus, an introduction to multivariable calculus, vector spaces and ordinary differential equations. It is designed for students undertaking an engineering degree and forms an integral part of the Engineering Foundation Year.

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 Analyse engineering problems using vector concepts</td>
<td>📋🔍🔍🔍</td>
</tr>
<tr>
<td>2 Apply the techniques of calculus in a variety of engineering problems, including differentiation and integration</td>
<td>📋🔍🔍🔍</td>
</tr>
<tr>
<td>3 Use numerical algorithms for integration and solving differential equations</td>
<td>📋🔍🔍</td>
</tr>
<tr>
<td>4 Use functions depending on multiple variables as well as multivalued functions</td>
<td>⏰🔍🔍</td>
</tr>
<tr>
<td>5 Apply the techniques of calculus to analytically solve a range of first and second order ordinary differential equations</td>
<td>📋🔍🔍</td>
</tr>
<tr>
<td>6 Use a symbolic manipulation package for more advanced tasks of integration and solving differential equations</td>
<td>📋🔍🔍</td>
</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></td>
</tr>
<tr>
<td>Thinking skills</td>
<td>(use analytical skills to solve problems)</td>
</tr>
<tr>
<td>Information skills</td>
<td>(confidence to investigate new ideas)</td>
</tr>
<tr>
<td>Communication skills</td>
<td></td>
</tr>
<tr>
<td>Technology skills</td>
<td></td>
</tr>
<tr>
<td>Learning how learn</td>
<td>(apply principles learnt to new situations)</td>
</tr>
<tr>
<td>(confidence to tackle unfamiliar problems)</td>
<td></td>
</tr>
<tr>
<td>International perspective</td>
<td>(value the perspectives of others)</td>
</tr>
<tr>
<td>Cultural understanding</td>
<td>(value the perspectives of others)</td>
</tr>
<tr>
<td>Professional Skills</td>
<td>(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

Lectures.
Workshops.
Laboratory Sessions.

Online quizzes:
There are 8 weekly online quizzes starting in the first teaching week. In teaching weeks 5 and 6, and again in weeks 11 and 12 the usual weekly quizzes are replaced by supervised quizzes (altogether there are 2 of them) which are held during the computer lab period. The due date for each quiz is given on the quiz itself. You can access these quizzes through the Engineering Mathematics 2 section of Blackboard. Under Assessments you will find Online Quiz Info (easy-to-navigate information describing how the AiM (Online) Quizzes work; please read this before you attempt any of the quizzes), and Online Quizzes (a link to the (AiM) web server that hosts the quizzes). Each quiz (except the first quiz) tests any work covered up to its due date. Note that if Blackboard is down, Bentley students may access the online quizzes directly on http://aim02.curtin.edu.au.

Any queries regarding the quizzes may be emailed to maths-aim@lists.curtin.edu.au (there are links within AiM for this). Please make the subject of such queries something like: EM2 Quiz 4 Qn 3. Dr Greg Gamble (room 314.353) will promptly respond to your queries. Most responses will also be blogged on the AiM homepage for EM2; so you should check the blog in case someone else has had a similar query you were about to pose, in case 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!).

Non-Bentley info.:  
Miri: EM2 quizzes on http://aim03.curtin.edu.au Messages to maths-aim@lists.curtin.edu.au ideally should have (Miri) after the unit name, e.g. EM2 (Miri) Quiz 4 Qn 3

Curtin College: EM2 quizzes on http://aim04.curtin.edu.au Messages to maths-aim@lists.curtin.edu.au ideally should have (CC) after the unit name, e.g. EM2 (CC) Quiz 4 Qn 3

Learning Resources

Essential texts
The required textbook(s) for this unit are:


Other resources
LMS (Blackboard): http://lms.curtin.edu.au. The various links on Blackboard will give you access to:
Lecture Notes.
Workshop Session Sheets.
Laboratory Session Sheets.
Online Quiz Link & Information.
A Discussion Forum.
A Mail Tool to contact your lecturer, tutor or fellow students.

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>Online Quizzes</td>
<td>20 percent</td>
<td>Week: Teaching weeks 1, 2, 3, 4, 7, 8, 9 &amp; 10 Day: As advised on quiz Time: As advised on quiz</td>
<td>1,2,3,4,5,6</td>
</tr>
<tr>
<td>Workshop Exercises</td>
<td>20 percent</td>
<td>Week: Teaching week 3, 5, 7, 9 &amp; 11 Day: Your workshop day Time: In the second half of the workshop</td>
<td>1,2,3,4,5,6</td>
</tr>
<tr>
<td>Laboratory Exercises</td>
<td>10 percent</td>
<td>Week: Teaching week 4, 8 &amp; 10 Day: Your laboratory time Time: In the second half of the session</td>
<td>6</td>
</tr>
<tr>
<td>Final Examination</td>
<td>50 percent</td>
<td>Week: To be advised by the examinations office Day: To be advised by the examinations office Time: To be advised by the examinations office</td>
<td>1,2,3,4,5,6</td>
</tr>
</tbody>
</table>

Detailed information on assessment tasks

1. The online quizzes will be administered in two different modes. The first mode involves weekly quizzes which will be available continuously over a one week period and can be accessed anytime through the world wide web. These will generally cover material presented in lectures up to that point. In order to get used to these, a tutorial quiz has been made available for you to go through before attempting the assessed quizzes. There will be weekly quizzes during teaching weeks 1, 2, 3, 4, 7, 8, 9, and 10. The due date for each quiz is clearly indicated at the top of the quiz page and you should aim to complete it well before then. The length of time available to complete each quiz takes into account possible downtimes of the system and no extension of the due time will be considered. Although a quiz may come online before a Monday, there is no system support over the weekend. A student who gets full marks for all the above 8 quizzes will score 10% of the mark towards the final assessment for this unit. In addition, you will be required to complete two supervised online quizzes in during the laboratory sessions in teaching week 6 and 12. Each of these will contribute 5% towards your final grade.

Most of the questions in the online quizzes are randomized so that different students are likely to see
different versions of the same question. While we will do our best to keep availability for the entire week, it is possible that the software server may be slow or break down occasionally. Thus, you are strongly advised to

- save (i.e. use the ‘Mark’ option – see below) your work frequently while completing a quiz, and
- do not leave completion of a quiz until the last minute, as the server is more likely to have a high workload!

The Week 1 quiz is a diagnostic. Not all of you will know the material necessary to complete the diagnostic quiz, but it is important that you attempt as many questions as possible to allow us to identify any deficiencies in your mathematics background and give you appropriate feedback. Thus, an attempt at Week 1 will contribute full marks towards your final grade, regardless of the actual score achieved.

 Except for Week 1, each assessed weekly quiz will consist of questions based on material presented during lectures in the previous teaching week. Assuming you have prepared sufficiently well, you should be able to complete them in under 45 minutes.

The two supervised online quizzes will be conducted in the laboratories during teaching week 6 and 12. They must be completed within the given time duration of 45 minutes. These quizzes will assess material from lectures presented in teaching weeks 1-4 and 1-10, respectively.

For further details on the online quizzes, see the “Online Quiz Info” link under Assessments from the Blackboard course menu on the homepage.

2. Each student is required to attend the fortnightly workshops which are run in the manner of a tutorial. The aim of these is to clear up any remaining difficulties you may still have with the lecture material and to learn how to turn it into practice. For this purpose you will be given a sheet of exercises to work through when you get to a workshop. In all but the first workshop, after thorough discussion of these exercises with the tutor present, you will be given a small set of questions to do on your own which are to be submitted to the tutor for marking. After awarding a mark out of 10, the tutor will return these to you in the next workshop. In addition, you are required to bring along your working for the lecture note exercises from the previous fortnight. The tutor will peruse these and award a mark (0, 1 or 2 out of 2) which is then combined with the mark for your assessment questions for that class. At the end of the semester, the marks obtained will be averaged and contribute 20% of your final grade.

3. Each of the laboratory sessions will be used to introduce various commands and features of the Maple package as it relates to the course contents. At the start of each session, you will be given a set of Maple based exercises to work through with the help of a tutor. Once these have been completed and discussed, for the sessions in teaching weeks 4, 8 and 10 you will be given a small set of tasks to do on your own. Once completed, the associated Maple workbook should be saved and submitted as instructed by your tutor. Note that Maple is widely available in various labs around the campus, so you can practice the use of the software in your own time if necessary. Finally, your performance in the submitted laboratory work will be collated at the end of the semester and contribute 10% towards your final grade.

4. The final examination will be held during the official examination period. It will be of a 2 hour duration and cover all of the material presented in lectures during weeks 1-12 of the semester as well as some basic Maple knowledge. Further details will be given closer to the end of semester. The final examination will contribute 50% towards your final grade.

**Pass requirements**

To pass this unit you must:

1. Achieve a grade/mark greater than or equal to 5/50.
2. Obtain a minimum of 40% in the final examination.

**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. Late submission of assessments is not accepted in this unit. Students will receive a zero mark for any assessment item submitted late.

Assessment extension

A student unable to complete an assessment task by/on the original published date/time (eg examinations, tests) or due date/time (eg 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 OASIS for details.

Deferred examinations/tests will be held from 15/02/2017 to 17/02/2017. 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 15/02/2017 and 17/02/2017. 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 OASIS for details.

Reasonable adjustments for students with disabilities/health circumstances likely to impact on studies

A Curtin Access Plan (CAP) is a document that outlines the type and level of support required by a student with a disability or health condition to have equitable access to their studies at Curtin. This support can include alternative exam or test arrangements, study materials in accessible formats, access to Curtin’s facilities and services or other support as discussed with an advisor from Disability Services (disability.curtin.edu.au). Documentation is required from your treating Health Professional to confirm your health circumstances.

If you think you may be eligible for a CAP, please contact Disability Services. If you already have a CAP please provide it to the Unit Coordinator at the beginning of each semester.

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.

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

Engineers Australia Accreditation

<table>
<thead>
<tr>
<th>Assessment Item</th>
<th>Unit learning outcomes assessed</th>
<th>EA Stage 1 Competencies assessed</th>
<th>Level of thinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online Quizzes</td>
<td>1, 2, 3, 4, 5, 6</td>
<td>1.2</td>
<td>3</td>
</tr>
<tr>
<td>Workshop Exercises</td>
<td>1, 2, 3, 4, 5, 6</td>
<td>1.2</td>
<td>3</td>
</tr>
<tr>
<td>Laboratory Exercises</td>
<td>6</td>
<td>1.2</td>
<td>3</td>
</tr>
<tr>
<td>Final Examination</td>
<td>1, 2, 3, 4, 5, 6</td>
<td>1.1, 1.2</td>
<td>3</td>
</tr>
</tbody>
</table>

Scientific Calculators

All students enrolled in EFY units that require exam assessments will be issued with a HP10s Scientific Calculator. This is the only approved calculator that is to be used in exams for these units. The distribution of calculators started at the enrolment session. If you have not yet received your calculator, please contact the EFY office located in Building 204, Room No 319 from Week 1. You will need to present your ID card for collection. Please note only one calculator will be issued per student and any replacement calculators are the responsibility of the student.

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 eesj@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:

None.
# Program Calendar
## Program Calendar – Semester 2 2015

<table>
<thead>
<tr>
<th>Week</th>
<th>Begin Date</th>
<th>Lecture Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>27 July</td>
<td>Geometric vectors and vector operations (12A-C); The Dot Product (12D); Orthogonal vectors and projections.</td>
</tr>
<tr>
<td>1.</td>
<td>1 August</td>
<td>The Cross Product (12E); Equations of lines and planes; Distances between lines, points and planes. Euclidean vector spaces.</td>
</tr>
<tr>
<td>2.</td>
<td>8 August</td>
<td>Vector subspaces; Linear dependence/independence; Basis and Dimension of a vector space; Plenary lecture: The Power Method and Google.</td>
</tr>
<tr>
<td>3.</td>
<td>15 August</td>
<td>Inverse trigonometric functions; Hyperbolic functions (5E) and their inverses; Standard Integral Formulae; Integration by Parts and Tabular Integration (8D).</td>
</tr>
<tr>
<td>4.</td>
<td>22 August</td>
<td>Tuition Free Week</td>
</tr>
<tr>
<td>5.</td>
<td>29 August</td>
<td>Partial Fractions (8E); Integration by Partial Fractions (8F); Volumes of revolution: Disc and Washer methods.</td>
</tr>
<tr>
<td>6.</td>
<td>5 September</td>
<td>The Shell Method; Lengths of curves and surfaces of revolution; Parametrized curves and their calculus (6F); Moments and centres of mass.</td>
</tr>
<tr>
<td>7.</td>
<td>12 September</td>
<td>Work done by a variable force; Mean and RMS values of Functions (9D); Approximate integration: Trapezoidal Rule (9A), Simpson’s Rule (9B).</td>
</tr>
<tr>
<td>8.</td>
<td>19 September</td>
<td>Tuition Free Week</td>
</tr>
<tr>
<td>9.</td>
<td>26 September</td>
<td>Functions of two or three variables, vector valued functions; Partial derivatives (15A); Total differential and approximation (15B); Chain Rules.</td>
</tr>
<tr>
<td>10.</td>
<td>3 October</td>
<td>Implicit Differentiation; Optimisation (15C); Introduction to differential equations, direction fields; Separable 1st order ODEs (13A).</td>
</tr>
<tr>
<td>11.</td>
<td>10 October</td>
<td>Linear 1st ODEs (13B); Applications (13C-D); Numerical solutions of 1st order ODEs: Euler (13E), Improved Euler (13F) and Runge-Kutta (13G) methods.</td>
</tr>
<tr>
<td>12.</td>
<td>17 October</td>
<td>Homogeneous 2nd order linear ODEs with constant coefficients (14A); Applications (14B); Method of Undetermined Coefficients (14C).</td>
</tr>
<tr>
<td>13.</td>
<td>24 October</td>
<td>Method of Variation of Parameters (14C); Applications (14B).</td>
</tr>
<tr>
<td>14.</td>
<td>31 October</td>
<td>Study Week</td>
</tr>
<tr>
<td>15.</td>
<td>7 November</td>
<td>Examinations</td>
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The only authoritative version of this Unit Outline is to be found online in OASIS
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