



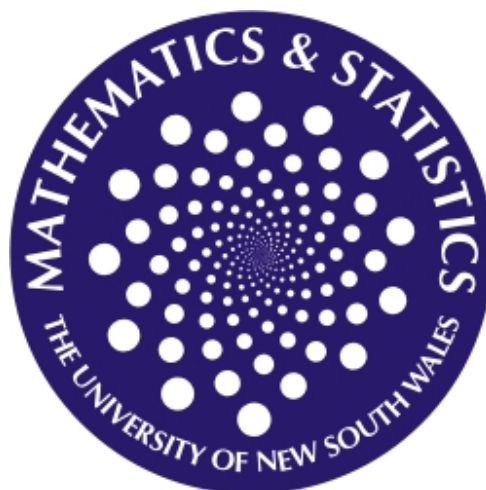
UNSW
THE UNIVERSITY OF NEW SOUTH WALES

**FACULTY OF SCIENCE
SCHOOL OF MATHEMATICS AND STATISTICS**

MATH5215

**DYNAMIC EQUATIONS
ON TIME SCALES**

Session 2, 2007



MATH5215 – Course Outline

Information about the course

Course Authority: Dr. Chris TISDELL

Lecturers: Dr. Chris TISDELL. RC-4103, email cct@unsw.edu.au.

Consultation: Please use email to arrange an appointment.

Credit, Prerequisites, Exclusions:

This course counts for 6 Units of Credit (6UOC).

There are no formal prerequisites but it will be assumed that students are familiar with first year calculus and second year ordinary differential equations at the level of MATH1231 (or MATH1241) and MATH2120 (or MATH2130).

There is no higher version of this subject.

Lectures: There will be two lectures per week, with specific times to be decided on Monday, week 1 of session:

Wed 4pm	RC-3084
Thur 11am	RC-3084

Tutorials: There are no tutorials.

My eLearning Vista: Further information, skeleton lecture notes, and other material will be provided via My eLearning Vista.

Course aims

This course aims to introduce students to the area of *dynamic equations on time scales*, which is a modern and flexible extension of: traditional calculus; differential equations; and dynamical systems.

The basic concepts of delta derivative and delta integral will be defined and developed to form dynamic equations on time scales. These equations will be analysed, with qualitative and quantitative aspects of solutions to be discovered and explored. Modelling aspects of real-world phenomena will also feature.

Relation to other mathematics courses

This subject builds on the areas of calculus and ordinary differential equations introduced in first and second year mathematics subjects.

This course is particularly useful for those majoring in either Applied or Pure mathematics, or for those who are planning to teach, as the course features extensions of both theoretical ideas and modelling techniques, from calculus and differential equations.

Student Learning Outcomes

Students taking this course will develop an appreciation and knowledge of the basic time scale calculus, including the associated dynamic equations, and their modelling potential.

The ability to successfully analyse, explore and discover the qualitative and quantitative aspects of solutions to dynamic equations on time scales will be paramount.

Through regularly attending lectures and applying themselves in tutorial exercises, students will develop competency in mathematical presentation, written and verbal skills.

Relation to graduate attributes

The above outcomes are related to the development of the Science Faculty Graduate Attributes, in particular: **1. Research, inquiry and analytical thinking abilities**, **4. Communication**, **6. Information literacy**

Teaching strategies underpinning the course

New ideas and skills are introduced and demonstrated in lectures, then students develop these skills by applying them to specific tasks in assessments.

Rationale for learning and teaching strategies

We believe that effective learning is best supported by a climate of enquiry, in which students are actively engaged in the learning process. To ensure effective learning, students should participate in class as outlined below.

We believe that effective learning is achieved when students attend all classes, have prepared effectively for classes by reading through previous lecture notes, in the case of lectures, and, in the case of tutorials, by having made a serious attempt at doing for themselves the tutorial problems prior to the tutorials.

Furthermore, lectures should be viewed by the student as an opportunity to learn, rather than just copy down lecture notes.

Effective learning is achieved when students have a genuine interest in the subject and make a serious effort to master the basic material.

The art of logically setting out mathematics is best learned by watching an expert and paying particular attention to detail. This skill is best learned by regularly attending classes.

Assessment

Assessment in this course will consist of two assignments (40%) and a final examination (60%).

Knowledge and abilities assessed: All assessment tasks will assess the learning outcomes outlined above, specifically, the ability to analyse and explore the time scales calculus and the qualitative and quantitative aspects of solutions to dynamic equations on time scales.

Assessment criteria: The main criteria for marking all assessment tasks will be clear and logical presentation of correct solutions.

Assignments

Rationale: Assignments will give an opportunity for students to try their hand at more difficult problems requiring more than one line of argument and also introduce them to aspects of the subject which are not explicitly covered in lectures.

Assignments must be YOUR OWN WORK, or severe penalties will be incurred.

You should consult the University web page on plagiarism

www.lc.unsw.edu.au/plagiarism

and make sure you reference your material appropriately.

Task	Date Avail.	Date Due	Form of Submission	Weighting
Ass 1	Week 6	Mon Week 8	Written	20%
Ass 2	Week 8	Mon Week 12	Written	20%

Late assignments will not be accepted.

Examination

Duration: Two hours.

Rationale: The final examination will assess student mastery of the material covered in the lectures.

Weighting: 60% of your final mark.

Further details about the final examination will be available in class closer to the time.

Additional resources and support

Tutorial Exercises

A set of tutorial exercises will be given out. These problems are for YOU to do to enhance mastery of the course.

Lecture notes

A set of skeleton notes containing only definitions, theorems and proofs will be provided for the course on My eLearning Vista.

Textbooks

The textbook is “*Dynamic equations on time scales. An introduction with applications*”, Martin BOHNER and Allan PETERSON. Birkhäuser, Boston, 2001.

The content of the course will be defined by the lectures.

My eLearning Vista

All course materials will be available on My eLearning Vista. You should check regularly for new materials.

Course Evaluation and Development

The School of Mathematics and Statistics evaluates each course each time it is run. We carefully consider the student responses and their implications for course development. It is common practice to discuss informally with students how the course and their mastery of it are progressing.

Administrative matters

Additional Assessment

See attached handout.

School Rules and Regulations

Fuller details of the general rules regarding attendance, release of marks, special consideration etc are available via the School of Mathematics and Statistics Web page at

<http://www.maths.unsw.edu.au/students/current/policies/studentpolicy.html>.

Plagiarism and academic honesty

Plagiarism is the presentation of the thoughts or work of another as one's own. Issues you must be aware of regarding plagiarism and the university's policies on academic honesty and plagiarism can be found at <http://www.lc.unsw.edu.au/plagiarism> and http://www.lc.unsw.edu.au/plagiarism/plagiarism_STUDENTBOOK.pdf.

Detailed course schedule

It is intended that the following topics will be covered in the given order. Any variation from this will be indicated by the lecturer.

Section 1 – TIME SCALE CALCULUS: *The hybrid revolution begins.*

- motivational examples
- time scale definitions
- the delta derivative
- delta differentiation laws
- the delta integral.

Section 2 – LINEAR THEORY: *The power to model stop–start processes.*

- the exponential function on time scales
- first–order dynamic equations
- second–order dynamic equations.

Section 3 – NONLINEAR THEORY: *A deeper understanding of mathematics & our world.*

- metric spaces
- Banach's fixed–point theorem
- existence, uniqueness, boundedness & approximation of solutions to IVPs
- existence, uniqueness, boundedness & approximation of solutions to BVPs
- open problems for further research study.