



MONASH University

School of Mathematical Sciences

Honours in

Mathematics, Statistics,

Applied Mathematics, Astrophysics

and Atmospheric Science

(Fourth Year) 2009

(Revised 20 February 2009 with new topic - M4282)

<http://www.maths.monash.edu.au/honours>

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1. Entry Requirements and Enrolment

The normal minimum requirement for honours (fourth year) in mathematics is an average of at least 70 in 24 points of relevant third year units, or equivalent.

A list of relevant units that can be counted in this average is available from the Honours Coordinator, Maria.Athanassenas@sci.monash.edu.au, Room 419, 4th Floor, Building 28, Clayton Campus, telephone: - 9905 4462.

Applications for honours have to be submitted by (absolutely) no later than Tuesday 11 November, 2008 at the School of Mathematical Sciences in time for the application to reach the Faculty Office by their deadline of Friday 14 November, 2008. This is well before you know all of your third-year results. If you are considering doing Honours and think you have a chance, please submit an application. Students who intend on finishing their course at the end of 2008 but are not intending on starting honours until semester two 2009 can apply now. Students who are not eligible by the end of 2008 but want to start in semester two, 2009 must apply mid year 2009, not now.

How to apply

1. Obtain an Honours Application Form the Science Faculty web page or from Linda Mayer, Room 406, 4th Floor, Building 28 (Clayton) or from the Faculty of Science Office, Building 19 (Clayton).
2. Discuss your options with the Honours Coordinator, Dr Maria Athanassenas, Room 419, 4th Floor, Building 28, Tel. No. 9905 4462 and complete *Section A and B* of the application form. **Section B must be completed by the Applicant in conjunction with the Honours Coordinator.**
3. Return the completed application form to the School of Mathematical Sciences, Room 406, 4th Floor, Building 28 (Clayton) **by no later than Tuesday 11 November, 2008**. Please note students who wish to submit their application directly through the Faculty **by the Faculty deadline of Friday 14 November, 2008** **must** first see the Honours Coordinator, Dr Maria Athanassenas in Room 419, Building 28 to ensure that Section B of the Application is completed and signed off by her.
4. Successful applicants will be notified via a letter from the Faculty of Science during mid to late December 2008 or early January 2009. This letter will also outline the procedure for enrolling into your honours units at the Science Faculty. You then need to contact the School's Honours Coordinator, Maria Athanassenas, Room 419, 4th Floor, Building 28, to discuss your choice of lecturing topics, essays, projects etc.
5. During early December 2008, you will also be posted the School's *Internal Lecture Topic / Project enrolment form* or you can obtain this form directly from Linda Mayer, Room 406, 4th Floor, Building 28 (Clayton), this form is for internal school records only. Please take note of the deadline date of return of this form when you receive it.

2. Honours Unit Requirements

Each honours program, whether full-time or part-time consists of three units:

Astrophysics honours:

ASP4210 / ASP4220 / ASP4100

Atmospheric science honours:

ATM4210 / ATM4220 / ATM4100

Mathematics, Applied Mathematics and Statistics honours:

MTH4210 / MTH4220 / MTH4100

These vary slightly according to the area of study.

Astrophysics

ASP4210 Astrophysics honours part 1 (12 points): normally 3 lecture topics (33.3% - 4 points each).

ASP4220 Astrophysics honours part 2 (12 points): normally 3 lecture topics and an essay (33.3% - 4 points each).

ASP4100 Astrophysics honours part 3 (24 points): normally an essay (16.7% - 4 points) and a research project (83.3% - 20 points)

Atmospheric Science

ATM4210 Atmospheric science honours part 1 (12 points): normally 3 lecture topics (33.3% - 4 points each).

ATM4220 Atmospheric science honours part 2 (12 points): normally 2 lecture topics and an essay (33.3% - 4 points each).

ATM4100 Atmospheric science honours part 3 (24 points): a research project (100% - 24 points)

Mathematics, Applied Mathematics and Statistics

MTH4210 Mathematics honours part 1 (12 points): normally 3 lecture topics (33.3% - 4 points each).

MTH4220 Mathematics honours part 2 (12 points): normally 2 lecture topics and an essay for both Mathematics and Applied Mathematics or three lecture topics for Statistics (33.3% - 4 points each).

MTH4100 Mathematics honours part 3 (24 points): normally a research project (66.7% - 16 points) and two lecture topics (16.7% - 4 points each).

Honours lecture topics are normally chosen from the honours lecture topics listed later in this handbook. For Mathematics and Statistics Students, the honours lecture topics may also be chosen from the ICE-EM / AMSI Summer School being held from 12 January to 6 February 2009 at the University of Wollongong, NSW, (refer to pages 5 - 7 of this handbook). For Applied Mathematics, students must complete the two core topics M4411 and M4422 plus five other approved lecture topics. For Statistics, the honours lecture topics may be chosen from those available from the

Key Centre for Statistical Science. For Astrophysics, one third-year lecture unit may be counted to replace an honours lecture topic. For Atmospheric Science depending on the student's previous experience and interests, one of the honours lecture topics listed may be replaced by a third-year atmospheric science or mathematics lecture unit. Otherwise, up to two third year mathematics lecture units may be counted, with the permission of the Honours Coordinator. If more than the total required number of honours lecture topics (including third-year lecture units) are taken, then those with the best final results will be used to determine your final overall grade in Honours.

Your choice of lecture topics appears only in the School records; you are allowed to change it in the first few weeks of the semester. The important thing is to make sure you meet the honours unit requirements listed above. If in doubt, check your choice of topics with the Honours Coordinator.

3. List of Honours lecture Topics

The lecture topics fall into five main groups - mathematics, applied mathematics, statistics, astrophysics and atmospheric science. You can select lecture topics from any group, as long as the requirements of your enrolled honours units are met. It is your own responsibility to ensure that a sufficient number of lecture topics is taken.

Students interested in statistics should bear in mind that honours statistics topics may be taken at other universities, as part of the Key Centre for Statistical Science program (KCSS). Details may be obtained from the statistics advisor, Dr Aidan Sudbury, Room 459, 4th Floor, Building 28, (Clayton), email: Aidan.Sudbury@sci.monash.edu.au telephone: (03) 9905 4405.

Honours topics from other Schools or outside Monash may also be available in other areas, and you can take these with the permission of the Honours Coordinator.

In addition, ALL Honours students are eligible to attend the ICE-EM/AMSI Summer School organised through the Australian Mathematical Sciences Institute (AMSI) and its International Centre of Excellence for Education in Mathematics (ICE-EM) and have these honours courses offered there count towards their Honours degree. Any one of the four weekly courses or two courses running over two weeks will count as an equivalent to one honours lecture topic being offered by the School of Mathematical Sciences. Courses are open to prospective honours students in the School of Mathematical Sciences. For prospective honours students in mathematical sciences at any of the consortium universities / research establishments the courses will be free of tuition charges, and those from interstate will have their travel and accommodation paid in full.

In 2009, the ICE-EM / AMSI Summer School will be hosted by the University of Wollongong, NSW held from 12 January to 6 February 2009. For more information, please visit: <http://www.uow.edu.au/informatics/mathsummerschool/>

Important Note: Not all of the lecture topics listed below will necessarily be offered next year, for example if they attract an insufficient number of students, topics may be cancelled. **Thus it is important for you to notify us, at the time of enrolment, which lecture topics you wish to take.** A topic not offered as a lecture course can often be used as the basis of an essay.

3.1 Mathematics lecture topics

Note that units with code ending in 1 are offered in first semester, those with code ending in 2 are offered in the second semester.

M4031 General Relativity

M4051 Topology

M4061 Banach Algebras

M4081 Lie Groups

M4361 Diophantine Equations

M4022 Partial Differential Equations

M4042 Differential Geometry

M4072 Galois Theory

Please note students in the Maths honours program may also take

M4411 Advanced Computational Mathematics A and/or

M4422 Advanced Methods for Applied Mathematics

from the Applied Mathematics lecture topics, provided they have completed the appropriate prerequisites. Please refer to 3.3 Applied Mathematics lecture topics contents section and section 5.3 Applied Mathematics in the details of topics section for the actual synopsis for each unit.

If you want more options to choose from the topics on offer by the School in 2009, additional lecture topics can be taken by Mathematics and Statistics honours students through the ICE-EM/AMSI Summer School which is being held at University of Wollongong, NSW, 12 January to 6 February 2009. This summer school is being run through the Australian Mathematical Sciences Institute (AMSI) and its International Centre of Excellence for Education in Mathematics (ICE-EM).

To obtain details and information about topics being offered at the ICE-EM/AMSI Summer School in 2009, visit:
<http://www.uow.edu.au/informatics/maths/summerschool/>

If you are interested in taking one of these summer semester topics, please speak to the Honours Coordinator, Dr Maria Athanassenas, telephone, 9905 4462, Room 419, 4th Floor, Building 28, Email: Maria.Athanassenas@sci.monash.edu.au

ICE-EM / AMSI Summer Semester Units 2009

| | |
|---|-------------------------|
| Advanced Data Analysis | - full course (4 weeks) |
| Groups of Lie type and their Geometries | - full course (4 weeks) |
| Linear Analysis | - full course (4 weeks) |
| Mathematics for Nanotechnology | - full course (4 weeks) |
| Measure Theory and Integration | - full course (4 weeks) |
| Industrial Mathematics | - half course (2 weeks) |
| Mathematics in Industry Study Group | - half course (2 weeks) |

3.2 Statistics lecture topics

Note that units with code ending in 1 are offered in first semester, those with code ending in 2 are offered in the second semester.

M4191 Stochastic Calculus and Mathematical Finance

M4271 Stochastic Processes

M4232 Statistical Inference

M4282 Computation in Financial Mathematics - NEW

The following units are also available to Statistics honours students through the Key Centre for Statistical Sciences (KCSS).

Please check the website address mentioned below **at a later date to view the 2009 offerings.**

Details of the individual units are available from Dr Aidan Sudbury, telephone, 9905 4405, Room 459, 3rd Floor, Building 28.

List below is still subject to change at the point of publication of this document.

AHD Analysis of Hierarchical Data

AMD Analysis of Medical Data

CAS Consulting and Applied Mathematics

AFE Applied Financial Econometrics

FE2 Financial Econometrics 2

GTA Game Theory and Applications

MOP Mathematics of Option Pricing

PI Probability for Inference

RA Regression Analysis

SIM Statistical Inference

SPA Stochastic Processes and Applications

SQPI Statistics for Quality and Productivity in Industry

TSA Time Series Analysis

For more information, see the Key Centre web page:

<http://www.buseco.monash.edu.au/centres/kcss/>

Statistics honours students can have more options to choose from the topics on offer by the School in 2009, i.e., additional lecture topics can be taken by Mathematics and Statistics honours students through the ICE-EM/AMSI Summer School which is being held at University of Wollongong, NSW, 12 January to 6 February 2009. This summer school is being run through the Australian Mathematical Sciences Institute (AMSI) and its International Centre of Excellence for Education in Mathematics (ICE-EM).

To obtain details and information about topics being offered at the ICE-EM/AMSI Summer School in 2009, visit:
<http://www.uow.edu.au/informatics/maths/summerschool/>

If you are interested in taking one of these summer semester topics, please speak to the Honours Coordinator, Dr Maria Athanassenas, telephone, 9905 4462, Room 419, 4th Floor, Building 28, Email: Maria.Athanassenas@sci.monash.edu.au

ICE-EM / AMSI Summer Semester Units 2009

| | |
|---|-------------------------|
| Advanced Data Analysis | - full course (4 weeks) |
| Groups of Lie type and their Geometries | - full course (4 weeks) |
| Linear Analysis | - full course (4 weeks) |
| Mathematics for Nanotechnology | - full course (4 weeks) |
| Measure Theory and Integration | - full course (4 weeks) |
| Industrial Mathematics | - half course (2 weeks) |
| Mathematics in Industry Study Group | - half course (2 weeks) |

3.3 Applied Mathematics lecture topics

Note that units with code ending in 1 are offered in first semester, those with code ending in 2 are offered in the second semester.

M4411 Advanced Computational Mathematics A

M4031 General Relativity

M4151 Waves in Fluids

M4422 Advanced Methods for Applied Mathematics

M4022 Partial Differential Equations

M4192 Stochastic Calculus and Mathematical Finance

Students in the Applied Mathematics honours program must complete the two core topics M4411 and M4422 along with five other lecture topics (including at least two from those listed above and no more than one third-year unit) as approved by the Applied Mathematics honours advisor.

Students in other honours programs may also take M4411 and/or M4422 provided they have completed the appropriate prerequisites.

3.4 Astrophysics lecture topics

Note that units with code ending in 1 are offered in first semester, those with code ending in 2 are offered in the second semester.

M4031 General Relativity

M4331 Planetary Dynamics and Evolution

M4411 Advanced Computational Mathematics A

M4112 The Sun

M4222 Research Topics in Astrophysics

M4422 Advanced Methods for Applied Mathematics

Compulsory Core Units:

M4031, M4331, M4112

Recommended Units:

M4222, M4411, M4422

3.5 Atmospheric Science lecture topics

Note that units with code ending in 1 are offered in first semester, those with code ending in 2 are offered in the second semester.

M4151 Waves in Fluids

M4511 Boundary Layer Meteorology

M4561 Atmospheric Modelling

M4571 Advanced Dynamical Meteorology

M4581 Steady Circulations of the Atmosphere and Oceans

M4500 Synoptic Meteorology Laboratory

Please note students in the Maths honours program may also take

M4411 Advanced Computational Mathematics A and/or

M4422 Advanced Methods for Applied Mathematics

from the Applied Mathematics lecture topics, provided they have completed the appropriate prerequisites. Please refer to 3.3 Applied Mathematics lecture topics contents section and section 5.3 Applied Mathematics in the details of topics section for the actual synopsis for each unit.

4. Essays and projects

As outlined in Section 2 above, the general requirements for completing the honours year in the School of Mathematical Sciences includes an essay, a major project and various lecture topics.

In Mathematics, Applied Mathematics, Astrophysics and Atmospheric Science the essays are worth 1 lecture topic (i.e. 4 points), Statistics students are not required to do an essay but do an extra lecture topic in place of this. In Mathematics, Applied Mathematics and Statistics the projects are worth 4 lecture topics (i.e. 16 points). In Astrophysics the project is worth 5 lecture topics (i.e. 20 points). In Atmospheric Science the project is worth 6 lecture topics (i.e. 24 points).

The essay must be completed in the first semester, and its recommended length is 15-20 pages, with a maximum of 25. Neat handwritten essays are accepted, but you are encouraged to use LaTeX, because it is easier to backup and revise, and it gives superior presentation. At the end of the semester you will be required to give a 25 minute talk on your essay, which counts 20% towards the overall essay mark.

In Astrophysics, the essay will normally be done in preparation for the research project. It comprises a literature survey as well as discussion of any mathematical and numerical techniques which are necessary to complete the project but which are unfamiliar to the student. The supervisor and co-supervisor will direct both the essay and the project. The project is worth 5 lecture topics (i.e. 20 points).

The project is due at the end of second semester and includes a talk, which counts 10% towards the overall project mark. There is also a short talk given at the beginning of second semester, which is not assessed, the purpose of the non-assessed talk is to help students clarify their goals and obtain feedback before writing up their work. The recommended length of the written project is 40-50 pages.

The time you spend on the essay and project should be similar to the time spent on the equivalent number of lecture topics. It is therefore clear that the project should be commenced at the beginning of your first semester, alongside the essay (which may be on a related topic). You should choose a topic and find a supervisor during January or February. It is also advisable to meet your supervisor regularly, say once a week, as soon as lectures begin.

The School offers some essay and project topics in advance. However, we will also attempt to satisfy your own interests, provided a supervisor with the appropriate expertise is available. Further information may be obtained when you enrol, but it is not necessary to wait that long. You are welcome to consult the Honours Coordinators or Honours Advisors (listed under the contacts section of this handbook).

5. Details of topics

5.1 Mathematics

M4031 GENERAL RELATIVITY

- **Lecturer:** Leo Brewin
- **Contact Details:** Leo.Brewin@sci.monash.edu.au, Room 317, Building 28, Tel.: 9905 4456.

Aims

The aim is to study General Relativity: to understand its claims as a gravitational theory, its relationship with special relativity and Newtonian gravitational theory and to examine its predictions and their observational verification (or even non-verification). This topic is also designed to serve as an introductory course for anyone who wants to do further study in GR.

Syllabus

Differential geometry: Riemannian manifolds, covariant differentiation, geodesics, curvature tensor. Einstein's equations, black holes, experimental tests of general relativity.

Prerequisites

MTH2010 Multivariable Calculus and ASP2051 / ASP3051 Relativity and Cosmology.

Recommended book

D'Inverno, R., "Introducing Einstein's relativity", Oxford, 1992.

References

Schutz, B.F., "A First course in general relativity", CUP, 1985.

Wald, R.M., "General relativity", U. of Chicago Press, 1984.

M4051 TOPOLOGY

- **Lecturer:** Burkard Polster
- **Contact Details:** Burkard.Polster@sci.monash.edu.au, Room 411, Building 28, Tel.: 9905 4493.

Aims

Topology is the geometry of continuity, and as such it is involved in almost all parts of mathematics. The aim of this unit is to explain the basic concepts of topology, with the help of examples from geometry, analysis and algebra, and to see how topology interacts with geometric, algebraic and analytic properties.

An example from classical geometry is the Euler polyhedron formula, which shows that the quantity

$$(\text{number of vertices}) - (\text{number of edges}) + (\text{number of faces})$$

is independent of the way a surface is divided into polygonal regions. A related example in differential geometry is the Gauss-Bonnet theorem, which shows that the total curvature of a surface depends only on the number of "holes" in it.

Syllabus

Open, closed and compact sets. Continuous mappings and homeomorphisms. Curves, surfaces and other manifolds, in particular spheres and projective spaces. From the Euler polyhedron formula to homology. The classification of surfaces: genus and orientability. Fundamental group, quotient spaces and coverings. Genus and the Gauss-Bonnet theorem.

Prerequisite

MTH3132 Analysis and Geometry, MTH2140 / MTH3140 Real Analysis

References

Armstrong, M. A., "Basic topology", McGraw-Hill, 1979.

Stillwell, J., "Classical topology and combinatorial group theory", Springer Verlag, 1980.

Thurston, W.P., "Three-dimensional geometry and topology", vol. 1, Princeton University Press, 1997.

Weeks, J., "The shape of space", 2nd edition, Marcel Decker, 2002.

M4061 BANACH ALGEBRAS

- **Lecturer:** Alan Pryde
- **Contact Details:** Alan.Pryde@sci.monash.edu.au, Room 424, Building 28, Tel.: 9905 4417.

Aims

The main aim of this unit is to present a number of major theorems in functional analysis. This branch of mathematics is fundamental to the study of various areas of mathematical physics, such as quantum mechanics and to the modern theory of partial differential equations. The unit progresses from Hilbert spaces, through Banach spaces and Banach algebras to C^* -algebras, and provides a background to reading in operator theory. In addition it provides some startling applications of the theory of complex analysis.

Syllabus

Banach spaces. Linear transformations. The closed graph and open mapping theorems. Dual spaces. Hahn-Banach theorem. Alaoglu theorem. Banach algebras. Maximal group. Spectrum and resolvent. Gelfand-Mazur theorem. Maximal ideals of commutative Banach algebras. Gelfand representation theorem. Stone-Weierstrass theorem. C^* -algebras. Gelfand-Naimark representation theorem.

Prerequisites

MTH2140 / MTH3140 Real Analysis.

MTH3160 Analysis and Topology (recommended).

MTH3021 Complex Analysis and Integral Transforms (recommended).

M4051 Topology (recommended as a co-requisite).

Recommended reading

Simmons, G.F., "Introduction to topology and modern analysis", McGraw-Hill.

M4081 LIE GROUPS

- Lecturer: Todd Oliynyk
- Contact Details: Todd.Oliynyk@sci.monash.edu.au, Room 421, Building 28, Tel.: 9905 4433.

Aims

This course aims to introduce the concept of Lie group and explain its origins in geometry and physics. Students will first meet the orthogonal groups as groups of rigid motions of Euclidean space, and then the unitary and symplectic groups as the analogous groups for spaces with complex and quaternion coordinates respectively. There will also be some discussion of the exceptional groups and the octonions, and of the classification of simple Lie groups.

Syllabus

The classical Lie groups and their Lie algebras, maximal tori, and centers. The geometry and topology of Lie groups. The exponential map. Classification of simple Lie groups via the classification of their Lie algebras.

Prerequisites

MTH2021 Linear Algebra , MTH2140 / MTH3140 Real Analysis

References

Tapp, K, “Matrix groups for undergraduates”, American Mathematical Society, 2005.

(This is for reference only, as I will hand out my own notes.)

M4361 DIOPHANTINE EQUATIONS

- **Lecturer:** Daniel Delbourgo
- **Contact Details:** Daniel.Delbourgo@sci.monash.edu.au, Room 425, Building 28, Tel.: 9905 4771.

Aims

The study of rational solutions to polynomials (in several variables) can be traced back to the ancient Greeks. As an illustration, the equation

$$x^3 + y^3 = 1$$

has infinitely many real solutions, but only two rational solutions i.e. $(x,y) = (1,0)$ or $(0,1)$. Bizarrely, the method of finding rational points on curves is intimately connected to the number of holes (the genus) of the curve over the complex numbers.

The course will cover the very basics of algebraic geometry, with an emphasis on explicit methods. We will then focus exclusively on curves, and how to find points on them. After covering conics, we next describe the rich theory of elliptic curves (genus = 1), and hopefully the Mordell-Weil theorem which is beautiful!

Syllabus

Affine and Projective Varieties; Hilbert's Nullstellensatz; Embeddings of Curves; the Hasse Principle for Conics; Elliptic Curves and Modular Forms; Ramanujan's Conjecture (if there is time).

Prerequisites

Algebra and Number Theory I, II.

References

Please contact lecturer.

M4411 ADVANCED COMPUTATIONAL MATHEMATICS A

Please note Mathematics Honours students may also take the new unit of M4411 Advanced Computational Mathematics A from the Applied Mathematics Honours Discipline as part of their Mathematics Honours course, provided they have completed the appropriate prerequisites

Please view the synopsis and prerequisites for M4411 under Section 5.3 of this Handbook entitled: Applied Mathematics

M4022 PARTIAL DIFFERENTIAL EQUATIONS

- **Lecturer:** Professor Robert Bartnik
- **Contact Details:** Robert.Bartnik@sci.monash.edu.au, Room 420, Building 28, Tel.: 9905 4484.

Aims

Partial Differential Equations (PDE) arise naturally whenever natural processes involving change and variation are studied. Applications may be found in fields as diverse as biology and medicine, finance and chemistry, and geometry and physics.

This subject will survey the most important types of PDE (elliptic, parabolic and hyperbolic), studying their distinguishing properties and the techniques used to explore these properties.

Topics include the Cauchy (initial value) problem with various boundary and initial conditions; Dirichlet and Neumann boundary value problems (BVP); the role of explicit solutions; existence and uniqueness proofs; and maximum principles and mean values. The choice of topics may vary - please consult the lecturer for details.

Syllabus

Examples of PDE --- heat equation, wave equation and Laplace's equation, --- mathematical models and variational methods, Euler-Lagrange equations.

Harmonic functions: subharmonic, superharmonic functions; mean value properties; maximum principles; representation formulae, Green's functions.

Heat equation: heat kernel representation; mean value property; maximum principles, existence and uniqueness.

Wave equation: energy estimates and uniqueness; d'Lambert representation; Duhamel's principle.

M4022 Partial Differential Equations continued over the page\...

Functional analytic techniques

Overview of L^p -theory; approximation by convolutions.

Weak derivatives; Sobolev spaces; weak solutions.

Embedding theorems; Rellich compactness.

Review of Hilbert space theory; weak convergence; Riesz, Lax-Milgram theorems.

Prerequisite:

MTH3160 Analysis and Topology.

Recommended:

MTH3011 Partial Differential Equations.

References:

John, F., "Partial differential equations", Springer Verlag, 3rd edition, 1978.

Gilbarg, D., Trudinger, N.S., "Elliptic partial differential equations of second order," Springer Verlag, 2nd edition, 1983.

Strauss, W., "Partial differential equations; an introduction", Wiley, 1992.

Evans, L.C., "Partial differential equations", AMS, 1998.

Folland, G.B., "Introduction to partial differential equations", Princeton, 2001.

M4042 DIFFERENTIAL GEOMETRY

- **Lecturer:** Dr Pengzi Miao
- **Contact Details:** Pengzi.Miao@sci.monash.edu.au, Room 414, Building 28, Tel.: 9905 4432.

Aims

Manifolds are “topological spaces with local coordinates” (e.g. surfaces) i.e. spaces locally homeomorphic to the euclidean m -space. A differentiable structure on such a manifold makes it possible to generalize to these “curved spaces” many basic concepts of calculus, connected with differentiation or integration of functions and maps defined on the “flat” euclidean m -space.

This is an introductory course on differentiable manifolds and related basic concepts, which are the common ground for differential geometry, differential topology, global analysis, (i.e calculus on manifolds including geometric theory of integration) and modern mathematical physics.

Syllabus

Smooth manifolds; coordinate systems. Tangent vectors; tangent and cotangent bundles of a manifold, tensor fields; connections and covariant differentiation. Metrics. Geodesics. Curvature tensor. Relation between geometry and topology of manifolds. Applications to general relativity.

Prerequisites

MTH3132 Analysis and Geometry or MTH2021 Linear Algebra with Applications. M4051 Topology is recommended as a co-requisite.

Recommended reading

Informal lecture notes may be provided.

Do Carmo, M., “Introduction to Riemannian geometry”, Birkhäuser, 1992.

References

Spivak, M.A., “A comprehensive introduction to differential geometry”, Vol. I, Publish or Perish Inc., 1979 (1970).

Spivak, M., “Calculus on manifolds”, W.I. Benjamin, Inc., 1965.

M4072 GALOIS THEORY

- **Lecturer:** Tom Hall
- **Contact Details:** Tom.Hall@sci.monash.edu.au, Room 432, Building 28, Tel.: 9905 4412.

Aims

The aim of this unit is to study fields and their symmetry, and thereby understand some classical problems of geometry and algebra. These problems can all be translated into polynomial equations, and Galois discovered that the solution of such equations depends on their symmetry. He also recognised that symmetry is captured by the group concept, and found a property of groups (now called “solvability”) which detects solvability of equations.

Galois theory develops these ideas systematically to explain why a variety of problems cannot be solved. In the process, some important concepts of group theory are developed and applied.

Syllabus

Formulation of classical problems in field theory. The arithmetic of polynomials. Irreducibility. Unsolvability of the classical ruler and compass problems. Automorphisms of fields and the Galois group. Radical extensions. Unsolvability of the general quintic equation.

Prerequisites

Please see lecturer

References

Fraleigh, J. B., “A first course in abstract algebra”, Wiley.

Petsinis, T., “The French mathematician”, Penguin.

Stillwell, J. C., “Elements of algebra”, Springer-Verlag.

M4422 ADVANCED METHODS FOR APPLIED MATHEMATICS

Please note Mathematics Honours students may also take the new unit of M4422 Advanced Methods for Applied Mathematics from the Applied Mathematics Honours Discipline as part of their Mathematics Honours course, provided they have completed the appropriate prerequisites.

Please view the synopsis and prerequisites for M4422 under Section 5.3 of this Handbook entitled: Applied Mathematics

5.2 Statistics

M4191 STOCHASTIC CALCULUS AND MATHEMATICAL FINANCE

- **Lecturer:** Prof. Fima Klebaner
- **Contact Details:** Fima.Klebaner@sci.monash.edu.au, Room 352, Building 28, Tel.: 9905 4409.

Aims:

This unit provides an introduction to Stochastic Calculus and mathematics of financial derivatives. Stochastic calculus is an extension of calculus to non-differentiable functions. It is a branch of pure mathematics, which found use in applications. Besides finance it is also used in engineering. I teach from my book “Introduction to stochastic calculus with applications”, 2nd Ed, Imperial College Press, 2005.

Syllabus

Variations and Quadratic variation of functions. Review of Integration and Probability. Brownian motion. Ito integrals and Ito’s formula. Stochastic Differential Equations and Diffusions. Calculation of expectations and PDE’s, Feynman-Kac formula. Martingales and Semimartingales. Change of Probability Measure and Girsanov Theorem. Fundamental Theorems of Asset Pricing. Change of Numeraire. Application to options.

Prerequisites

Some knowledge of probability is required and some knowledge of financial mathematics is desirable.

References

Hull, John, “Options, futures and other derivative securities”, Prentice Hall.

Klebaner, Fima, “Introduction to stochastic calculus with applications”, 2nd edition, Imperial College Press, 2005.

M4271 STOCHASTIC PROCESSES

- **Lecturer:** Boris Miller
- **Contact Details:** Boris.miller@sci.monash.edu.au, Room 464, Building 28, Tel.: 9905 5870.

Aims:

This unit provides an introduction to general theory of stochastic processes and their applications. Stochastic processes constitute a branch of applied mathematics, which found use in various areas of engineering, resource management, control, and finance. The main uses of stochastic processes are the estimation and filtering, stochastic optimization and control.

Syllabus

Basic concepts of the probability theory and stochastic processes. Random sequences. Markov chains. Continuous-time Markov chains. Estimation of Markov processes. Wonham filter. Optimal control. Applications to the resource management and telecommunications. Random functions. Stochastic differential equations. Kalman filtering in continuous time.

Prerequisites

It would be useful to have MTH2222 and MTH3241 as prerequisites. Some knowledge of basic probability is desirable.

References

Ross, Sheldon M, "Stochastic processes", John Wiley & Sons, NY, 1983.

Elliot, Robert J, ea, "Hidden Markov models", Springer-Verlag, NY, 1995.

Miller, B and Pankov, A, "Theory of random processes", Moscow, Nayka, 2002.

M4232 STATISTICAL INFERENCE

- Contact Details: Boris.buchmann@sci.monash.edu.au, Room 453, Building 28, Tel.: 9905 4487.

Aims:

Still to be advised

Syllabus

Still to be advised

Prerequisites

Still to be advised

References

Still to be advised

M4282 COMPUTATION IN FINANCIAL MATHEMATICS - NEW

- **Lecturers:** Prof. Fima Klebaner, Dr. Tianhai Tian
- **Contact Details:** Fima.Klebaner@sci.monash.edu.au, Room 460, Building 28, tel.: 99054409, Tianhai.Tian@sci.monash.edu.au, Room 451, Building 28, Tel. 99020890

Aims:

This unit introduces computational methods for simulating and evaluating financial market models. After the introduction of financial market models such as interest rate models, this unit provides numerical methods to solve stochastic differential equations and to compute required properties of the solution. It also uses Monte Carlo methods to solve problems in financial mathematics including option pricing and discusses optimization methods for estimating model parameters from financial market data. Computing programs in MATLAB or C++ are developed for the numerical methods discussed in this unit.

Syllabus

Stochastic differential equations. Wiener process. Numerical method. Taylor expansion of stochastic differential equations. Strong solution. Weak solution. Mean-square stability property. Monte Carlo simulation method. Evaluation of option values. European option. American option. Optimization methods. Calibration. The method of moments. Maximum-likelihood method. Computer Programming. MATLAB. C++.

Prerequisites

Some knowledge of probability is required and some knowledge of financial mathematics is desirable.

References

Klebaner, Fima, "Introduction to stochastic calculus with applications", 2nd edition, Imperial College Press, 2005.

P.E. Kloeden, E. Platen, H. Schurz, "Numerical solution of SDE through computer experiments", Springer-Verlag, 1994.

R. Seydel, "Tools for computational finance", Springer, 2002.

5.3 Applied Mathematics

Students undertaking the Applied Mathematics honours program must complete the following two core topics amongst the seven approved lecture topics that they can undertake. The synopsis of the 2 core topics for applied mathematics honours are outlined in this section.

Please refer to 3.3. Applied Mathematics topics for the list of those from within the other disciplines that are approved for applied mathematics honours students to undertake and please refer to the details of topics sections of the other disciplines for the synopsis of these additional 5 approved topics.

M4411 ADVANCED COMPUTATIONAL MATHEMATICS A

- Lecturers: Simon Clarke and Michael Page
- Contact Details: Michael.Page@sci.monash.edu.au, Room 326, Building 28, Tel.: 9905 4486; Simon.Clarke@sci.monash.edu.au, Room 209, Building 28, Tel.: 9905 4421.

Aims

To appreciate some of the important computational techniques which have broad applicability to solving research problems in applied mathematics, especially the main approaches and key factors involved in the numerical approximation of partial differential equations by finite difference methods.

Syllabus

The main topics covered are:

- A brief overview of classes of methods for multidimensional problems; non-uniform grids and coordinate transformations; truncation error, stability, consistency and convergence.
- Direct and iterative solution of elliptic PDE's, including conjugate gradient and multigrid approaches.
- Direct and operator splitting methods for the solution of parabolic PDE's in multiple dimensions, including FFT and ADI methods.
- Methods for the accurate solution of the advection equation and hyperbolic PDE's, including upwind and flux-splitting techniques.

M4411 continued over the page\...

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Prerequisites

MTH3011 and satisfactory completion of (or exemption from) the introductory computer programming topic M4400 Computer Programming and visualisation. MTH3051 recommended

Textbook (access essential)

LeVeque, Randall, "Finite Difference Methods for Ordinary and Partial Differential Equations", SIAM, 2007.

M4422 ADVANCED METHODS FOR APPLIED MATHEMATICS

- Lecturers: Paul Cally and Anthony Lun
- Contact Details: Paul.Cally@sci.monash.edu.au, Room 322, Building 28, Tel.: 9905 4471; Anthony.Lun@sci.monash.edu.au, Room 318, Building 28, Tel.: 9905 4447.

Aims

To appreciate some of the key principles of approximation of solutions of differential equations and integrals by asymptotic analysis

Syllabus

The syllabus will follow the textbook (Bender & Orszag) quite closely, so it is essential that students have access to that book. Some "lectures" will also be set as reading.

- Local analysis of linear ODE's, including irregular singular points and asymptotic series.
- Asymptotic expansion of integrals, including stationary phase and steepest descent.
- Perturbation series, including singular series and asymptotic matching.
- Boundary-layer theory, including matching between layers.
- WKB theory.

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M4422 continued from previous page\...

Assessment

- Continuous assessment (problems from Bender & Orszag) 50%
- Exam 50%

Prerequisites

MTH3060 recommended

Textbook (access essential)

Bender, C.E. and Orszag, S.A., “Advanced Mathematical Methods for Scientists and Engineers” Springer 1999 (originally McGraw-Hill 1978). [US\$72 from Amazon]

5.4 Astrophysics

Compulsory Core Units are M4031, M4331, M4112. Recommended Units are M4222, M4411, M4422

M4031 GENERAL RELATIVITY

- **Lecturer:** Leo Brewin
- **Contact Details:** Leo.Brewin@sci.monash.edu.au, Room 317, Building 28, Tel.: 9905 4456.

Aims

The aim is to study General Relativity: to understand its claims as a gravitational theory, its relationship with special relativity and Newtonian gravitational theory and to examine its predictions and their observational verification (or even non-verification). This topic is also designed to serve as an introductory course for anyone who wants to do further study in GR.

Syllabus

Differential geometry: Riemannian manifolds, covariant differentiation, geodesics, curvature tensor. Einstein's equations, black holes, experimental tests of general relativity.

Prerequisites

MTH2010 Multivariable Calculus and ASP2051 /ASP3051 Relativity and Cosmology.

Recommended book

D'Inverno, R., *Introducing Einstein's relativity*, Oxford, 1992.

References

Schutz, B.F., *"A first course in general relativity"*, CUP, 1985.

Wald, R.M., *"General relativity"*, U. of Chicago Press, 1984.

M4331 PLANETARY DYNAMICS AND EVOLUTION

- **Lecturers:** Rosemary Mardling and Louis Moresi
- **Contact Details:** Rosemary.mardling@sci.monash.edu.au, Room 314, Building 28, Tel.: 9905 4506, Louis.moresi@sci.monash.edu.au, Room 311, Building 28, Tel.: 9905 4450.

Part 1: Planetary Dynamics

Since 1995, over 300 planets have been discovered orbiting nearby Sun-like stars including 30 multiple-planet systems. None of these systems is anything like the Solar System; most contain planets with significantly eccentric orbits and many are extremely short-period. A huge amount of international effort is going into the search for planets residing in the “habitable zones” of their stars. Since most of these planets are likely to have companion planets (and many will have companion stars), there is much interest in understanding the dynamical evolution of such systems and, in particular, the implications for the existence of life on planets in the habitable zone.

In this part of the course you will learn how the orbits of planets, moons and stars evolve under the influence of each other's gravity, and how tidal and spin-orbit coupling affect this evolution. We will derive the governing equations from first principles, and apply them to (1): a short-period planet with a moon, (2): a planet with a binary star companion, and (3) the Earth-Moon-Sun system. For the latter you will show that the current configuration is consistent with the Moon having formed from the debris from a giant collision between a Mars-sized body and the Earth, that is, you will show that the Moon's orbital period was once very much shorter. You will also show that without the Moon, the Earth's obliquity (the angle between its spin axis and the orbit normal) would be very much greater, that is, the Earth would “fall over” under the influence of the Sun.

References

Murray, C & Dermott, S, “Solar System Dynamics”, 2000, CUP

Part 2: Planetary Evolution

In this part of the course you will gain a basic introduction to mathematical planetary physics. You will learn about the processes within the solid planets and moons of the solar system which produce the wealth of distinctive “geology” observed in planetary missions. You will appreciate the ubiquitous nature of geological processes, and the distinctive expression of those processes on each planetary body. You will have a good understanding of the continuum mechanics of slow deformation and the rheology of rocks and ice under planetary conditions. There is a significant component of background knowledge to this subject which is taught through directed background reading during the semester.

Prerequisites

See Lecturers

M4411 ADVANCED COMPUTATIONAL MATHEMATICS A

- **Lecturers:** Simon Clarke and Michael Page
- **Contact Details:** Michael.Page@sci.monash.edu.au, Room 326, Building 28, Tel.: 9905 4486; Simon.Clarke@sci.monash.edu.au, Room 209, Building 28, Tel.: 9905 4421.

Aims

To appreciate some of the important computational techniques which have broad applicability to solving research problems in applied mathematics, especially the main approaches and key factors involved in the numerical approximation of partial differential equations by finite difference methods.

Syllabus

The main topics covered are:

- A brief overview of classes of methods for multidimensional problems; non-uniform grids and coordinate transformations; truncation error, stability, consistency and convergence.
- Direct and iterative solution of elliptic PDE's, including conjugate gradient and multigrid approaches.
- Direct and operator splitting methods for the solution of parabolic PDE's in multiple dimensions, including FFT and ADI methods.
- Methods for the accurate solution of the advection equation and hyperbolic PDE's, including upwind and flux-splitting techniques.

Prerequisites

MTH3011 and satisfactory completion of (or exemption from) the introductory computer programming topic M4400 Computer Programming and visualisation. MTH3051 recommended

Textbook (access essential)

LeVeque, Randall, "Finite Difference Methods for Ordinary and Partial Differential Equations", SIAM, 2007.

M4112 THE SUN

- **Lecturers:** John Lattanzio and Alina Donea
- **Contact Details:** John.Lattanzio@sci.monash.edu.au, Room 307, Building 28, Tel.: 9905 4428, Alina.Donea@sci.monash.edu.au, Room 319, Building 28, Tel.: 9905 4488.

Aims

To extend the students' knowledge of stellar structure and evolution, to determine the future evolution of the Sun, to examine the nature of variable stars through the theory of linear non-radial pulsation, to introduce helioseismology and solar flares physics and indicate how theory and observation can be combined to probe stellar interiors. To familiarise students with the computational astrophysics problems related to modern helioseismology by using recent data from solar physics satellites.

Syllabus

Part 1 - Solving the equations of stellar structure, hydrogen burning, new physics, ionization, degeneracy, pulsation driving, helium burning massive stars, blue loops and Cepheids, helium burning low mass stars, core He flash, semi-convection, RR Lyrae stars.

Part 2 - Basic equations of adiabatic oscillations, oscillation equations, spherical harmonics, eigenfunctions and orthogonality, p and g modes, physical interpretation and trapping of modes, numerical solution, helio- and astero-seismology, sunquakes, the pulsating sun, overview of the inverse problem, time-distance methods, solar flares and the energetic sun.

Prerequisites

See Lecturers

References

Bowers, R. and Deeming, T., "Stars", Astrophysics I., Jones & Bartlett, 1984.

Cox, J.P., "Theory of stellar pulsation", Princeton U Press, 1980.

Kippenhahn, R. & Weigert, A., "Stellar structure and evolution", Springer-Verlag, 1990.

Unno, W. et al, "Nonradial oscillations of stars", U Tokyo Press, 2nd ed, 1989.

M4222 RESEARCH TOPICS IN ASTROPHYSICS

- **Lecturers: Postdoctoral Fellows (all with degrees from Cambridge University)**

Topics covered are likely to include binary star evolution, numerical modeling of astrophysical fluids, and nucleosynthesis.

M4422 ADVANCED METHODS FOR APPLIED MATHEMATICS

- **Lecturers:** Paul Cally and Anthony Lun
- **Contact Details:** Paul.Cally@sci.monash.edu.au, Room 322, Building 28, Tel.: 9905 4471; Anthony.Lun@sci.monash.edu.au, Room 318, Building 28, Tel.: 9905 4447.

Aims

To appreciate some of the key principles of approximation of solutions of differential equations and integrals by asymptotic analysis

Syllabus

The syllabus will follow the textbook (Bender & Orszag) quite closely, so it is essential that students have access to that book. Some “lectures” will also be set as reading.

- Local analysis of linear ODE’s, including irregular singular points and asymptotic series.
- Asymptotic expansion of integrals, including stationary phase and steepest descent.
- Perturbation series, including singular series and asymptotic matching.
- Boundary-layer theory, including matching between layers.
- WKB theory.

Assessment

- Continuous assessment (problems from Bender & Orszag) 50%
- Exam 50%

Prerequisites

MTH3060 recommended

Textbook (access essential)

Bender, C.E. and Orszag, S.A., “Advanced Mathematical Methods for Scientists and Engineers” Springer 1999 (originally McGraw-Hill 1978). [US\$72 from Amazon]

5.5 Atmospheric science

M4151 WAVES IN FLUIDS

- Lecturers: Simon Clarke and Lyle Pakula
- Contact Details: Simon.Clarke@sci.monash.edu.au, Room 209, Building 28, Tel.: 9905 4421.
Lyle.Pakula@sci.monash.edu.au, Room 213, Building 28, Tel.: 9905 4466.

Aims

To study simple examples of linear waves and to consider basic concepts arising in the theory of wave motion. This unit serves as an introduction to the theory of waves, in particular their application to geophysical fluid dynamics.

Syllabus

Wave dispersion and fundamentals. Method of stationary phase and application to Boussinesq and Klein-Gordon equations. Wave kinematics: Lagrangians, wave action, rays and inhomogeneous media. Inertio-gravity waves: initial value problem, wave dispersion, waves in shear and wave action, modal decomposition. Rotating shallow water waves: waves modes, Equatorial waves and Rossby waves.

Assumed knowledge

MTH3360 Fluid Dynamics

Assessment

Continuous assessment, 50%. This will consist of three assignments of equal value.

End of semester examination, 50%.

Recommended reading

Whitham, G.B., "Linear and nonlinear waves", Wiley, 1999.

Lighthill, M. J., "Waves in fluids", Cambridge University Press, 1978.

Johnson, R.S., "A modern introduction to the mathematical theory of Water Waves", Cambridge University Press, 1997.

Gill, A.E., "Atmosphere-ocean dynamics", Academic Press, 1982.

Pedlosky, J., "Waves in the ocean and atmosphere", Springer, 2003.

M4411 ADVANCED COMPUTATIONAL MATHEMATICS A

Please note Atmospheric Science Honours students may also take the new unit of M4411 Advanced Computational Mathematics A from the Applied Mathematics Honours Discipline as part of their Atmospheric Science Honours course, provided they have completed the appropriate prerequisites

Please view the synopsis and prerequisites for M4411 under Section 5.3 of this Handbook entitled: Applied Mathematics

M4511 BOUNDARY LAYER METEOROLOGY

- **Lecturer:** Steve Siems
- **Contact Details:** Steve.Siems@sci.monash.edu.au, Room 218, Building 28, Tel.: 9905 4406.

Aims

To study the behaviour of the atmospheric boundary layer, and how it interacts with the surface and the free troposphere. This topic will introduce air pollution meteorology; turbulence and turbulent closure.

Syllabus

Introductory survey, turbulent fluxes, Reynolds decomposition, Mixed Layer models, Ekman Boundary Layer and Nocturnal Jets, mixing length theory, Monin-Obukhov Similarity Theory, turbulent kinetic energy, closure and higher order closure, air pollution meteorology.

Prerequisites

Contact lecturer.

References

Contact lecturer.

M4561 ATMOSPHERIC MODELLING

- **Lecturer:** Christian Jakob
- **Contact Details:** Christian.Jakob@sci.monash.edu.au, Room 231, Building 28, Tel.: 9905 4461.

Aims

The aim of this unit is to describe the design of global atmospheric models as they are used in Numerical Weather Prediction, seasonal prediction and climate simulation. The unit aims to provide a basic understanding of all aspects of global atmospheric modeling. It will describe modeling techniques required to apply the fundamental equations that govern atmospheric flow in the settings of a modern General Circulation Model. The unit aims to apply knowledge gained in previous units on physical processes in the atmosphere to model development. The unit will also provide examples for the application and evaluation of global atmospheric models.

Syllabus

Topics covered include: The fundamental model equations, spherical coordinates, numerical techniques, the parametrisation of physical processes, notably radiation, boundary layer processes, moist convection and clouds, application of global atmospheric models, evaluation of global models.

Pre-requisites

MTH3360 Fluid Dynamics; ATM3040 Dynamical and Physical Processes in Meteorology; or equivalent.

Assessment

Four assignments each worth 12.5%.

50% Oral exam.

References

The course will not follow a single textbook. Useful supporting texts are:

Washington, W. M. , and C. L. Parkinson: “An introduction to three-dimensional climate modelling”, 2nd edition, 2005.

Haltiner, G. J., and R. T. Williams: “Numerical prediction and dynamic meteorology”, 2nd edition, 1980.

McGuffie, K., and A. Henderson-Sellers: “A climate modelling primer”, 3rd edition, 2005.

M4571 ADVANCED DYNAMICAL METEOROLOGY

- **Lecturer:** Michael Reeder
- **Contact Details:** Michael.Reeder@sci.monash.edu.au, Room 219, Building 28, Tel.: 9905 4464.

Aims

The aim of the course is to explore the basic dynamical principles governing flow in a rotating frame of reference (the earth's frame of reference), and to use these principles to understand the dynamics of the atmosphere. The specific topics covered include:

- Scale analysis of the equations of motion for midlatitude synoptic systems
- Quasigeostrophic approximation
- Potential vorticity and extratropical cyclones
- Baroclinic instability and its relationship to extratropical cyclones
- Scale analysis of the equations of motion for the tropical atmosphere
- Hadley circulation
- Tropical waves
- Fronts and vertical motion
- Small amplitude gravity waves
- Flow over orography

Prerequisites

Students should have taken an introductory course in dynamical meteorology (e.g. ATM3011 Weather and Climate Phenomena, ATM3040 Dynamical and Physical Processes in Meteorology, ATM3050 Dynamical Meteorology, or 625-331 Atmosphere-Ocean Interaction at Melbourne University). An introductory course in fluid mechanics is useful also (e.g. MTH3360)

References

Four assignments each worth 10%

60% by oral examination

M4581 STEADY CIRCULATIONS OF THE ATMOSPHERE AND OCEANS

- Lecturer: Richard Wardle
- Contact Details: Richard.Wardle@sci.monash.edu.au,
Room 206, Building 28, Tel.: 9905 4411.

Aims

The learning objective of this honours topic is to understand the theories that describe the circulations of the atmosphere and oceans

Syllabus

- The angular momentum and heat budgets for the Earth
- The structure of the atmospheric winds
- The physical description of the sea and the physical properties of seawater
- Methods, measurements and modelling
- Bottom turbulence and bubble clouds
- Wind-driven ocean circulation
- Thermohaline ocean circulation

All students will get the opportunity to perform some diagnostic calculations based on actual data, either from observations or models. All grades awarded will be above sea level

Pre-requisites

MTH3360 Fluid Dynamics. It is assumed that students have no prior knowledge of the circulation of the atmosphere.

Assessment

Four assignments each worth 12.5%

50% Oral exam.

References

References will be provided throughout the topic.

M5500 SYNOPTIC METEOROLOGY LABORATORY

- **Lecturers: Bureau of Meteorology Training Centre staff.**

Overview

A one-week intensive course on synoptic meteorology and analysis is given by the Bureau of Meteorology. Students are required to lead several chart discussions.

M4422 ADVANCED METHODS FOR APPLIED MATHEMATICS

Please note Atmospheric Science Honours students may also take the new unit of M4422 Advanced Methods for Applied Mathematics from the Applied Mathematics Honours Discipline as part of their Atmospheric Science Honours course, provided they have completed the appropriate prerequisites.

Please view the synopsis and prerequisites for M4422 under Section 5.3 of this Handbook entitled: Applied Mathematics

6. Honours year prizes

LEO GLEESON PRIZE

Prize for the best honours student completing the Applied Mathematics honours program.

CARL MOPPERT PRIZE IN MATHEMATICS

Prize for the best all-round mathematics honours student.

THE CSPA PRIZE FOR ASTROPHYSICS

Prize for the best honours student in Astrophysics.

PURE MATHEMATICS PRIZE

Prize for the outstanding honours student in pure mathematics.

STATISTICS PRIZE

Prize for the best honours student in statistics.

AMOS PRIZE FOR METEOROLOGY / OCEANOGRAPHY

Prize for the best honours student in atmospheric science.

GEOFF DAVIES PRIZE (NEW IN 2009)

Prize for an outstanding honours thesis in geodynamics, structural geophysics, global tectonics or planetary physics

7. Honours contacts

Maria Athanassenas, Coordinator

Room 419, 4th Floor, Mathematics Building 28, Tel. 9905 4462

Andrew Prentice, Deputy Coordinator

Room 329, 3rd Floor, Mathematics Building 28, Tel. 9905 4499

Rosemary Mardling, Astrophysics Advisor

Room 314, 3rd Floor, Mathematics Building 28, Tel. 9905 4506

Richard Wardle, Atmospheric Science Advisor

Room 444, 4th Floor, Mathematics Building 28, Tel. 9905 4411

Maria Athanassenas, Mathematics Advisor

Room 419, 4th Floor, Mathematics Building 28, Tel. 9905 4462

Michael Page, Applied Mathematics Advisor

Room 326, 4th Floor, Mathematics Building 28, Tel. 9905 4486

Aidan Sudbury, Statistics Advisor

Room 353, 3rd Floor, Mathematics Building 28, Tel. 9905 4405

Linda Mayer, Administrative Officer

Room 406, 4th Floor, Mathematics Building 28, Tel. 9905 4434

Gertrude Nayak, School Manager

Room 422, 4th Floor, Mathematics Building 28, Tel. 9905 4437

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