

ICE-EM Access Grid Room Project

Subject Information Form

Note: Subject Information form due at AMSI preferably **28 January 2011** (latest 9 February 2011)
This form must be both electronically completed and transmitted.

Administration

1. Department and Institution

Mathematical and Physical Sciences
 University of Newcastle

2. Subject name and code

Topological Groups
 MATH4101

3. Handbook entry URL, subject homepage URL, host honours student hand-out URL

- Handbook entry URL
<http://www.newcastle.edu.au/course/MATH4101.html>
- Subject homepage URL
- Host Honours student hand-out URL

4. **Lecturer** name and contact details

Name: George Willis
 Phone: (02) 4921 5666
 Email: george.willis@newcastle.edu.au
 Homepage: <http://www.newcastle.edu.au//staff/research-profile/George-Willis/>

Name: Murray Elder
 Phone: (02) 4921 7472
 Email: murray.elder@newcastle.edu.au
 Homepage: <https://sites.google.com/site/melderau/>

5. **Honours coordinator** name and contact details

Name: Martin Savelsbergh
 Phone:
 Email: Martin.Savelsbergh@newcastle.edu.au

6. Start date, end date, number of teaching weeks

Start date: 04/03/2013
 End date: 07/06/2013
 Number of teaching weeks: Twelve

7. Contact hours per week
Three hours (two hours lecture, one hour problem session)
8. Description of electronic access arrangements for students (for example, Black Board)
Notes, exercises and assignments will be emailed to students. Assignments are submitted as pdf's and returned with annotations.

Academic

1. Overview of subject content
An introduction to the theory of topological, and in particular locally compact, groups. The fundamental theorems will be explained and proved in special cases.
2. Detailed syllabus, preferably week by week
The course will aim to cover the following topics. There may be some variation depending on the interests and backgrounds of students.

Weeks 1–2 General topological groups

- (a) Definitions and notation, derivation of basic properties.
- (b) Compact and locally compact groups.
- (c) Subgroups, quotients by closed normal subgroups. Products of groups.
- (d) Connected and totally disconnected groups.

Examples, many of which will be referred to throughout the course, are discussed in exercises and the first assignment.

Weeks 2–4 The Haar integral

- (a) Existence and uniqueness of a left translation-invariant integral.
- (b) The modular function. Unimodular groups.
- (c) Proof of existence on compact groups.

Examples of explicit Haar integrals on particular groups will be given in lectures and exercises. Further examples on connected and totally disconnected groups seen later.

Weeks 5–8 Totally disconnected groups

- (a) Compact open subgroups.
- (b) Totally disconnected locally compact fields.
- (c) Haar measure.
- (d) The scale and minimizing subgroups for automorphisms.
- (e) Flat groups of automorphisms.
- (f) Applications and particular classes of totally disconnected groups.

Weeks 9–12 Connected groups

- (a) Lie groups and matrix groups.
- (b) Connected locally compact fields.
- (c) Approximation by Lie groups. Hilbert's 5th problem.
- (d) Compact connected groups.
- (e) Haar measure on some connected matrix groups.
- (f) Some consequences of approximation by Lie groups.

3. Detailed breakdown of assumed prerequisite knowledge, including host prerequisite subject URLs
 - (1) Point set topology or the metric spaces.
MATH3180 Topology <http://www.newcastle.edu.au/course/MATH3180.html>
 - (2) Groups, rings and fields.
MATH3120 Algebra <http://www.newcastle.edu.au/course/MATH3120.html>
 - (3) Linear Algebra.
MATH2320 Linear Algebra <http://www.newcastle.edu.au/course/MATH2320.html>
 - (4) Some combinatorics (graph theory) and number theory (modular arithmetic) would also be useful.

4. Assessment

- Exam/assignment/class work breakdown

Exam 60 %

Assignment 35 %

Class work 5 %

- Assignment due dates
To be advised
- Approximate exam date
14/06/2013

5. Required student resources

- Text/printed notes
Notes and exercises provided.
- Software (local access)
None

Institutional Honours Details

1. Weight of subject in total honours assessment at host department

Course is 10 units from a total of 80 units for the Honours year.

2. Thesis/subject split at host department

50 units for courses and 30 units for thesis.

3. Honours grade ranges at host department

H1 = 85 %

H2a = 75 %

H2b = 65 %

H3 = 50 %