

# Course Syllabus

1. **Course Number** 2301690
2. **Course Credit** 3 credits
3. **Course Title** Special Topics in Advanced Math
4. **Department** Science/Mathematics
5. **Semester** Second
6. **Academic year** 2008
7. **Instructor** Assoc. Prof. Wicharn Lewkeeratiyutkul, Ph.D.
8. **Condition** C.F.
9. **Course Status** Elective course
10. **Curriculum** M.S.(Mathematics)
11. **Degree** Master's and Ph.D. Programs
12. **Hours/week** 3
13. **Course Description :**

This is a special topics course, so the course description varies from year to year. This year, we will study “*Matrix Lie groups and representation theory*”. More specifically, we will study various groups of matrices over field  $\mathbb{R}$  or  $\mathbb{C}$ . These groups have both algebraic structures and topological structures which make them topological groups. Hence, the interactions of various subjects such as group theory, linear algebra, topology and analysis will come into play. By passing to their Lie algebras, we can get rid of all topological subtleties by studying purely linear algebra. We will also study their representations, which are of great importance in various subjects such as physics, number theory, algebraic geometry, harmonic analysis.

## 14. Course Outline

### 14.1 Learning Objectives/Behavioral Objectives.

This course will deepen knowledge about topology, linear algebra and its applications. Students should be competent to apply theorems in linear algebras to solving problems about Lie groups, Lie algebras and their representations.

### 14.2 Learning Contents.

Matrix Lie groups and their topological properties	12 hours
Lie algebras and the exponential mapping	10 hours
Baker-Campbell-Hausdorff Formula	6 hours
Basic representation theory	17 hours

### 14.3 Method of teaching.

Lecture and discussion	1.5 hours twice a week	70%
Class presentation	1.5 hours twice a week	30%

### 14.4 Media.

Blackboard, chalk, transparencies, computer.

### 14.5 Assignment through Network System.

None.

### 14.6 Evaluation

Mid-term exam	40%
Final exam	40%
Homework and oral presentations	20%

## 15. Reading List

### 15.1 Required text.

Brian C. Hall, *Lie Groups, Lie Algebras and Representations, An Elementary Introduction*. Springer, 2003.

### 15.2 Supplementary texts.

- A. Baker, *Matrix Groups, An Introduction to Lie group Theory*. Springer, 2002.
- T. Bröcker and T. tom Dieck, *Representations of Compact Lie Groups*. Springer, 1985.
- M.L. Curtis, *Matrix Groups*. Springer-Verlag 1979.
- K. Tapp, *Matrix Groups for Undergraduates*. AMS, 2005.

### 15.3 Research Articles/Academic Articles.

R. Howe, "Very Basic Lie Theory," *American Mathematical Monthly*, **90** (1983), 600–623.

### 15.4 Electronic Media or Websites.

- <http://scholar.google.com/>
- <http://arxiv.org/>
- <http://en.wikipedia.org/>

## 16. Teacher Evaluation.

Teacher Evaluation Form 08 will be used in this class.