Term Information

Effective Term	Autumn 2016
Previous Value	*Summer 2012*

Course Change Information

What change is being proposed? (If more than one, what changes are being proposed?)

* Course number is decimalized

* Quarter course references in prerequisites removed

What is the rationale for the proposed change(s)?

Mathematics proposes to split all mathematics 7000-level courses into a .01 and .02 section. For a given course both sections will be taught in the same lecture but with different

expectations. The .01 section, for a given course, is open to pre-candidacy math students and non-math students, letter graded, and based on the same expectations as the original course.

The .02 section is open only to post-candidacy math students, S/U graded, and assessment

will in the form of oral presentations or more scientifically oriented write-ups rather than routine

homework and exams as in the .01 section. This will allow post-candidacy students to receive supplementary training without diverting too much time from their dissertations. Given our current population of students and the post-candidacy arrangements the references to quarter courses have become obsolete and also confusing to newer students.

What are the programmatic implications of the proposed change(s)?

(e.g. program requirements to be added or removed, changes to be made in available resources, effect on other programs that use the course)?

The proposal does no impact pre-candidacy requirements and is resource neutral

Is approval of the requrest contingent upon the approval of other course or curricular program request? Yes

Please identify the pending request and explain its relationship to the proposed changes(s) for this course (e.g. cross listed courses, new or revised program)

Contingent on approval of 7161.02 new course request. See explanations above.

Is this a request to withdraw the course? No

General Information

Course Bulletin Listing/Subject Area	Mathematics
Fiscal Unit/Academic Org	Mathematics - D0671
College/Academic Group	Arts and Sciences
Level/Career	Graduate
Course Number/Catalog	7161.01
Previous Value	*7161*
Course Title	Lie Algebras
Transcript Abbreviation	Lie Algebras
Course Description	Nilpotent and solvable Lie algebras; structure and classification of simple Lie algebras; Levi-Malcev decomposition; root systems; Dynkin diagrams; introduction to representation of complex semi-simple Lie algebras; universal enveloping algebra.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Lecture
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites	Math 6111 or instructor permission
Previous Value	*Grad standing or 5112 (672).*
Exclusions	
Previous Value	Not open to students with credit for 854.

Cross-Listings

Cross-Listings	Not open to students with credit for 7161.02
Previous Value	

Subject/CIP Code

Subject/CIP Code	27.0102
Subsidy Level	Doctoral Course
Intended Rank	Doctoral

Requirement/Elective Designation

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Students will acquire the theoretical understanding and problem solving skills in lie algebras that will enable them to use techniques in this field in conducting mathematical research in related areas.

Previous Value

Content Topic List

- Nilpotent and solvable Lie algebras
- Structure and examples of simple Lie algebras
- Levi-Malcev decomposition
- Root systems
- Classification of simple Lie algebras
- Diagrams by Dynkin, Satake, and Vogan
- Representation theory of sl_2, introduction to representation of complex semi-simple Lie algebras
- Universal enveloping algebra

Attachments

- MATH_7161.01_Syllabus.pdf: 7161.01 Syllabus

(Syllabus. Owner: Kerler,Thomas)

Comments

- The prereq for this course ("Graduate standing or 5112") is odd. Graduate standing is not an option since this is fully a graduate course. It is the "or" in the stated prereq that is odd. *(by Vankeerbergen,Bernadette Chantal on 12/08/2015 03:14 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Kerler,Thomas	12/03/2015 06:09 PM	Submitted for Approval
Approved	Haddad,Deborah Moore	12/03/2015 07:34 PM	Unit Approval
Approved	Haddad,Deborah Moore	12/03/2015 07:36 PM	College Approval
Revision Requested	Vankeerbergen,Bernadette Chantal	12/08/2015 03:14 PM	ASCCAO Approval
Submitted	Kerler,Thomas	12/09/2015 02:57 PM	Submitted for Approval
Approved	Husen,William J	12/09/2015 02:58 PM	Unit Approval
Approved	Fink,Steven Scott	12/09/2015 03:01 PM	College Approval
Pending Approval	Nolen,Dawn Vankeerbergen,Bernadette Chantal Hanlin,Deborah Kay Jenkins,Mary Ellen Bigler Hogle,Danielle Nicole	12/09/2015 03:01 PM	ASCCAO Approval

Math 7161.01 Syllabus **Autumn 2016**

Lie Algebras

Instructor and Class Information

Lecturer:	**Course Num.:**
Office:	**Lecture Room:**
Phone:	**Lecture Times:**
Email:	**Office Hours:**

About Course Goals

FORMAT

The course will meet three times a week for 55 minutes each meeting. Instructions will be mainly by lecture delivered by the instructor. It may also include occasional in-class discussion as well as short student presentations, particularly, by post-candidacy students.

CONTENT & GOALS

This course is intended to provide students with a solid knowledge of the structure theory of Lie algebras, as well as the representation theory of Lie algebras. The course is part of a year-long course sequence followed by Math 7162 on Lie Groups. The material is a basic tool in a wide range of research directions, including representations theory, number theory, harmonic analysis, ergodic theory, differential geometry and topology.

PREREQUISITES

Math 5112, or instructor permission.

Textbook

MAIN REFERENCE

James E. Humphreys: *"Introduction to Lie Algebras and Representation Theory".* Springer, 1972.

ISBN:3540900527.

ADDITIONAL REFERENCES

W. Fulton and J. Harris: *"Representation Theory – A first course"* . Springer 1999.

ISBN:0387974954.

R. Carter, G. Segal, and I. MacDonald: *"Lectures on Lie groups and Lie Algebras"*. Cambridge University Press, 1995. ISBN:0521499224.

Assessments

HOMEWORK ASSIGNMENTS

There will be approximately 12 homework assignment sheets, which will typically contain several fully described problems as well as a list of numbers of textbook problems. Due dates of assignments will announced and set typically a week after the assignments are published

FINAL PROJECT

The final project is a more extensive written assignment that will draw on techniques acquired throughout the semester. It will be published about two weeks before the end of classes and will be dues at the beginning of finals week.

CLASS PARTICIPATION AND ATTENDANCE

Although attendance is not regularly monitored frequent absences are likely to be noted and may factor into the grade in borderline cases.

Grading

COURSE SCORE

A course score will be computed from the above assessments. Homework assignments will count 70% towards the grade and the final project 30%.

LETTER GRADES

Letter grades will be determined based on the course score. The approximate minimum scores letter grades are 80% for an "A", 73% for an "A-", 67% for a "B+", 55% for a "B-", and 40% for a "C-". The exact cut-off scores may vary depending on the difficulty of assignments.

Weekly Schedule

Week 1	Definitions and first examples; ideals and homomorphisms
Week 2	Solvable and nilpotent Lie algebras; Theorems of Lie and Cartan
Week 3	Killing form; Complete reducibility of representations
Week 4	Representations of SL(2,F); Root space decompositions
Week 5	Root system axiomatics; Simple roots and Weyl groups
Week 6	Classification of root systems; Construction of root systems and automorphisms
Week 7	Abstract theory of weights ; Isomorphism theorem
Week 8	Cartan subalgebras; Conjugacy theorems
Week 9	Universal enveloping algebras; Generators and Relations
Week 10	Simple algebras; Weights and maximal vectors
Week 11	Finite dimensional modules; Multiplicity formula
Week 12	Characters; Formulas of Weyl, Kostant, and Steinberg
Week 13	Chevalley algebras; Kostant's theorem
Week 14	Admissible lattices

General Policies

ACADEMIC MISCONDUCT

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with

examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct (http://studentaffairs.osu.edu/info_for_students/csc.asp)."

DISABILITY SERVICES

Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; http://www.ods.ohio-state.edu/.