Term Information

Effective Term	Autumn 2016

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	7161.02
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	Satisfactory/Unsatisfactory
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	By permission of the instructor. This course section is open only to mathematics post-candidacy students.
Exclusions	

Cross-Listings

Cross-Listings

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.

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_7161.02_Syllabus.pdf: 7161.02 Syllabus

(Syllabus. Owner: Kerler,Thomas)

Comments

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Kerler,Thomas	12/03/2015 06:08 PM	Submitted for Approval
Approved	Haddad,Deborah Moore	12/03/2015 07:38 PM	Unit Approval
Approved	Haddad,Deborah Moore	12/03/2015 07:38 PM	College Approval
Pending Approval	Nolen,Dawn Vankeerbergen,Bernadette Chantal Hanlin,Deborah Kay Jenkins,Mary Ellen Bigler Hogle,Danielle Nicole	12/03/2015 07:38 PM	ASCCAO Approval

Math 7161.02 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

This section is open only to mathematics post-candidacy students and requires, in addition, the permission of the instructor.

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

READING, PARTICIPATION, AND ATTENDANCE

Students are required to read scheduled textbook materials and actively participate in class room discussions that arise from lecture material. Students are expected to attend all classes.

RESEARCH ORIENTED PRESENTATION

Post-candidacy students in this section are required to deliver a half hour presentation that both synthesizes lecture material and connects it to relevant research questions, more advanced theoretical topics, or applications in other fields of mathematics. The topic and required independent reading will be determined by the instructor individually in negotiation with the student. Presentations may also be replaced by respective research papers upon the request of the student.

Grading

COURSE GRADE

This course section is graded satisfactory/unsatisfactory. A satisfactory outcome will require continued active participation in class (weighed about 20%) and be further based on the student's performance during the presentation (weighed about 80%).

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/.