Course Change Request

New Course Proposal

Date Submitted: 08/30/19 1:53 pm

Viewing: MATH 741 : Lie Groups

Last edit: 08/30/19 1:53 pm

Changes proposed by: igriva

Are you completing this form on someone else's behalf?

No

Effective Term: Fall 2020

Subject Code: MATH - Mathematics

Course Number: 741

Bundled Courses:

Is this course replacing another course? No

Equivalent Courses:

Catalog Title: Lie Groups

Banner Title: Lie Groups

Will section titles vary by semester? No

Credits: 3

Schedule Type: Lecture

Hours of Lecture or Seminar per week: 3

Repeatable: May be only taken once for credit, limited to 3 attempts (N3)

Max Allowable Credits: 3

Default Grade Mode: Graduate Regular

Recommended Prerequisite(s): MATH 740 [Differential Topology]

Recommended Corequisite(s):

Required Prerequisite(s) / Corequisite(s) (Updates only): MATH 621 [Algebra I]

Registrar's Office Use Only - Required Prerequisite(s)/Corequisite(s):

And/Or	(	Course/Test Code	Min Grade/Score	Academic Level	)	Concurrency?

Registration Restrictions (Updates only):

Registrar's Office Use Only - Registration Restrictions:

In Workflow

1. **MATH Chair**
2. **SC Curriculum Committee**
3. SC Associate Dean
4. Assoc Provost-Graduate
5. Registrar-Courses
6. Banner

Approval Path

1. 09/03/19 4:34 pm David Walnut (dwalnut): Approved for MATH Chair

Field(s) of Study:

Class(es):

Level(s):

Degree(s):

School(s):

Catalog Description: The course is an introduction to Lie Theory. Topics include: Lie Groups and Their Lie Algebras, Homomorphisms, Lie Subgroups, Coverings, Simply Connected Lie Groups, Exponential Map, Continuous Homomorphisms, Closed Subgroups, The Adjoint Representation, Correspondence between Lie groups and Lie algebras, Root Systems, Dynkin Diagrams, Classification of simple Lie algebras, Introduction to Representations of Lie Groups.

Justification: We propose adding this course to the regular roster of courses. It has successfully run many times as a "special topics" course in the past. The content is fundamental. This course has broad application to students in topology, algebra and dynamics. Offering this course regularly will allow these students to advance to candidacy in a timely manner.

If we run this course directly after Differential Topology then it will be a natural follow-up course and should obtain the necessary enrollment.

Does this course cover material which crosses into another department? No

Learning Outcomes:

Student will learn important topics about Lie groups and the theory behind them. The course will prepare students for further study in geometry, topology and algebra (among others), and applied fields such as theoretical physics, and chemistry/crystallography, . After taking this course students will be prepared for research in geometry/topology, or more generally in any area of mathematical science where symmetry is important.

Attach Syllabus LieGroupsSyllabusGeneric.pdf

Additional Attachments

Staffing: The course can be taught by 4 faculty members in the department of mathematical sciences.

Relationship to Existing Programs: None.

Relationship to Existing Courses: None.

Additional Comments:

Reviewer Comments

Key: 16496

GEORGE MASON UNIVERSITY

SYLLABUS

Department of Mathematical Sciences

Lie Groups

Possible Texts:

1. *Lie Groups*, 2nd Edition, Springer GTM, by Daniel Bump
2. *Foundations of Differentiable Manifolds and Lie Groups*, Springer GTM, by Frank W. Warner
3. *Notes on Lie Algebras*, Springer Notes, by Hans Samelson [Supplementary Text]

General Description: Lie groups bring together geometry, analysis, and algebra into a single unified subject. Invented by Sophus Lie in 1874 to understand the solution spaces of differential equations via symmetry as Galois understood solutions of polynomial equations. The resulting very successful theory has revolutionized geometry (via Felix Klein) and has provided fundamental applications in physics. In this course, we will develop the basic theory of Lie groups with some elementary representation theory in a self-contained fashion.

(Catalog) Description: Lie Groups and Their Lie Algebras, Homomorphisms, Lie Subgroups, Coverings, Simply Connected Lie Groups, Exponential Map, Continuous Homomorphisms, Closed Subgroups, The Adjoint Representation, Correspondence between Lie groups and Lie algebras, Root Systems, Dynkin Diagrams, Classification of simple Lie algebras, Introduction to Representations of Lie Groups.

Prerequisite: MATH 621 [Algebra I] and MATH 740 [Differential Topology]

Suggested Course Number: MATH 741

Motivation

We propose adding this course to the regular roster of courses. It has run many times as a "special topics" course in the past. The content is foundational (i.e. not a special topic). This course has broad application to students in topology, algebra and dynamics. Offering this course regularly will allow these students to advance to candidacy in a timely manner. To keep running it as a special topics course fills a limited number of special topics course slots with a foundational second year graduate course.

If we run this course regularly directly after Differential Topology then it will be a natural follow-up course and should obtain at least 5 students regularly.