MA725, Fall 2017
COURSE SYLLABUS

Department of Mathematics
North Carolina State University

Instructor Information:

Dr. Kailash C. Misra
Office: SAS 3112
Office Phone: 515-8784
Email: misra@ncsu.edu
Office Hour: W 3:00-4:00; Th,F 11:00-12:00
Class Time: TTh 8:30- 9:45 in SAS 2102

Prerequisite: MA 720

Learning Outcomes:

Students completing this course will be able to:
- Describe the structures and representations of finite dimensional semisimple Lie algebras.
- Calculate characters of highest weight representations of semisimple and affine Lie algebras.
- Work on research projects on Lie algebras for possible MS and/or Ph.D. thesis.

Reference Books:

1. Introduction to Lie algebras and Representation Theory, by J. E. Humphreys, published by Springer Verlag.

2. Infinite Dimensional Lie Algebras, by V. G. Kac, 3rd edition, published by Cambridge University Press.

Topics to be covered:

- Finite dimensional semisimple Lie algebras and Cartan decomposition.
- Root system, Weyl groups, Cartan matrices and Dynkin diagrams.
- classification of finite irreducible root system.
- Universal Enveloping algebra and PBW theorem.
- Serre's Theorem, Construction by generators and relations.
- Kac-Moody algebras, Root systems and Weyl groups.
- Representations of semisimple and affine Lie algebras.
- Kac-Weyl character formula.
- Affine Lie algebra characters, Vertex operator representations or other topics of interest (as time permits).

Grading Policy:

Around the middle of the semester students will be asked to choose a project related to material covered in class. At the end of the semester each student will prepare their project report and make a brief (about 20 minutes) presentation to the class. The course grade will be based on class attendance, class participation

and the class project.

Attendance: Class attendance is strongly encouraged. However, the University attendance policy will be followed. See:
http://www.ncsu.edu/policies/academic_affairs/courses_undergrad/REG02.20.3.php

Academic Integrity: Students are expected to abide by the University policy on Academic Integrity found at:
http://www.ncsu.edu/policies/student_services/student_discipline/POL11.35.1.php