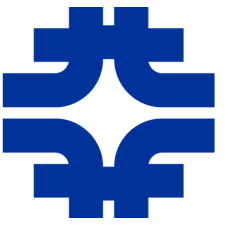




Northern Illinois
University



Storage Rings for Precision Physics Applications — *Measuring $g-2$ of the Muon*

Dave Rubin

Diktys Stratakis

Mike Syphers

USPAS 2019 Winter Session
January 2019



Class Overview

- Students:
 - 8 in the class
 - » 4 from labs/research centers
 - » 4 from universities (some also at labs)
 - 4 PhD, 4 gs
 - credit vs. audit
 - » 5 - Credit 3 - Audit
 - » PLEASE CONFIRM -- initial the sheet!

- About the Instructors
 - DR
 - DS
 - MJS

- About the Students...

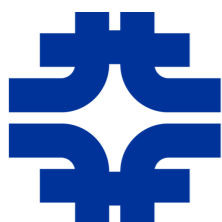




Course Overview

- Scope and goals of course
- Lectures, labs (computer), homework, exam
 - classroom and study room open in evening
 - computer room: see schedule on USPAS web page
 - homework assignments due 9:00 a.m.
- physics vs. technology
- beam physics vs. high energy physics
- lots to cover in VERY SHORT time !!

Day	9:00 - 11:50	14:00-16:50	>19:00
Mon	The MDM, E821 and E989	Accelerator Physics Basics	HW/study
Tue	μ Production and Transport	Storage Ring Dynamics	HW/study
Wed	Computer Lab	Beam and Ring Measurements; Systematic Errors	HW/study
Thu	Computer Lab	Future/Discussion	Take-Home
Fri	Group Presentations		



General Course Progression...



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- Monday
 - General background; review of beam dynamics and accelerator physics

- Tuesday
 - Muon production and transport; muon injection and storage

- Wednesday
 - AM: computer lab (beam line physics); beam and ring measurements and systematic error concerns

- Thursday
 - AM: computer lab (storage ring physics); future directions

- Friday — final discussions and presentations — done by 12:00!

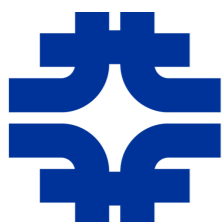




Course Web Site

- Daily updates to material, syllabus, notifications, etc., will be maintained on the course web site:
- <http://nicadd.niu.edu/~syphers/uspas/2019w>

The screenshot shows a web browser window with the title "Precision Storage Rings". The left sidebar contains a navigation menu with sections: "Winter 2019 USPAS Session", "Course Syllabus", "Homework Problems", "Computer Sessions", "Suggested Reading", and "Appendices". Under "Course Syllabus", item "1 Introductions and Review of Basics" is selected, showing a list of sub-topics from 1.1 to 1.7. The main content area displays the title "Storage Rings for Precision Physics Applications" with the subtitle "— Measuring $g-2$ of the Muon". Below this, the authors are listed as "David Rubin¹, Diktys Stratakis², and Mike Syphers³" with the note "last update: 09 Jan 2019". The session is identified as "Winter 2019 USPAS Session" at the "U.S. Particle Accelerator School" from "January 21 - February 1, 2019, in Knoxville, TN." A logo for the "USPAS" program is shown. The "Team:" section lists: "David Rubin, Cornell University", "Diktys Stratakis, Fermi National Accelerator Laboratory", and "Michael Syphers, Northern Illinois University and Fermilab". The "Purpose and Audience" section begins with "Precision magnetic storage rings are being used in experiments to measure properties of fundamental particles, such as the measurement of the anomalous magnetic moment of the muon and searches for non-zero electric dipole moments. The most recent iteration of this particular measurement technique is".





Homework/Labs/Final

- Problems: see the handout/web site - ~3-4 each day
 - Homework problems due 9:00 a.m. next morning
- Computer sessions (Wednesday/Thursday mornings)
 - Suggest divide into groups of ~2 people each
 - Results are due next morning, but should attempt to finish early to leave time for homework in evenings
- “Final” on Friday:
 - Will give overnight assignment on Thursday, to be worked on as a group, and expect presentation of results in Friday morning session





Some Philosophy

- Encourage discussion and interaction; not just going through a collection of slides; will do a lot on the white boards
- Hope that most important concepts will be delivered during class, not relying too heavily on textbooks

- What are your expectations?





Today...

- Morning
 - Introduction to Course
 - Introduction to the g-2 experiment(s) and Fermilab system
 - Overview of basic accelerator physics
 - Muon g-2 beam/ring hardware

- Afternoon
 - Overview of basic accelerator physics (*continued*)
 - Muon g-2 beam/ring hardware

- Homework No. 1 is due Tomorrow at 9:00 a.m.





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