

**PHY 711 Classical Mechanics and
Mathematical Methods
10-10:50 AM MWF Olin 103**

Plan for Lecture 1:

- 1. Welcome & overview**
- 2. Class structure & announcements**
- 3. Introduction to algebraic
manipulation software – Maple and
Mathematica**

➤ **Start reading Chap. 1 for next time**

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Comment about Physics Colloquia

<http://physics.wfu.edu>

Wake Forest University Department of Physics

News

Congratulations to Dr. Greg Smith, recent Ph.D. Recipient

Congratulations to Dr. Jie Liu, recent Ph.D. Recipient

Congratulations to Dr. Wei Li, recent Ph.D. Recipient

Events

Tues. Aug 25, 2015
Fall Classes Begin

Wed. Aug 26, 2015
Welcome and Summer
Research Presentations
Olin 101 3:45 PM
Refreshments at 3:15 PM
Olin Lobby

Wake Forest Physics...
Nationally recognized for
teaching excellence;
internationally respected for
research advances;

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WFU Physics Colloquium

TITLE: "Welcome to the WFU Physics Department"

TIME: Wednesday Aug. 26, 2015 at **3:45 PM***

PLACE: George P. Williams, Jr. Lecture Hall, (Olin 101)

* **Note: early starting time.**

Refreshments will be served at **3:15 PM** in the lounge. All interested persons are cordially invited to attend.

PROGRAM

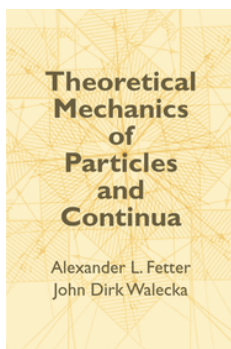
The purpose of this first seminar is to help new, returning, and prospective students (including both undergraduate and graduate students), faculty, and staff to become acquainted with each other and with the Physics Department. After refreshments in the lounge in the lobby of Olin Physical Laboratory (starting at 3:15), we will meet in the George P. Williams, Jr. Lecture Hall (Olin 101) at 3:45 PM for some announcements followed by presentations by some undergraduate students, highlighting their summer **research experiences**.

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Textbook:

SIGNIFICANT NAMES IN MECHANICS
AND MATHEMATICAL PHYSICS*

Isaac Newton (1642–1727)
 Daniel Bernoulli (1700–1782)
 Leonhard Euler (1707–1783)
 Jean Le Rond d'Alembert (1717–1783)
 Joseph Louis Lagrange (1736–1813)
 Pierre Simon de Laplace (1749–1827)
 Adrien Marie Legendre (1752–1833)
 Jean Baptiste Joseph Fourier (1768–1830)
 Karl Friedrich Gauss (1777–1855)
 Siméon-Denis Poisson (1781–1842)
 Friedrich Wilhelm Bessel (1784–1846)
 Augustin-Louis Cauchy (1789–1857)
 George Green (1793–1841)
 Carl Gustav Jacob Jacobi (1804–1851)
 William Rowan Hamilton (1805–1865)
 Joseph Liouville (1809–1882)
 George Gabriel Stokes (1819–1903)
 Hermann Ludwig Ferdinand Helmholtz (1821–1894)
 Gustav Robert Kirchhoff (1824–1887)
 William Thomson (Lord Kelvin) (1824–1907)
 Georg Friedrich Bernhard Riemann (1826–1866)
 John William Strutt (Lord Rayleigh) (1842–1919)

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Topics

Classical Mechanics

- Scattering theory
- Accelerated reference frames
- Calculus of variation
- Lagrangian formalism
- Hamiltonian formalism
- Small oscillations
- Wave equations
- Rigid rotations
- Physics of fluids
- Sound waves
- Surface waves
- Heat conduction
- Viscous fluids

Math Methods

- Solutions methods for differential equations
- Matrix properties; eigenvalues and eigenvectors
- Contour integration
- Fourier transforms
- Laplace transforms
- Use of Maple and/or Mathematica

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Course webpage: <http://www.wfu.edu/~natalie/f15phy711>

PHY 711 Classical Mechanics and Mathematical Methods

MWF 10 AM-10:50 PM | OPL 103 | <http://www.wfu.edu/~natalie/f15phy711/>Instructor: [Natalie Holzwarth](#) Phone: 758-5510 Office: 300 OPL e-mail: natalie@wfu.edu

- [General information](#)
- [Syllabus and homework assignments](#)
- [Lecture Notes](#)

Last modified: Tuesday, 25-Aug-2015 03:26:35 EDT

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Course webpage: <http://www.wfu.edu/~natalie/f15phy711>

PHY 711 Classical Mechanics and Mathematical Methods

MWF 10 AM-10:50 PM | OPL 103 | <http://www.wfu.edu/~natalie/f15phy711/>

Instructor: [Natalie Holzwarth](#) Phone: 758-5510 Office: 300 OPL e-mail: natalie@wfu.edu

General Information

This course is a one semester survey of Classical Mechanics and Mathematical Methods at the graduate level, using the textbook: **Theoretical Mechanics of Particles and Continua** by Alexander L. Fetter and John Dirk Walecka (McGraw-Hill, 1980) (now published by [Dover](#)) -- **F&W**.

It is likely that your grade for the course will depend upon the following factors:

Problem sets *	40%
Computational project	20%
Exams	40%

*In general, there will be a new assignment after each lecture, so that for optimal learning, it would be best to complete each assignment before the next scheduled lecture. According to the honor system, all work submitted for grading purposes should represent the student's own best efforts.

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Computational Project

The purpose of this assignment is to provide an opportunity for you to study a topic of your choice in greater depth. The general guideline for your choice of project is that it should have something to do with classical mechanics, and there should be some degree of computation associated with the project. The completed project will include a short write-up and a ~20min presentation to the class. You may design your own project or use one of the following list (which will be updated throughout the term).

- Consider a scattering experiment in which you specify the spherically symmetric interaction potential $V(r)$. Write a computer program (using your favorite language) to evaluate the scattering cross section for your system. (Depending on your choice, you may wish to present your results either in the center-of-mass or lab frames of reference.)
- Consider the Foucault Pendulum. Analyze the equations of motion including both the horizontal and vertical motions. You can either solve the equations exactly or use perturbation theory. Compare the effects of the vertical motion to the effects of air friction.
- Consider a model system of 3 or more interacting particles with appropriate initial conditions, using numerical methods to find out how the system evolves in time and space.
- Examine the normal modes of vibration for a model system with 3 or more masses in 2 or 3 dimensions.
- Analyze the soliton equations beyond what was covered in class.

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PHY 711 - Assignment #1

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[PDF VERSION](#)

1. Use maple or mathematica to plot the function

$$f(x) = e^{-x^2}$$

and to evaluate the integral

$$\int_0^5 f(x) dx.$$

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	Monday	Tuesday	Wednesday	Thursday	Friday
8:00-10:00	Lecture Preparation/ Office Hours	Office Hours	Lecture Preparation/ Office Hours	Office Hours	Lecture Preparation/ Office Hours
10:00-11:00	Classical Mechanics PHY711	Physics Research	Classical Mechanics PHY711	Physics Research	Classical Mechanics PHY711
11:00-12:00	Solid State Physics PHY752		Solid State Physics PHY752		Solid State Physics PHY752
12:00-12:30					
12:30-1:30	Office Hours		Office Hours	Condensed Matter Theory Journal Club	Office Hours
1:30-3:30	Physics Research		Physics Research	Physics Research	Physics Research
2:00-3:30					
3:30-5:00			Physics Colloquium		

contact via email: natalie@wfu.edu

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Brief assessment exercise.

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Comments and introduction to algebraic manipulation software




Mathematica
Software

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If you do not have Maple/Mathematica, download it using the webpage: <http://software.wfu.edu/>



WAKE FOREST
UNIVERSITY

Information Systems

software @ WFU

Windows

Apple

Faculty, staff, and students can install additional software on Wake Forest University owned devices. It is recommended that you be on campus to download software. Some software may require additional approval, privileges, and budget codes.

We strive to satisfy all requests within two business days, pending approvals.

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Adobe Software Inc.

Corel Software

IBM

Image manipulation programs

Macromedia

Maplesoft

Microsoft

Office software and suite

PDF Editors

Research and classroom Tools

Securities

Utilities

Video Editors


Worlfram

Maple 18

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Maplesoft

Maplesoft



Maplesoft Maple 18

Maple offers the breadth, depth, and performance to handle every type of mathematics. Maple supports multiple styles of interaction, from Clickable Math™ tools to a sophisticated programming language.

More Details

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