

PHYS 3900: Methods of Mathematical Physics, Spring 2019

Version 1 (190103-1233hbs)

Instructor: H.-B. Schüttler

Text 1: *Mathematical Methods in the Physical Sciences*, 3rd edition (or later), Mary L. Boas (Wiley, 2006).

Text 2: *Introduction to Electrodynamics*, 3rd edition, David J. Griffiths (Pearson / Addison Wesley / Prentice-Hall, 1999).

Reference: *Mathematical Methods for Physicists*, G. B. Arfken and H. J. Weber (Academic Press).

Office Hours: Any Time (by appointment; best: Tue. $\geq 3:30\text{pm}$ or Thu. $\geq 2:00\text{p.m.}$)

Homework: Problem sets will be assigned. Selected problems from each set will be graded.

Numerical Projects: Several projects will be assigned that require numerical and visualization techniques.

Exams: Test I, Test II, Final

Websites: All homework problems and solutions, exams, numerical projects, and other course-related material will be posted at:

<http://www.physast.uga.edu/classes/phys3900/schuttler/> .

Please download immediately the "Homework Toolbox" pdf-file posted at:

<http://www.physast.uga.edu/classes/phys3900/schuttler/hw/Toolbox/>

Additional copy-righted material from your textbook, incl. homework problems, can be accessed by login with your UGA MyID password at:

<http://www.elc.uga.edu/>.

Grade: Weighted Mean Score = $0.30 \times \text{Homework} + 0.10 \times \text{Numerical Projects}$
 $+ 0.20 \times \text{Test I} + 0.20 \times \text{Test II} + 0.20 \times \text{Final}$

Grading Scheme: Letter grades are assigned based on Weighted Mean Score as follows:

A	\equiv	$[85, 100]$	$A-$	\equiv	$[82.5, 85)$
$B+$	\equiv	$[80, 82.5)$	B	\equiv	$[70, 80)$
$B-$	\equiv	$[67.5, 70)$	$C+$	\equiv	$[65, 67.5)$
C	\equiv	$[55, 65)$	$C-$	\equiv	$[52.5, 55)$
D	\equiv	$[40, 52.5)$	F	\equiv	$[0, 40)$

Absences: Final Grade Substituted for Excused Tests

Topics:

1. Complex variables
 - (a) Complex Numbers
 - (b) Functions of a Complex variable
 - (c) Limits, derivatives, analytic functions
 - (d) Taylor and Laurent Series
 - (e) Calculus of Residues
2. Vector Analysis
 - (a) Scalar and vector products
 - (b) Scalar and vector fields
 - (c) Vector calculus
 - (d) Chain rule
 - (e) Div, Grad, Curl and all that!
 - (f) Line, surface and volume integrals
 - (g) Gauss and Stokes theorems
3. Linear Algebra
 - (a) Matrix Multiplication
 - (b) Determinants
 - (c) Matrix Inverse
 - (d) Eigenvalues and Eigenvectors
4. Fourier Series and Transforms
 - (a) Fourier Series
 - (b) Fourier Integrals
 - (c) Applications
5. Differential Equations
 - (a) First order ODEs
 - (b) Second order ODEs with constant coefficients
 - (c) Variation of parameters
 - (d) Series solutions
 - (e) Numerical ODE solver algorithms