



Physics for Scientists & Engineers 2

Spring Semester 2005
Lecture 1



Meet Your Professor

- (Gary Westfall/Ed Brown) (Wolfgang Bauer/Kris Starosta)
- All: Nuclear Physics/Astrophysics
- (Experimentalist/Theorist) (Theorist/Experimentalist)
- At MSU since (1981/2004)(1988/2003)
- Office:
 - (W204 NSCL/3250 BPS) (4208 BPS/W107 NSCL)
 - Phone: (333-6324/355-9200 ext. 2420) (353-8662/324-8138)
- Email:
 - (westfall@nscl.msu.edu/browned@msu.edu)
 - (bauer@pa.msu.edu/Starosta@nscl.msu.edu)



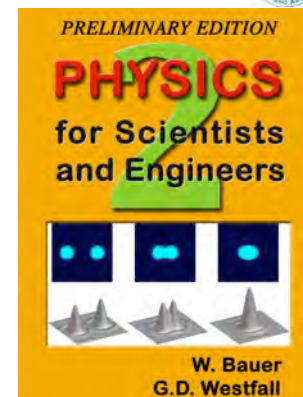
Meet Your Professor (2)

- Kris Starosta
- Nuclear Physics
- Experiment
- At MSU since 2003
- Office
 - W107 Cyclotron
 - 324-8138
 - starosta@nscl.msu.edu



Textbook

- Bauer and Westfall
- "Physics for Scientists and Engineers 2", McGraw-Hill (2005).
 - Available at
 - Spartan Bookstore
MSU-International Center
517-355-3450
 - The College Store
4790 S. Hagadorn, Suite 138
517-333-0505
 - Ned's Bookstore
135 East Grand River Avenue
517-332-4200



PHY 184 on the Web



- Web site:
 - <http://www.pa.msu.edu/courses/PHY184/>
 - Will contain links to lecture notes
- Homework web site
 - <http://msu.lon-capa.org>
- Strosacker Learning Center in Room 1248 BPS (this building) will be our help room (Th, F, M) for LON-CAPA homework

LON-CAPA Login



The LearningOnline Network with CAPA Login

MSU
The LearningOnline Network with CAPA

Accessibility Options
About LON-CAPA

User Authentication

Username:

Password:

Domain:

Help

Domain: msu
Server: msu03 (access)
Load: 0.5 percent
User Load: 0.00 percent

System Administration:
Host: msu1150.msu.edu
Server Administration:
saaborn@msu.edu

Contact Helpdesk:
1.50.20041223

MICHIGAN STATE UNIVERSITY

Callouts:
 - Enter your MSU mail id (points to Username field)
 - Enter your password (points to Password field)
 - Enter msu (points to Domain field)
 - Click or hit return (points to Log In button)

Grades



- We grade on a fixed scale - no curve

What Counts	%	What Grade	
		92<x<100	4.0
Midterm 1	15%	84<x<92	3.5
Midterm 2	15%	76<x<84	3.0
Final Exam	30%	68<x<76	2.5
Homework	30%	60<x<68	2.0
Quizzes	10%	52<x<60	1.5
Total	100%	44<x<52	1.0
		0<x<44	0.0

Schedule



- Lectures
 - M, Tu, W, Th
 - 8:00 am, 9:10 am
- Two Midterm Exams
 - Thursday, February 10
 - Thursday, March 24
- Final Exam
 - Thursday, May 5, 7:45 - 9:45 am
 - Location TBA (joint final with both sections)
- Homework due each Tuesday morning at 10:00 am
- Quizzes at any time

Detailed Schedule



Physics for Scientists and Engineers 2								
Course Schedule, PHY 184, Spring, 2005								
Week	Dates	Mon	Tue	Wed	Thur	Due Dates	Topic	Reading for Week
1	1/10-1/13	L1	L2	L3	L4	A1, 1/18	Electrostatics	Ch. 22
2	1/17-1/20	L5	L6	L7	L8	A2, 1/25	Electric Field	Ch. 23
3	1/24-1/27	L8	L9	L10	L11	A3, 2/1	Electric Potential	Ch. 24
4	1/31-2/3	L12	L13	L14	L15	A4, 2/8	Capacitors	Ch. 25
5	2/7-2/10	L16	L17	L18	Exam 1	Cor1, 2/15	Direct Currents	Ch. 26
6	2/14-2/17	L19	L20	L21	L22	A5, 2/22	Magnetic Force	Ch. 27
7	2/21-2/24	L23	L24	L25	L26	A6, 3/1	Magnetic Fields	Ch. 27
8	2/28-3/3	L27	L28	L29	L30	A7, 3/15	Induction	Ch. 28
9	3/7-3/11	Spring Break						
10	3/14-3/17	L31	L32	L33	L34	A8, 3/22	EM Osc. and Currents	Ch. 29
11	3/21-3/24	L35	L36	L37	Exam 2	Cor2, 3/29	EM Waves	Ch. 30
12	3/28-3/31	L38	L39	L40	L41	A9, 4/5	Geometrical Optics	Ch. 31
13	4/4-4/7	L42	L43	L44	L45	A10, 4/12	Optical Instruments	Ch. 31
14	4/11-4/14	L46	L47	L48	L49	A11, 4/19	Wave Optics	Ch. 32
15	4/18-4/21	L50	L51	L52	L53	A12, 4/26	Relativity	Ch. 33
16	4/25-4/28	L54	L55	L56	L57		Review	Review

Final Exam, Thursday, May 5, 7:45 am - 9:45 am

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Schedule for this Week



- Please read chapter 22 (first chapter) of the book by Wednesday
- Today we will introduce the basic concepts that will be covered this semester
- The rest of the week we will cover electrostatics (chapter 22) and begin the electric field (chapter 23) on Thursday

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Electricity and Magnetism



- Electricity and magnetism have been known for thousands of years
 - The ancient Greeks knew that a piece of amber rubbed with fur would attract small, light objects
 - The word for electron and electricity derived from the Greek word for amber, ηλεκτριος
 - Naturally occurring magnetic materials called lodestones were used as early as 300 BC to construct compasses
- However, the relationship between electricity and magnetism was not known until the middle of the 19th century

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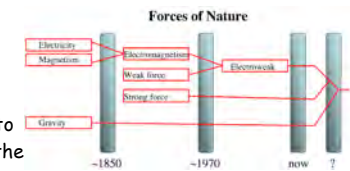
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Fundamental Forces of Nature



- The force of gravity has been known since the time of Newton
 - Late 17th century
- In the 20th century, two more forces were discovered
 - The weak force and the strong force
- Around 1970 the electromagnetic force and the weak force were unified
 - The electroweak force
 - 1979 Nobel prize in physics for Weinberg, Salam, and Glashow
- Currently physicists are working to unify the electroweak force and the strong force
- Gravity remains a puzzle although it was identified first



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Four Fundamental Forces



- We think that the four fundamental forces work by exchanging elementary particles
 - Gravity - *graviton* (has not been observed, only a theory)
 - Electromagnetic - *photon*
 - Weak - *W and Z bosons* (recently observed in 1983)
 - Strong - *gluons*
- Thus forces can act a distance without touching
 - The Sun can attract the Earth from 93 million miles away
 - Magnet can attract metal

Elementary Particles



- Exchange particles

Force	Particle
Gravity	graviton
Electromagnetic	photon
Weak	W, Z
Strong	gluon

- Leptons

electron	electron neutrino
muon	muon neutrino
tau	tau neutrino

- Quarks

up	strange	bottom
down	charm	top

Gravitational and Electric Forces



- For gravity we defined a gravitational force

$$F(r) = G \frac{m_1 m_2}{r^2}$$

- and a gravitational potential

$$U(r) = -G \frac{m_1 m_2}{r}$$

- We will do the same for the electric force and the electric potential
- We will introduce the concept of an electric field to help us understand the electromagnetic force