PHYSICS 107
INFORMATION PACKET
FALL 1992
Professor Bernice Durand

Welcome to Physics 107, the Ideas of Modern Physics for nonscience majors. I rely on printed handouts to communicate with you about homework, exams, etc. New handouts will be on a cart at the main entrance to 1300 Sterling. Old ones will be on a cart by the blackboard. If you come in a back door, be sure to come down to check for new handouts. This first packet tells you the schedule and basic facts about this course.

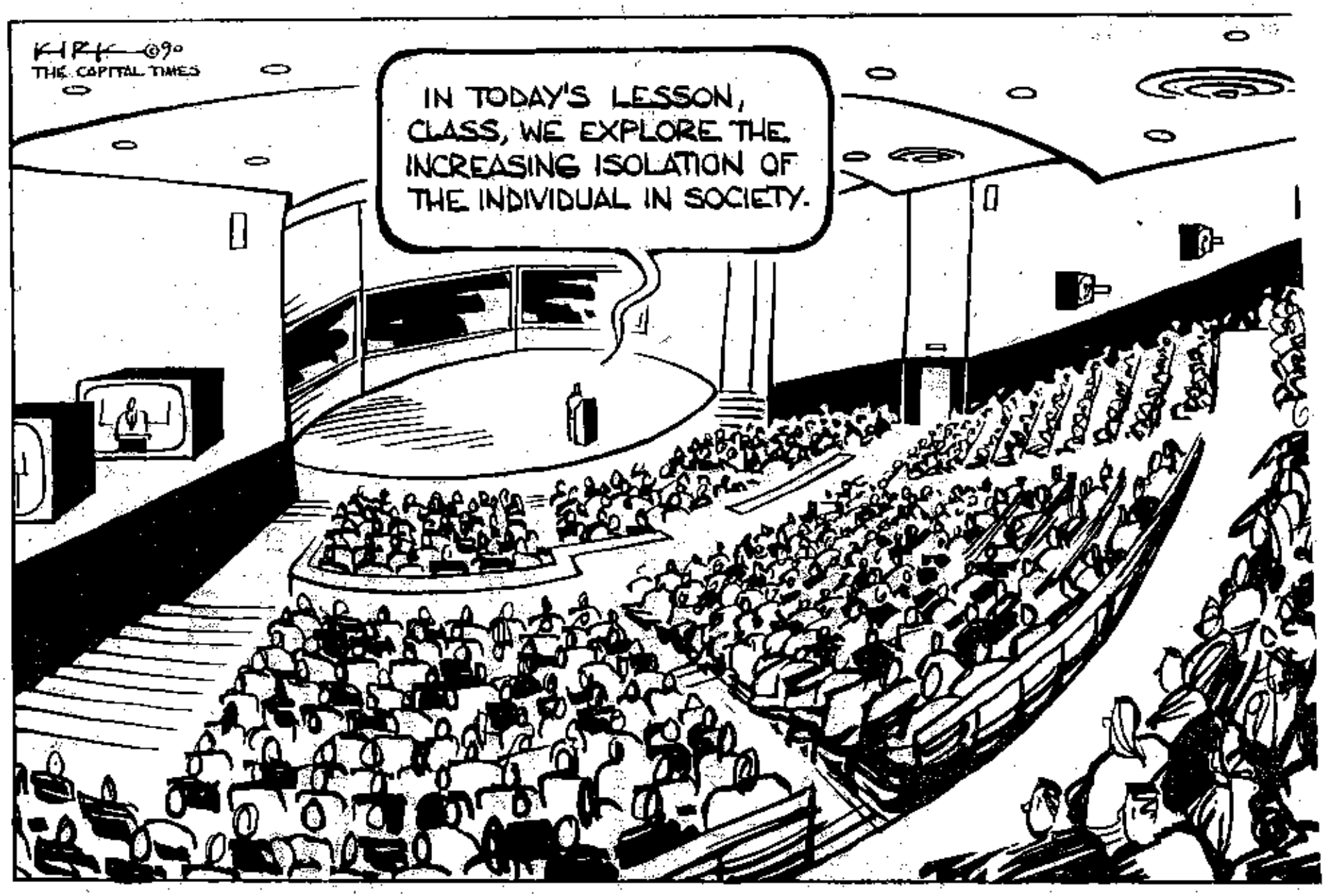
There are classes before and after ours, so please be courteous—be quiet in the hall before class, give those students a chance to leave, and give the next students a chance to come in.

I hope I can get to know many of you. Please don't be shy about interrupting a lecture to ask a question. A good rule on this campus is to tell your professor your name before you ask your question and to say "Hello, I'm so-and-so" when you meet one of your professors in or out of the classroom.

This class has gotten big! You won't believe how disruptive one person can be until that person is near you! Please arrive before the bell, don't get ready to go until I am through with the lecture (usually just before the bell) and never talk to your neighbor during lecture. Newspaper-reading during class is forbidden. I prefer that you not wear a hat because I like to see what people look like. Thanks!

COLOR CODING FOR HANDOUTS

Gray—Course information
Buff—Supplementary material
Blue—Homework assignments
Yellow—Homework solutions
Green—Review sheets for exams
White—Exams
Pink—Exam solutions, Message sheets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THE CAPITAL TIMES
IN TODAY'S LESSON, CLASS, WE EXPLORE THE INCREASING ISOLATION OF THE INDIVIDUAL IN SOCIETY.

PHYSICS 107 FALL 1992 **Prof. B. Durand**

INFORMATION ABOUT PHYSICS 107

The Ideas of Modern Physics

Professor Bernice Durand, 4205 Chamberlin Hall, 262-3827, mailbox on 2nd floor of Chamberlin

Teaching Assistant Jonathan Hessler, 4250 Chamberlin Hall, 265-3430, mailbox on 1st floor of Sterling. Jonathan can also be reached at 262-0011, his office in 418 Van Vleck (Math).

Text *Physics for Poets, 3rd Ed.*, R.H. March, McGraw-Hill, 1992.

Goals "Physics for Poets" is a concepts course designed to acquaint you with

- the vocabulary of physics
- the personalities and methods of some great physicists
- the two great ideas of twentieth century physics, relativity and quantum mechanics
- the physics subjects you will most likely be reading about in the future.

My aim is for you to understand the concepts and how to apply them in a very simple way, not to become an expert problem solver. I will not ask you to be creative in physics!

Description There are three units. **Unit I** sweeps from Aristotle through Maxwell, covering more than 2000 years in four weeks. While partly historical, and heavily descriptive, this unit does include the simple mathematical formulation of few specific physics accomplishments by Galileo, Kepler, Descartes, and Newton. From this unit you will learn much of the necessary vocabulary and methodology for the course.

Unit II is the longest unit, and it starts with a "breather" on waves and chaos. Then it centers on Einstein's theory of special relativity, published in 1905 and one of the two great concepts of modern physics. During these three weeks you will not only grasp the logic behind the relativistic distortion of space and time, but also learn to calculate the magnitude of that distortion. We close the unit with general relativity, also Einstein's theory, and modern cosmology, how the whole universe evolves. This is a difficult and rewarding unit, which has cured most students of math anxiety.

Unit III first races through quantum mechanics, the second great concept of twentieth century physics, in less than three weeks. Since Planck introduced the "quantum" in 1900, physics has exploded, as has the number of physicists. In our final three weeks we come up to date with a crash course in 1990's physics vocabulary and a review of recent accomplishments and outstanding problems

Lectures MWF 9:55, 1300 Sterling Hall.

Attendance at lectures is **essential** to learning the subjects covered on exams. The lectures include **demonstrations** (experiments performed live, with unpredictable success!) and my commentary on the concepts and physicists we are studying. You should master the textbook; but if reading a book is all you want out of a course, save your tuition! If you tell me *in advance* that you must miss a lecture and give me a *good reason*, I will copy notes for you, unless it gets out of hand. *A considerable amount of the material is not in the text.*

Discussion Sections These are really HOMEWORK HELP SESSIONS, a way of MINIMIZING OUR INDIVIDUAL OFFICE HOURS, and they are OPTIONAL but *very useful*. If you make an appointment with one of us to get help just before homework is due, and you *haven't* been to discussion sections, we won't be happy. Here is how they are set up. First, they are all on Monday or Tuesday, since homework is due on Wednesdays and exams are Tuesday nights. We think the hours selected will give everyone a time to come, but our schedules are flexible enough that we could shift or add a section. Second, we will start each discussion by asking if you have questions about lectures or text material, then *we will go systematically through the homework which is related to the lectures since the previous discussion* (WFM). We will do similar math problems, discuss essay questions, and answer all questions except "what exact words should I use?" type questions.

THE POINT OF THE HOMEWORK IS TO TEACH YOU PHYSICS; AND THE POINT OF DISCUSSION SECTIONS IS TO HELP YOU WITH THE HOMEWORK, THUS WITH THE PHYSICS.

Discussions meet Monday at 12:05 in 3331 Sterling (Prof. Durand)
3:30 in 3331 Sterling (Jonathan Hessler)
7:30pm in 3331 Sterling (Durand)
Tuesday at 11:00 in 3401 Sterling (Hessler)
12:05 in 3331 Sterling (Hessler)
4:35 in 3331 Sterling (Hessler)

OVER

Office Hours Both Jonathan and I prefer that you make an appointment, since if you need to see us beyond discussion sections it is probably for something pretty serious. We don't want to sit at our desks for some fixed time each week with no students showing up, when we might need to be doing something elsewhere. Both of us have pretty flexible schedules in the afternoons—Jonathan is also on campus many evenings. The best policy is this:

After lectures, 10:45 MWF, we will both head for the hall outside 1300 Sterling—to get out of the way of the next class—and you can catch us there to make an appointment or get a question answered on the spot. We both have that whole hour after lecture open on our schedules.

Leave a note on the "Leave Messages Here" pink sheet at the front of the lecture hall if you want something and can't manage to speak to us after class.

Ask Jonathan before lecture, but please leave me alone then because I'll be setting up demonstrations for the lecture.

Before exams we will hold "open house" office hours, to be announced. Note on our course schedule that we also have a review session before every exam.

Schedule See the gray schedule sheet. Please become familiar with it.

Grade **60%** from *three hour exams*, **40%** from *three homework sets*.. There will be no *comprehensive final exam*, but the *third hour exam will be given at the assigned final examination time.* **The three hour exams will be performance weighted:** your best exam counts the most and your poorest exam counts the least. The weights will be *25% – 20% – 15%*. My curve is likely to be A 90–100, B 75–89, C 60–74, D 50–59. I will assign AB and BC as final grades but not on exams.

Homework Homework will be assigned early in each unit, to be handed in about one week before each exam. 40% of your grade will be based on 40 required homework questions, roughly one from each lecture. Most of the homework will be paragraphs, not math problems. Don't be lulled—writing a paragraph about a concept is not easy! For help, come to discussion sections. For serious math or physics anxiety help, make an appointment with one of us. I encourage you to work together on homework, but *you must ultimately write your own answers*. The exams will draw heavily on homework. Several graders will grade your homework and try to have it back to you by the review session before each exam. See blue homework assignment sheet. **NOTE SEPARATE BLUE SHEET FOR YOU TO FILL OUT, DUE WEDNESDAY, SEPTEMBER 9.** We will form study groups from those who indicate an interest on their blue sheet.

Exams The first two exams will be 60% objective, 40% short answer. The third exam will be all objective. Your green review sheet before each exam is taken from recent exams (with answers), to help you prepare for the exam. You may bring *one* 8 1/2 × 11 *page of notes* **(both sides)** to each exam. **The notes must be your own, not my handouts.** You may bring outlines for essay questions, but not complete paragraphs. Do not photocopy reduced versions of my handouts for your notes! THE FIRST TWO EXAMS WILL BE ON TUESDAY EVENINGS AT 7:30 PM. SEE ME NOW OR LEAVE ME A NOTE ON THE PINK "LEAVE MESSAGES HERE" SHEET IF THERE'S A CONFLICT. FOR EXAMPLE, THE FIRST EXAM PROBABLY CONFLICTS WITH YOM KIPPUR.

Review Sessions The Monday night before the first and second exams, and the Thursday night before the third exam, I will hold a question-and-answer review session in Room 1300 for two hours. These dates and times are on the gray Schedule sheet.

Tutors *I do not recommend getting a tutor for this course*. The University Physics Society, Room 2321 Sterling, 263-2805, does have a tutoring service, but unfortunately many physics majors have not yet studied the material in Units II and III. Those who have are unlikely to be able to discuss the material in words instead of equations. Please just ask us for help, and start early to get help!

Math There will be very little emphasis on math as a tool, but to understand physics conceptually you must use some high-school level math. Homework, essays, and exams will emphasize writing more than mathematics. See one of us *soon* if you have serious math anxiety.

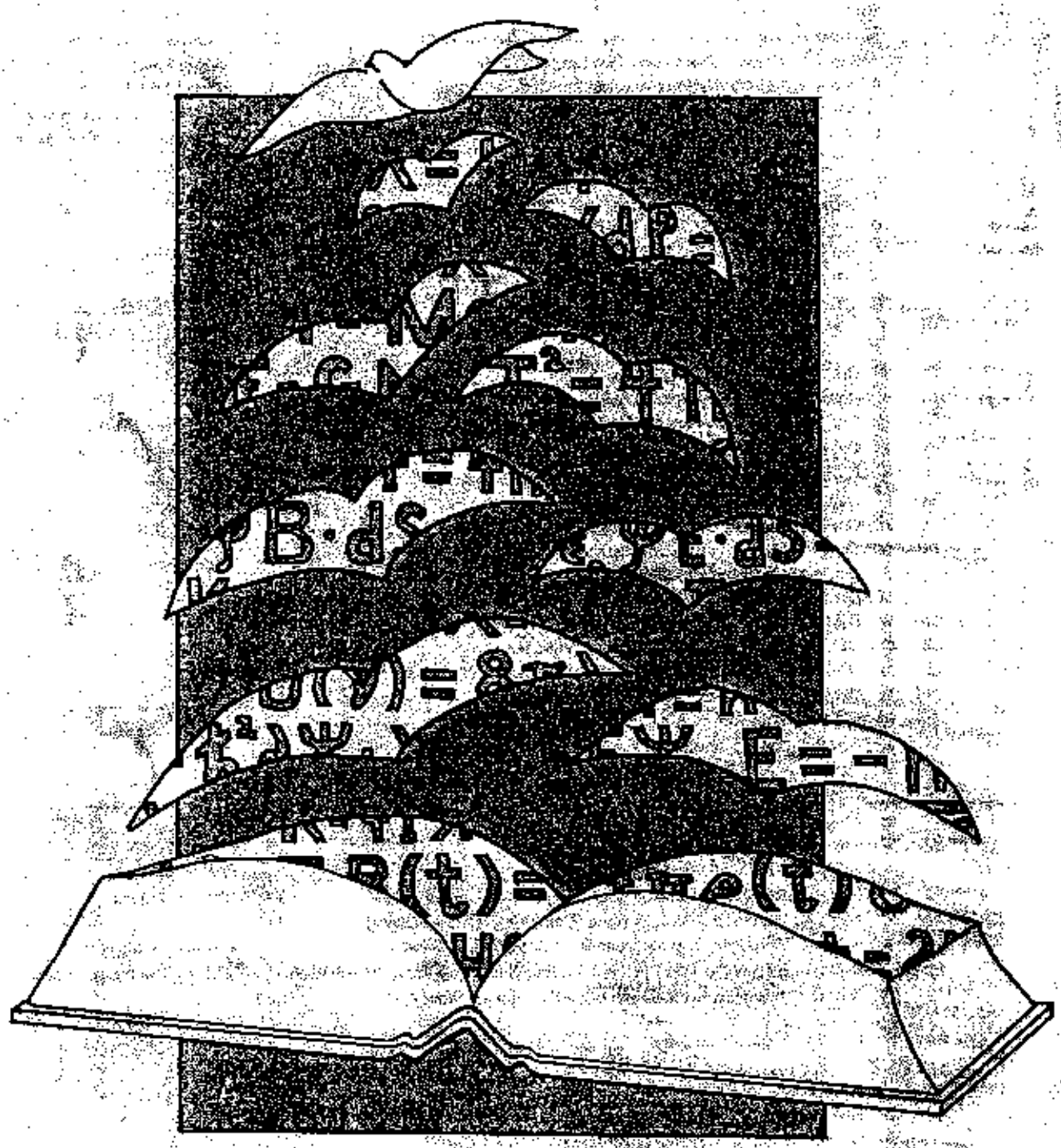
Reserve materials All handouts plus a copy of the text will be on reserve in the **Physics Library**, 4220 Chamberlin, hours M–Th 8–9, F 8–4:30, Sat 10–2, Sun 1–5, 262-9500. A copy of the text is on reserve in the College Library.

PHYSICS 107 SCHEDULE

Fall 1992
Prof. B. Durand

Week	*Lec*	*Date*		*Subject*	*Chap*	*Take notice!*
1	1	W	Sep 2	Why and How We Learn Physics; Harvard Video	X*	Course Info, Blue sheet
	2	F	Sep 4	Galileo: Kinematics, Two Leaps of Logic	1	History Sheet I, Homework Set I
2	3	W	Sep 9	Galileo: Uniform Acceleration, Falling Motion	1	BLUE SHEET DUE
	4	F	Sep 11	Galileo: Three Great Principles	2	Last day to drop w/o record
3	5	M	Sep 14	Descartes, Huygens: Momentum as a Quantity of Motion, Conservation Law I	2	Tues Sept 15 Last day to add
	6	W	Sep 16	Newton: Dynamics, Three Great Laws of Motion	3	
	7	F	Sep 18	Tycho, Kepler, Galileo: Demystifying the Heavens	4	
4	8	M	Sep 21	Newton: Universal Law of Gravitation	4	
	9	W	Sep 23	Energy, Work, Power, Conservation Law II	5	History Sheet II
	10	F	Sep 25	Coulomb, Faraday: Electromagnetic Force and Field	6	
5	11	M	Sep 28	Maxwell: The First Unified Field Theory. END OF UNIT I	6	Rosh Hashanah
	12	W	Sep 30	Waves I: Simple Harmonic Behavior of a Simple System	7	HOMEWORK I DUE Review Sheet I
	13	F	Oct 2	Waves II: Sound Waves	7	HW I Solutions
6	14	M	Oct 5	Waves III: Light Waves	7	
	Rev	M	Oct 5	Review Session for Exam I, 1300 Sterling, 7–9 pm		Use Review Sheet I
	Ex	T	Oct 6	EXAM ON UNIT I, 1300 Sterling plus other rooms, 7:30–8:30 pm		EXAM I Use 1 page of notes, 2 sided
	15	W	Oct 7	Chaos: Complex Behavior of a Simple System	X	Yom Kippur
	16	F	Oct 9	The famous γ (gamma) factor; Right Triangle	8	Exam I solutions
7	17	M	Oct 12	Einstein: Two Postulates of Special Relativity	9	Homework Set II
	18	W	Oct 14	Gedanken Experiments: Simultaneity, Length	9	
	19	F	Oct 16	Gedanken Experiments: Clock Slowdown, Time Ordering	9	
8	20	M	Oct 19	Spacetime: γ Factor, Triangle, 4th dimension	10	
	21	W	Oct 21	Albert/Henry Video; Spacetime Diagrams	X	
	22	F	Oct 23	Albert/Henry Video; Mass and Energy	11	
9	23	M	Oct 26	Albert/Henry Video; Real Life Examples of γ Factor	X	
	24	W	Oct 28	$E = mc^2$ and Bombs	11	
	25	F	Oct 30	Equivalence Principle, Geodesics, Inertia	12	Last day to drop
10	26	M	Nov 2	Curved Spacetime, Physics is Math	12	
	27	W	Nov 4	Cosmology: Big Bang, Expanding Universe	12	
	28	F	Nov 6	Cosmology: Black Holes, Dark Matter. END OF UNIT II	12	
11	29	M	Nov 9	The Atom and its Structure	13, 14	
	30	W	Nov 11	Planck: Light is Quantized	15	HOMEWORK II DUE Review Sheet II
	31	F	Nov 13	Einstein: The Photoelectric Effect, Waves are Particles	15	HW II Solutions
12	32	M	Nov 16	Bohr: The Hydrogen Atom (Dumping Classical Physics)	15	
	Rev	M	Nov 16	Review Session for Exam II, 1300 Sterling, 7–9 pm		Use Review Sheet II
	Ex	T	Nov 17	EXAM ON UNIT II, 1300 Sterling plus other rooms, 7:30–8:30 pm		EXAM II Use 1 page of notes, 2 sided
	33	W	Nov 18	deBroglie, Schrödinger, Born; Particles are Waves	16,17	
	34	F	Nov 20	Superconductivity	X	Exam II solutions Superconductivity sheet Last Day to Withdraw
13	35	M	Nov 23	Heisenberg: Uncertainty Principle, Philosophy	17,18	Homework Set III
	36	W	Nov 25	Feynman: Quantum Field Theory, Dynamics	19	
		F	Nov 27	NO LECTURE – **THANKSGIVING RECESS**		
14	37	M	Nov 30	The Nobel Prize: Great 20th Century Physicists	X	Nobel Sheets
	38	W	Dec 2	Four Forces: Bosons	19	4 Interactions Sheet
	39	F	Dec 4	Building Blocks: Quarks, Leptons	19	Notes on Particles Sheet
15	40	M	Dec 7	Inner Space/Outer Space, Course Evaluation END OF MATERIAL FOR HOMEWORK III	X	Inner/Outer sheet
	41	W	Dec 9	Feynman Video I, Things You Now Can Understand	X	
	42	F	Dec 11	Feynman Video II, Questions Physicists Can't Answer Yet	X	HOMEWORK III DUE Review Sheet III
16	43	M	Dec 14	Symmetry as a Unifying Principle. END OF UNIT III	X	Homework III Solutions
	Rev	Th	Dec 17	Review Session for Exam III, 1300 Sterling, 7–9 pm		Use Review Sheet III
	Ex	Sat	Dec 19	EXAM ON UNIT III, Rooms to be Announced, 12:25 pm		EXAM III Use 1 page of notes, 2 sided
	Gr	M	Dec 21	Final Grades Posted, 4205 Chamberlin, 262-3827, 1:00 pm		Grades

* X indicates that the subjects covered in lecture are *not* covered in Prof. March's text. *Some* of these subjects are covered in supplements written by Prof. Durand. Attendance at lecture is always important!



In nature's infinite book of secrets, a little I can read.
Shakespeare