

PHY 320 §1 2014 Fall (CRN 3815) Syllabus Introductory Modern Physics

Course-Section Web Site: www.science.marshall.edu/foltzc/p32014f.htm

Class meets: _T_R_ 8:00–9:15 in Science 281, from Aug.25 – Dec.05 (+ final 8–10, Dec.11)

Attendance at each class meeting is expected; chronic non-attendance may be penalized.

If you miss a Quiz or Exam, contact me before the next class meeting about a make-up.

If you miss a paper homework due class, hand it in later that day or email it to me (photo).

Instructor: Dr. Curt Foltz ; Science 159 ; foltzc@marshall.edu ; (304) 696-2519

office hours: MTW_F 12:30–2:00pm ; M_W__ 3:30–5:30pm

other times by appointment or chance ... (usually free 9:30 – 12:00)

Catalog Course Description: PHY 320 Introductory Modern Physics 3 hrs. lecture

An introductory study of atomic and molecular theories, relativity, quantum theory, and nuclear physics. (PR: PHY 203 or 213 and MTH 140 or MTH 230 ... CR PHY 421)

PHY 320 introduces the very new physics that arose at the start of the 20th Century.

Attempts to make E&M consistent with Mechanics led to the recognition that velocities did not add linearly, and to new formulae for momentum and Energy.

Observation of radioactivity led to models of the atom based on a dense nuclear core surrounded by electrons; those electrons seem to be not deterministic, and behave in a non-local manner; investigations of the nucleus have led to the perspective that matter might be nothing more than field intensities interacting in a nonlinear manner.

Modern physics is notorious for being NOT intuitive – the interpretation of the equations is not obvious; the meaning of some of the basic symbols were argued over for decades.

Some 20th Century results seem to be totally incompatible with common sense.

On the other hand, the Modern perspective has been very successfully applied, forming the base of our entire high-tech society.

Required: Modern Physics 3rd edition (Wiley 2012) by Kenneth Krane

scientific calculator (with EE/exp button), Formula recall can help – but not programmable (a phone or laptop is NOT acceptable)

Recommended: tenacity ... try a textbook with a different perspective for that sticky topic.

patience ... this is Physics III, intended to come after Physics I and II – before Quantum.

discussion ... with an open mind, about what it means, how we know, and why that way.

cooperation with learners ... the best way to learn is to teach, best instruction is by peers.

caffeine ... 8am is probably not the best time to try learning Modern Physics deeply. Sorry.

time & effort outside of class, 5 to 10 effective hours each week to complete assignments.

Grade Components: 12 homework sets × 10 points/set (average) = 60 points (20%)

3 Exams × 80 points/exam = 240 points (80%)

Letter Scale: 100% > A > 85% > B > 75% > C > 65% > D > 55% > F

Exams will include short essay, numerical computations, and symbolic derivations.

Schedule : This is Approximate and Tentative!

- 2 (Aug.26,28): special relativity coordinates and velocity transforms (Ch.2a)
2 (Sep.2,4): special relativity momentum and Energy; Force and collisions (Ch.2b+)
3 (Sep. 9-16): photons absorbed, emitted, reflected; polarization and structure (Ch.3+)
2 (Sep.18,23): electron wave interference and structure in a uniform potential (Ch.4)
-- Exam 1 --
2 (Sep.25,30): electron waves in 1-d flat-bottom potential well, and at a step (Ch.5a)
3 (Oct.2-9): e⁻ in 2-d flat well, in a 2-d smooth well, and beside a 2-d smooth well (Ch.5b+)
3 (Oct.14-21): e⁻ in 3-d nuclear (1/r) well, including its spin magnetic moment (Ch.7)
1 (*a*) (Oct.23): fudging inner and outer atomic electrons, and molecule bonds (Ch.8, 9)
1 (*b*) (Oct.28): atom thermal *E* distributions; electrons in metals and crystals (Ch.10, 11)
-- Exam 2 --
3 (Nov.4-11): atom nucleus; structure, stability; decay Energy and lifetime (Ch.6,Ch.12)
2 (Nov.13,18): fusion activation Energy; nuclear excited states and resonances (Ch.13)
1 (*c*) (Nov.20): standard quark model for baryons & mesons, and lepton families (Ch.14)
2 (*d*) (Dec.4) cosmic microwaves, expanding universe, General Relativity, *etc* (Ch.15)
-- Exam 3 --
We might omit (or treat even more briefly) the starred topics (*a*, *b*, *c*, *d* above).

Cell Phones and other networked devices may NOT be used in class, except by MY invitation.

Statements that are valid for ALL Classes at Marshall:

These are printed in your MU catalog – the most recent version is also on-line at
www.marshall.edu/academic-affairs/?page_id=802

- + Academic Dishonesty Policy: progress in science is founded on honesty and openness
– no lying, no cheating, no stealing, no copying – zero tolerance!
- + Absence Policy: email me ASAP after any missed class (before visiting Dean of Students);
if class-work slides “too far” behind (3 weeks max) before Nov.01, you should withdraw.
- + Incomplete Grade Policy: to receive an “I”, you must have completed ¾ of the course
successfully (passing); course work must be completed within 1 semester (by 2014 May)
- + Computing Services’ Acceptable Use Policy :, don’t “lend” your account, or send spam
from it, or solicit from it ... remember to LOG OUT before leaving the Lab!
- + Students with Disability Policy: the student must initiate procedures to document a
disability, then request accommodation, at the Office of Disability Services (Prichard 117).
- + Inclement Weather Policy: don’t over-risk your safety to get to class (see Absence Policy)

Other Academic Responsibilities of Students are described in your catalog and on-line.