PHYSICS 2211 - Principles of Physics I
Lecture MWF 10:00-10:50 H-203
Recitation Sec. 09 - M 11:00 - 11:50 H-250
Recitation Sec. 11 - W 11:00 - 11:50 H-250
Recitation Sec. 13 - F 11:00 - 11:50 H-250
Recitation Sec. 15 - M 2:00 - 2:50 H-250
Spring 2018

Textbook: *Physics for Scientists and Engineer 9th ed)*, by Serway and Jewett
Web Assign Access

Instructor: Dr. Russ Patrick Office: H260f Phone: (470) 578-4209
Website: http://facultyweb.kennesaw.edu/rpatri11/
e-mail: mailto:rpatri11@kennesaw.edu

Tentative Syllabus and Exam Schedule

Week of	Material Covered	Exam Dates
1/8	Ch. 1 – Physics and Measurement	
1/15	Ch. 2 - Motion in One Dimension	
1/22	Ch. 3 – Vectors	
1/29	Ch. 4 - Motion in 2 or 3 Dimensions	**Wed. Jan. 31**
2/5	Ch. 5 – The Laws of Motion	
2/12	Ch. 6 – Applications of Newton's Laws	**Wed. Feb. 14**
2/19	Ch. 7 – Energy of a System	
2/26*	Ch. 8 - Conservation of Energy	
3/5	Ch. 9 – Linear Momentum	**Wed. Mar. 7**
3/12	Ch. 9 - Collisions	
3/19	Ch. 10-Rotation of Rigid Bodies	
3/26	Chs.11 –Angular Momentum	**Wed. Mar. 28**
4/2	**Spring Break- No Classes**	
4/9	Ch. 15 – Oscillatory Motion	
4/16	Ch. 16 – Wave Motion	
4/23	Ch. 13 – Universal Gravitation	**Wed. Apr. 25**
4/30**	Ch. 39 – Special Relativity	

Grade Determination

Exams (Best 4)	50%
WebAssign	15%
Recitation	10%
Final Exam	25%

Important Dates

*Last day to Withdraw	Wed. Feb. 28
**Last Day of Classes	Mon. April 30
Final Exam	Monday May 7 10:30-12:30

1) **Attendance Policy:** Attendance for all lectures is strongly encouraged. A large amount of material will be covered in a short time. Successful completion of this course will require a sustained effort on your part to keep up with the material and understand the topics as they are presented. ***If you miss a class, you are responsible for all notes, changes, and announcements made in that class.***

2) Recitation (1 class/week) will be used to reinforce the lectures. The recitation meetings will mainly consist of asking questions about homework examples along with additional examples not covered in lecture. Attendance is mandatory and will be 10% of your grade **Homework:** A list of problems from the text and supplementary problems will be given out for each chapter. It is essential that you try to solve these problems. Some problems will be part of a Web Assignment, which will be 15% of your final grade. Some exam questions may come directly from the homework assignments or be very similar to these problems.

3) Exams: There will be five (5) scheduled tests given on the dates shown above. If all 5 exams are taken, the lowest exam grade will be dropped. ***NO MAKE-UP EXAMS WILL BE GIVEN UNDER ANY CIRCUMSTANCES!*** The average of your best 4 exam grades will comprise 50% of your final grade. I will supply a formula sheet for all exams; you should only bring a calculator and writing utensils. The exams will be a combination of multiple choice questions and problems.

- Any mobile device that transmits a signal is not permitted to be used in an exam.
- Late students will not be permitted into exam after other students have completed exam and left the exam room.
- Please deactivate any mobile device during exams. NO student will be permitted to leave an exam to answer a cell phone call.

4) Labs - Previously, this course existed as PHYS 2211K, which had a linked lab. Now, there are two separate courses: PHYS 2211L and PHYS 2211 are mutual co-requisites. [Note: if your major shows a requirement for PHYS 2211K, you are now required to take both PHYS 2211 and PHYS 2211L.]

5) Final Exam: The final exam is comprehensive and will comprise 25% of your total grade. It will consist of 25 multiple-choice questions. A formula sheet will be provided to you. You may bring only pencils and calculator. Please review final exam schedule before scheduling any traveling arrangements. Final Exam make-ups are only allowed for death, hospitalization, or scheduling conflicts with other final exams.

6) Office Hrs. T (12:00-2:00) WF (2:00-3:00) and by appointment.

7) Academic Dishonesty: KSU has an Honor Code and a procedure relating to when academic misconduct is alleged. All students should be aware of them. Information about the Honor Code and the misconduct procedure may be found at https://web.kennesaw.edu/scai/content/ksu-student-code-conduct

8) Any student with a documented disability or medical condition needing academic accommodations of class-related activities or schedules must contact the instructor immediately. Written verification from the KSU Student Disability Services is required. No requirements exist that accommodations be made prior to completion of this approved University documentation. All discussions will remain confidential. (http://www.kennesaw.edu/stu_dev/dsss/welcome.html)

9) The KSU Science and Math Academic Resources and Tutoring Center is an open resource for all KSU students. Located in Library 433 in Kennesaw and Student Center 185 in Marietta, the center provides free tutoring in Mathematics, Chemistry, Physics, and Engineering on a first-come first-serve basis. Specific hours and tutor schedules can be found on our website SMART.kennesaw.edu

10) Course Attendance Verification Statement:

Students are solely responsible for managing their enrollment status in a class; nonattendance does not constitute a withdrawal.

11) Withdrawal after Feb. 28 (W-Day) policy

- Students will need to visit the Registrar's office/website for the Academic Standing Appeal.
- Students will need to provide substantiation

http://registrar.kennesaw.edu/resources/academic_standing_appeals_withdraw.php

12) Course Prerequisite: MATH2253 (Minimum Grade of C)

13) Learning Objectives (PHYS2211)

a) Analyze and solve kinematical problems for systems moving in one and two dimensions using pictorial, graphical, physical, or mathematical representations (including calculus and vectors) of the system, and other representations as appropriate.
b) Analyze and solve statics and dynamics problems using Newton's laws (including the law of gravitation) in one and two dimensions using multiple representations including free-body diagrams and mathematical descriptions (including calculus and vectors) of the system.
c) Analyze and apply the conservation laws (energy and momentum) for linear and rotational systems, and develop solutions using multiple representations, including pictorial, graphical, or mathematical (including calculus and vectors) descriptions as appropriate.
d) Explain simple harmonic motion and compute parameters related to it in such applications as mass-spring oscillators, simple pendulums, and sinusoidal transverse waves.
e) Use special relativity to analyze differences in the behavior of objects as observed in different inertial reference frames, and explain the equivalence of mass and energy.

14) Web Assign Class Keys

Section 09 (Monday Morning Recitation): kennesaw 4680 3062

Section 11 (Wednesday Morning Recitation): kennesaw 5772 7201

Section 13 (Friday Morning Recitation): kennesaw 6531 1957

Section 15 (Monday Afternoon Recitation): kennesaw 2987 1685

Chapter 1 Homework
Problems 2,5,12,18,20,27,36,43,44

Chapter 2 Homework
Problems 1,4,7,9,10,14,17,20,28,30,38,48,50,51,61,62,73

Chapter 3 Homework
Problems 1,4,5,7,10,15,19,20,23,24,31,32,36,41,51

Chapter 4 Homework
Problems 1,7,9,13,16,20,23,29,33,40,43,60,70

Chapter 5 Homework
Problems 5,11,12,16,19,22,28,30,33,37,40,43,51,53,60,61,63,65,83

Chapter 6 Homework
Problems 1,2,3,6,11,13,16,18,21,23,38,45

Chapter 7 Homework
Problems 1,2,5,8,9,10,11,14,17,20,28,29,31,33 37,41,42,43,45,51,55

Chapter 8 Homework
Problems 3,4,5,6,7,12,15,18,22,23,31,33,38,39,43,44,63

Chapter 9 Homework
Problems 3,5,8,11,13,14,18,20,22a,23,24,31,32,34,42,43,46, 48,54,55,71,77,79

Chapter 10 Homework
Problems2,3,5,7,12,17,21,26,27,30,34,36,40,45,49,55,56,59,60,67,83

Chapter 11 Homework
Problems 3,5,11,12,20,22,23,25,27,30,31,35

Chapter 13 Homework TBA

Chapter 15 Homework
Problems 1,4,5,8,9,15,19,24,27,28,32,33,35,37,43,57,64,65

Chapter 16 Homework
Problems 1,5,7,9,11,13,17,19,22,24,26,31,39,45,47,56

Chapter 39 Homework TBA

Equations and Constants (Phys2211)

Kinematics, Newton's Laws

$\mathbf{A} \cdot \mathbf{B} = AB\cos\theta$ $\quad |\mathbf{A} \times \mathbf{B}| = AB\sin\theta$ $\quad \mathbf{r} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ $\quad \rho = \frac{m}{V}$

$\bar{v} = \frac{\Delta \mathbf{r}}{\Delta t}$ $\quad \mathbf{v} = \frac{d\mathbf{r}}{dt}$ $\quad \bar{a} = \frac{\Delta \mathbf{v}}{\Delta t}$ $\quad \mathbf{a} = \frac{d\mathbf{v}}{dt}$ $\quad v_f = v_i + at$

$x_f = x_i + v_i t + \frac{1}{2} at^2$ $\quad v_f^2 = v_i^2 + 2a(x_f - x_i)$ $\quad x_f = x_i + \frac{1}{2}(v_f + v_i)\, t$ $\quad x_f = x_i + v_f t - \frac{1}{2} at^2$

$y = (\tan\theta)x - \frac{gx^2}{2(v_o\cos\theta)^2}$ $\quad R = \frac{v_o^2 \sin(2\theta)}{g}$ $\quad a = \sqrt{a_x^2 + a_y^2}$ $\quad \tan\theta = \frac{a_y}{a_x}$ $\quad C = 2\pi r$

$\sum \mathbf{F} = m\mathbf{a}$ $\quad \mathbf{W} = m\mathbf{g}$ $\quad f \le \mu_s N$ $\quad f = \mu_k N$ $\quad a_{rad} = \frac{v^2}{r}$ $\quad T = \frac{2\pi r}{v}$

Work and Energy

$W = \mathbf{F} \cdot \mathbf{d} = Fd\cos\theta$ $\quad F = -kx$ $\quad W_{net} = \Delta K = -\Delta U$ $\quad W = \int F(x)\, dx$

$K = \frac{1}{2} mv^2$ $\quad P = \frac{dW}{dt} = \mathbf{F} \cdot \mathbf{v}$ $\quad E_{mech} = U + K = \text{constant}$ $\quad U_{Elastic} = \frac{1}{2} kx^2$ $\quad U_{Grav} = mgh$

$\sum \Delta U + \Delta K = W_{non\text{-}conservative}$

System of Particles, Momentum

$\mathbf{r}_{cm} = \frac{1}{M} \sum m_i \mathbf{r}_i$ $\quad \mathbf{p} = m\mathbf{v}$ $\quad \Sigma \mathbf{F} = \frac{\Delta \mathbf{p}}{\Delta t}$ $\quad \mathbf{I} = \int \mathbf{F}(t)\, dt = \mathbf{F_{avg}} \Delta t = \Delta \mathbf{p}$

$v_{1f} = \frac{m_1 - m_2}{m_1 + m_2} v_{1i} + \frac{2m_2}{m_1 + m_2} v_{2i}$ $\quad v_{2f} = \frac{2m_1}{m_1 + m_2} v_{1i} + \frac{m_2 - m_1}{m_1 + m_2} v_{2i}$ $\quad \sum \mathbf{F}_{ext} = m\mathbf{a}_{cm}$

Rotational Motion

$\omega = \frac{\Delta\theta}{\Delta t}$ $\quad \omega = \frac{d\theta}{dt}$ $\quad \alpha = \frac{\Delta\omega}{\Delta t}$ $\quad \alpha = \frac{d\omega}{dt}$ $\quad \omega = \omega_i + \alpha t$

$s = r\theta$ $\quad v = \omega r$ $\quad a_{tan} = \alpha r$ $\quad \theta = \theta_i + \omega_i t + \frac{1}{2} \alpha t^2$ $\quad \omega^2 = \omega_i^2 + 2\alpha(\theta - \theta_o)$

$\theta = \theta_i + \frac{1}{2}(\omega + \omega_i)\ t$ $\theta = \theta_I + \omega t - \frac{1}{2}\ \alpha t^2$ $K_{rot} = \frac{1}{2}\ I\omega^2$

$I = \sum m_i r_i^2$ (Point Masses) $I = I_{cm} + Md^2$ $\mathbf{L = r \times p}$ $L = I\omega$

$W = \int \tau\, d\theta$ $P = \tau\, \omega$ $\sum \tau = I\alpha$ $\boldsymbol{\tau = r \times F =}\ rF\sin\theta$

Universal Gravitation $F = G\frac{mM}{r^2}$ $U(r) = -G\frac{mM}{r}$ $G = 6.674 \times 10^{-11}\ N\ m^2/kg^2$

Harmonic Motion and Wave Motion

$F = ma = -kx$ $k = \frac{2\pi}{\lambda}$ $\omega = vk$ $E_T = \frac{1}{2}\ mv^2 + \frac{1}{2}\ kx^2 = \frac{1}{2}\ k\ A^2 = \frac{1}{2}\ mv_m^2$

$\omega = \sqrt{\frac{k}{m}} = 2\pi f$ $T = \frac{1}{f}$ $\omega = \sqrt{\frac{g}{L}}$ $v = \lambda f$ $v = \sqrt{\frac{T}{\mu}}$ $\mu = \frac{m}{L}$

$x(t) = A\cos(\omega t + \theta_o)$ $v(t) = -\omega A\sin(\omega t + \theta_o)$ $a(t) = -\omega^2 A\cos(\omega t + \theta_o) = -\omega^2 x$

$y(x,t) = A\cos[2\pi f(\frac{x}{c} \pm t)]$ $y(x,t) = A\cos[2\pi(\frac{x}{\lambda} \pm \frac{t}{T})]$ $y(x,t) = A\cos[kx \pm \omega t]$

Special Relativity

$\gamma = \frac{1}{\sqrt{1 - u^2/c^2}}$ $\Delta t = \gamma\ \Delta t_o$ $L = L_o/\gamma$ $x' = \gamma(x - ut)$ $y' = y$ $z' = z$

$t' = \gamma\,(t - ux/c^2)$ $v_x' = \frac{v_x - u}{(1 - uv_x/c^2)}$ $v_x = \frac{v'_x + u}{(1 + uv'_x/c^2)}$

$g = 9.8\ m/s^2 = 32\ ft/s^2$ $1\ kg = 1000\ g$ $1\ m = 100\ cm = 3.28\ ft$ $1\ inch = 2.54\ cm$

$1\ J = 1\ Nm = 0.738\ Ft\ lb$ $1\ m/s = 3.28\ ft/s = 2.24\ mi/hr$ Density of water $= 1000\ kg/m^3$

$A(Sphere) = 4\pi r^2$ $1\ liter = 1000\ cm^3$ $1\ eV = 1.6 \times 10^{-19}\ J$ $1\ nm = 10^{-9}\ m$

$1\ rev = 2\pi\ radians = 360^o$ $1\ Pa = 1\ \frac{N}{m^2}$ $1\ Watt = 1\ \frac{J}{sec}$ $1\ atm = 1.01 \times 10^5\ Pa$

$1\ p = 10^{-12}$ $1\ n = 10^{-9}$ $1\ \mu = 10^{-6}$ $1\ k = 10^3$ $1\ M = 10^6$ $1\ Watt = 1\ \frac{J}{sec}$

Speed of light $= 3 \times 10^8$ m/s (Vacuum) Speed of Sound = 343 m/s (Room Temp)