SYLLABUS

INSTRUCTOR. Mike Crittenden, 585-343-0055 ext. 6397, e-mail macrittenden@genesee.edu
(I check that email frequently on weekdays, and sometimes on weekends but not always. I check voicemail much less often and almost never look for messages in Blackboard.)
Alternate e-mail in case GCC system fails: professormac@live.com (If the GCC system has not failed, I go for weeks without checking that.)

OFFICE HOURS. M–F 11:15–12:10 in D369 (Batavia Campus) To minimize personal contact, consider using email, phone or Zoom. But if the building is open, I'll be there.

REQUIRED:
1) Textbook. College Physics by OpenStax. An electronic version is available for free at https://openstax.org/details/college-physics If you want a hard copy, it can be ordered through that website for $48.50, or purchased for somewhat more from the GCC bookstore. Student Solutions Manual, recommended. Free. Same link. Click on Student Resources.
2) Calculator, with trig functions. For tests, it must not resemble a phone.
3) Access to a computer with a webcam.
4) Access to high-speed internet.
5) A way to send me documents, such as a scanner or by taking pictures with a phone.

ANTICIPATED SCHEDULE:

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Final Exam (sec 1-14): Dec. 14, 15 or 16. The exact time will be announced when I know it.

I will record the lectures I would normally give in class. Watch them in Blackboard, under Course Videos, on whatever schedule you like, as you prepare for each quiz.

Most labs and testing will be in person, usually once a week. The class will split into two groups so people can distance. Some will come on Mondays, some on Wednesdays. Masks and gloves required. Everyone will come at the same time for exams and a few of the quizzes. Those days, we will use two rooms. However, some people will be uncomfortable
with that, so there will also be a remote option. It’s not a real lab experience if you don’t perform it yourself, so I encourage you to do that. If you are seriously concerned, the alternative will be videos of me performing each experiment. Tests can also be done remotely. During a normal lab, I would critique your work and send it back for correction a few times, so if you work from home, allow enough time before the deadline for multiple emails. I will not accept labs more than one week after the date on the schedule above.

Everyone will take at least some tests remotely. Remote tests must be taken during the regular class period on the scheduled date. I will proctor them by watching you through your webcam.

If the College closes for a snow day, the test and lab will be done remotely and we will stick to the schedule.

Permission for students from the Monday group to come W 9/9 and W 10/14 will be given on a first come, first served basis. If space is unavailable, do the lab based on the recording and take the quiz remotely on Wednesday. (M 9/7 and M 10/12 are holidays.)

GRADING SYSTEM / COURSE REQUIREMENTS:

You must earn at least two thirds of the possible lab points or you will receive an F for the course, regardless of your test scores. (You fail if you miss more than four labs.) Otherwise, assuming no reduction for dishonesty, your grade is determined as follows. (You can keep track of your grades below. Keep graded papers in case you find an error in my records.)

Quizzes (10 pt each): ___+___+___+___+___+___+___+___+___+___+___+___ = ___

Labs (10 pt each): ___+___+___+___+___+___+___+___+___+___+___+___ = ___

Exams 1, 2 & 3 (100 pts each): _____ + _____ + _____ = ___

Final Exam (175 pts): ___

Total: ___

No grades are dropped, except when replaced by a retest. No extra credit. Maximum score = 755, of which 140 points (18.5%) comes from quizzes, 140 points (18.5%) from labs, 300 (13.2% each for a total of 39.7%) from exams and 175 (23.2%) from the final.

A  92.6% - 100% (699 - 755 points)  C  70.6% - 74.2% (533 - 560)
A- 89.0% - 92.5% (672 - 698)  C- 67.0% - 70.5% (506 - 532)
B+ 85.3% - 88.9% (644 - 671)  D+ 63.3% - 66.9% (478 - 505)
B  81.6% - 85.2% (616 - 643)  D  59.6% - 63.2% (450 - 477)
B- 78.0% - 81.5% (589 - 615)  D- 56.0% - 59.5% (423 - 449)
C+ 74.3% - 77.9% (561 - 588)  F  0 - 55.9% (0 - 422)

If a lab or test has to be canceled, the same percents will apply to the smaller number of possible points.

W: To withdraw, contact the records office by the ninth week. Ws can not be issued by faculty.
IP: Contact me by the day after the final. As with any time extension, you need a legitimate reason.

For a crude estimate of your grade before the course is over:

\[
(1.85) \text{(quiz total so far)}/(\text{number of quizzes so far}) = \phantom{0000000000}
\]

\[
(1.85) \text{(lab total so far)}/(\text{number of labs so far}) = \phantom{0000000000}
\]

\[
(.630) \text{(exam total so far)}/(\text{number of exams so far}) = \phantom{0000000000}
\]

Total: \phantom{0000000000}%

With nearly perfect lab grades, which most people have, a little under 50% is needed on quizzes and exams to have 56% overall and get a D – . Mid 60s for a C (not C – ), high 70s for a B. (This is based on the idea that B– means "slightly above average," together with the fact that a typical class on a typical test has an average grade around 75%..)

Retests. I do not drop any grades. Instead, you can take another test on the same material. The better of the two grades counts. You may retake a maximum of five quizzes, within one week of the original, but not after the final exam. You may take one of the 100 point exams over, on the date in the schedule above. A retest gets "used up" even if it does not improve your grade. Making up a quiz you missed is a retest unless I agree otherwise. There are no re-retests or retests on the final.

Videos. For videos of lectures, go to www.genesee.edu then click myGCC at the top. Click LOGIN to myGCC and then enter your ID and password. If necessary, click Student and then My Courses near the top. Click PHY-121-01 Fall 20 and look under Course Videos. (Only the videos are in Blackboard. For all other materials, go to https://faculty.genesee.edu/macrittenden/PHY121.HTM)

IS THIS THE RIGHT PHYSICS COURSE FOR YOU?

PHY 100 is for students with unrelated majors such as Elementary Ed, Business or Drama. PHY 121 & 122: for technology or health-related majors such as Drafting or Pharmacy. 131, 132 & 133: for majors such as Physics, Engineering or Mathematics. It's fine to take a course which is more than the minimum necessary. Also, requirements vary between four-year schools; you should check what is required where you want to go.

COURSE DESCRIPTION:

Catalog description: An algebra/trigonometry based introduction to physics for career or transfer students with majors somewhat, but not closely, related to physics. Topics include one and two dimensional motion, Newton's laws, energy, momentum, rotation, statics, fluid mechanics, heat and thermodynamics, and special relativity. Three class hours, three lab hours. Fall only. Prerequisite: MAT 121 or MAT 136 or higher or by placement.

Course Learning Outcomes (CLOs):
Upon the successful completion of this course, a student will be able to:

1. Apply basic principles of mechanics conceptually, using proper terminology. (This includes Newton's laws, energy and momentum applied to translational and rotational statics and dynamics. Also fluid mechanics and an introduction to special relativity.)

2. Apply basic principles of thermodynamics conceptually, using proper terminology. (This includes the ideal gas law, heat and the first and second laws.)

3. Translate questions about physical topics into mathematical expressions.

4. Solve the equations they have set up. (This includes fluent use of algebra, trigonometry, and vector arithmetic. Also appropriate use of units and graphs.)

5. Reason creatively, developing solutions to multi-step problems which are not identical to others they have seen before.

6. Use laboratory equipment, given written instructions, to demonstrate and verify theoretical principles in actual physical systems.

7. Analyze the results of laboratory experiments, including their probable error, to draw conclusions on whether they are in agreement with generally accepted values or principles.

8. Prepare lab reports which clearly convey the underlying ideas of experiments as well as the methods and results.

RULES & POLICIES:

**Attendance:** I am not your mother and will not try to make your choices for you. I also don’t believe in giving away points for just sitting in a chair. Attendance is not part of calculating your grade. If thinking about skipping class, keep in mind that I will fail you if you can’t do this stuff.

Federal regulations require the College to report students who register for a class but “no show.” You must take specific actions at least once within the first three weeks or you will be dropped from the course. Examples of what will satisfy the federal expectations include, but are not limited to, any one of the following:

- Showing up at least once in a face to face class meeting.
- Submission of a student-to-instructor message about a specific aspect of the course. (Taking a remote quiz or just emailing me about course content counts. Emailing about something else, like telling me your computer is broken, does not.)
- Students who simply log into the course but perform no student-initiated action do **NOT** satisfy the expectations of the federal No Show attendance reporting and will be
dropped from the course. You must engage in at least one student-initiated activity to be counted as attending. (Going into Blackboard and looking around does not count.)

**Missing a quiz or exam:** If possible, contact me on or before the day of the test. You will probably need to document the fact that missing the test was beyond your control. (Paperwork from your medical treatment, the receipt for your car’s repairs or parts, the police report … ) If you’re sick for a quiz but not sick enough to see a doctor, just take the retest. If this happens for a big test, discuss it with me. If it’s a day or two after the test, you will need to explain why you couldn’t contact me sooner. I try to be reasonable; however, the final judgment as to what is reasonable is mine, and I may reject any undocumented excuse. If I do, the zero can be raised by a retest the same as any other grade. Don’t miss the Final without a good reason.

**Behavior:** If I feel you are unacceptably offensive or distracting, I may deny you permission to be in class for however long seems appropriate to me. This includes possible expulsion from the course, with zeros on all remaining work. I’ve never had to do this; let’s keep it that way. For more information on behavior, put “student code of conduct” in the search box at genesee.edu.

**Cheating:** A first offense will result in a course grade reduction of one letter. (If you cheat on an exam, the average of the other two exams will be used as the grade for that exam. If you cheat on a quiz, the average of the other quizzes will be used as its grade. After that, 83 points = 11% will be subtracted from your grade for the course.) I will notify the Dean of Students, which will lead to more severe penalties if you have a previous history of dishonesty. A second offense, meaning you previously cheated in any course at GCC, will result in a course grade of F. More extreme cases may lead to suspension or expulsion from the college as described in the Code of Conduct.

*Cheating* is obtaining or intentionally giving unauthorized information to create an unfair advantage in an examination, assignment, or classroom situation. *Plagiarism* is the act of presenting and claiming words, ideas, data, programming code or creations of others as one’s own. Plagiarism may be intentional – as in a false claim of authorship – or unintentional – as in a failure to document information sources using MLA (Modern Language Association), APA (American Psychological Association), Chicago or other style sheets or manuals adopted by Faculty at the College. Presenting ideas in the exact or near exact wording as found in source material constitutes plagiarism, as does patching together paraphrased statements without in-text citation. The purchasing or sharing of papers or projects between students or the re-use of papers or projects submitted for more than one assignment or class also constitutes plagiarism.”

Examples of academic dishonesty include but are not limited to the following:

- Taking an exam for another student.
- Having another student take an exam for you.
- Arranging with other students to give or receive answers by the use of signals.
• Copying from someone’s exam.
• Allowing another student to copy from you during an exam.
• Obtaining answers, information, translations or material from a source (ex. the Internet) without appropriate citation.
• Getting questions or answers from someone who has already taken the exam.
• Unauthorized use of information stored in the memory of an electronic device (ex. programmable calculators and cell phones) on a test or assignment. No information stored in any electronic devices may be used without explicit permission.

Punctuality: If you are late for a quiz or exam, your paper will be collected when everyone else’s is, unless you offer a reasonable explanation. If you arrive over 15 minutes after the class has started a lab, and there is no available setup, you will have to use the video instead.

Accessibility Statement: If you have a physical, psychological, medical, or learning disability that may impact your coursework or participation in this class, please contact the Assistant Dean for Student Services/Disabilities Coordinator, Success Coach, or Academic Advisor who will arrange an intake meeting. The Assistant Dean/Coordinator will determine with you what accommodations are necessary, appropriate, and reasonable. All information and documentation is confidential.

If you encounter any course materials that are inaccessible with adaptive equipment or inaccessible due to extenuating circumstances please let me know or contact those above.

For Access & Accommodation Services phone 585-343-0055 x6219 or email AccessServices@genesee.edu

Please contact GCCOnline@genesee.edu or call 585-343-0055 extension 6969 with any questions you might have about studying online, support services for online students, or questions about enrolling in other online courses.

Support Services.

Ask me for help any time.

Tutoring is available remotely. To find schedules, make appointments and view your tutoring history visit https://tutortrac.genesee.edu. To work with a tutor via email or to inquire about tutoring services, email tutoring@genesee.edu. Additional success resources are available in the Learning Center, which you can enroll in by visiting the Tutoring module within MyGCC.

STAR-NY is an online, evening tutoring service, available August 24 – December 16. It is open to all GCC students, whether they are in an online class or not. To work with a STAR-NY tutor, visit https://www.starny.org/ and log in with your GCC NetID and
password. Questions about the STAR-NY service can be sent to GCCOnline@genesee.edu

For information on other support such as testing services, disabilities support, internet access, help desk, financial, transfer or career services, or contact information for GCC people or offices, see genesee.edu. There is an “Information for All Students” document: From www.genesee.edu, click Student, just below the search box. Under Student Services, click Help Desk/Technical info. Click IFAS.

TIPS ON STUDYING & WHAT TO EXPECT FROM THE COURSE:

In class: Take good notes. A lot of this material will not stick to you the first time you hear it. You need something to refer to as you do the homework. If following the lectures is hard, do the reading before I go over it so you have an idea of what I’m talking about.

At home each week: Any course has some memorization, but this one is mostly about developing skills. Skill comes from actively practicing not passively watching something or reading about it. If you were taking piano lessons, looking at sheet music and reading about how to hold your hands might be a good place to start, but after that, re-reading and memorizing doesn’t accomplish much. You have to start trying to play and the more you play the better you get. Likewise, the way to get good at solving physics problems is by solving physics problems. When you get stuck on the homework, spend a little time trying to figure it out. Look through your notes or the text for similar examples. After a certain point, if you’re just going around in circles, look at the solutions. Then put the solutions away and finish the problem. If you get stuck again, take another peek. If you work on the homework until you can put the solutions on blank paper, just like during the quiz, you can do the same thing during the quiz. For some people, the weekly assignments may not be enough practice. It’s better to do three different problems once than to do the same problem three times. You can practice on sample problems from class. Cover up the solutions, try them, then compare. Also, you can download the Student Solution Guide, https://openstax.org/details/college-physics#student-resources-section for worked out solutions to some of the text’s end of chapter problems.

For the monthly exams and final: A month of material probably won’t cram into your head in one night. If you’ve been keeping up each week, refresh your memory by reading back through your notes. If there are areas where you do not feel confident, solve problems, preferably new ones.

This is a fairly demanding course for the average student. Expect to follow the 2 to 1 rule (Two hours outside of class per credit, meaning 8 hours per week for this course). On the other hand, don’t be intimidated. Just because every detail is not crystal clear does not mean you’re doomed to failure. While people who study hard don’t always get As, it’s rare for them to actually fail. And who knows? You may even discover that the mathematical description of nature can be an interesting subject.
Homework (Quiz Questions):

I will quiz you on homework rather than collecting it. Each assignment consists of several quizzes; on the dates indicated earlier, you will be given one of them in class, with the numbers changed.

Complete, line by line solutions are at https://faculty.genesee.edu/macrittenden/PHY121.HTM (I use Blackboard only for videos; this website is on a different server.)

Do not try to save time by just memorizing these solutions. The quizzes are only 19% of your grade. The rest of the time, you need to understand what you're doing. You can't learn to swim by just watching other people swim, and you can't learn physics by just watching problems be solved. This course is primarily about analytical skills, and skill comes from practice:

First, try to do the assignment yourself, from just your book and notes. If you don't spend at least 3 hours on it before you decide you need help, you're not making a serious attempt. Then, use my solutions to help with the parts you're stuck on. If the part you're stuck on is the whole assignment, you'd better see me or a tutor.

Need help? Remember, I'm paid to do this. It's not an imposition if you ask me to do my job.

Sec. 1: Straight line motion:

Reading: All of Ch. 2.

Quiz A. 1. (2.5 points) Is it possible to have a situation in which the velocity and acceleration have opposite signs? If so, sketch a velocity-time graph to prove your point.

2. (7.5) A stone is thrown upward from the edge of a cliff 18.0 m high. It just misses the cliff on the way down, and hits the ground below at 20.3 m/s. With what velocity was it released?
   ans: 7.70 m/s

Quiz B. 1. (3 points) You throw a ball straight up, which then drops back into your hands. If up is positive and down is negative, (a) As it rises, is its acceleration positive, negative or zero? (b) At the instant when it's highest, is its acceleration positive, negative or zero? (c) As it falls, is its acceleration positive, negative or zero?

2. (7) A stone is thrown upward from the edge of a cliff 18.0 m high. It just misses the cliff on the way down, and hits the ground below at 20.3 m/s. What is its maximum distance from the ground?
   ans: 21.0 m

C. 1. (4 points) With the help of conversion factors from your formula sheet, find the speed in kilometers per hour equivalent to 90.0 ft/s.
ans: 99.0 km/hr

2. (6 points) A car accelerating uniformly is going 6.00 m/s when it passes one checkpoint. It passes a second checkpoint 100 m away 10.0 s later. What is its acceleration?
ans: 0.800 m/s²

D. A woman is reported to have fallen 43.9 m (144 ft) from a building, to the top of a metal ventilator box, which she then crushed to a depth of 46.0 cm. She suffered only minor injuries. Neglecting air resistance, calculate her
(a) velocity just before she reached the box.
(b) average acceleration while in contact with the box.
ans: 29.3 m/s, –935 m/s² if down is positive. (Opposite signs if up is positive.)

E. 1. (4.5 points) A ball is thrown straight up, and then returns to its starting point. Taking up to be positive, fill in these graphs of the ball's motion. (Sketches – They don’t need to be to scale.)

E. 2. (5.5 points) A car moving at 20.0 m/s has its brakes slammed on, and stops in a distance of 40.0 m. What was the car’s acceleration, assuming it to be constant? Include the correct sign.
ans: -5.00 m/s²

Sec. 2: Vectors. Projectiles.

Read: Pages 91 – 100 & 104 – 111.

A. 1. (2 pts) A bullet is fired horizontally over level ground. In order to spend the most time in the air, its speed should be as _________ (fast? slow? doesn’t matter?) as possible. (Ignore air friction and the curvature of the earth.)

2. (8) A rifle is aimed horizontally at a mark on a large wall 2000 m away. The initial speed of the bullet is 500 m/s. Neglecting air drag, how far below the mark does the bullet strike the wall?
ans: 78.4 m

B. 1. (3 points) You walk around the block and end up at your starting point. If each of its four sides is 140 m long,
a. How large is your resultant displacement?
b. How far did you walk?
ans: 0, 560 m
2. (7) Add the following displacement vectors by direct measurement on a scale drawing. (I have rulers and protractors to loan during the quiz.) Vector A: 8.00 m at 45°. Vector B: 8.00 m at 180°. (Give both the magnitude and direction of the answer.)
   ans: 6.12 m at 112°. (Since this asks for a graphical solution, correctly calculating the answer with the component method will get half credit. Since a graphical solution is usually a little off, being within a few tenths of a meter, and a few degrees will get full credit.)

C. 1. (1 point) Can the magnitude of a vector have a negative value?

2. (9) A ball is thrown horizontally from the top of a building 35.0 m high. The ball strikes the ground at a point 80.0 m from the base of the building. Find (a) the time the ball is in flight, (b) its initial speed.
   ans: 2.67 s, 29.9 m/s

D. Hitting a tennis ball at ground level gives it an initial velocity of 24 m/s at 57° above the horizontal.
   (a) As it leaves the racket, what are
      - the x and y components of the ball's velocity?
      - the x and y components of the ball's acceleration?
   (b) When at its maximum height, what are
      - the x and y components of the ball's velocity?
      - the x and y components of the ball's acceleration?
   (c) How much time is the ball in the air?
   (d) When the ball lands, how far is it from the place where it was hit?
   ans: (a) 13.1 m/s, 20.1 m/s, 0, –9.8 m/s² (b) 13.1 m/s, 0, 0, –9.8 m/s² (c) 4.11 s (d) 53.7 m

E. 1. (2 points) For each of the following, state whether or not it is a vector: (a) temperature, (b) volume, (c) velocity, (d) age.

2. (8) You drop a crumpled ball of paper off a bridge. At one point as it falls, the forces on it are as shown. Use a scale drawing to find their resultant. (I have rulers and protractors to loan during the quiz. Give both the magnitude and direction of the answer.)
   ans: 1.37 N at -15.0°. (Since this asks for a graphical solution, correctly calculating the answer with the component method will get half credit. Since a graphical solution is usually a little off, being within a tenths of a newton, and a few degrees will get full credit.)

Sec. 3: Newton's Second Law:

Read: In Ch. 4, sections 4.1 – 4.3 and 4.5 – 4.7

A. 1. (2 points)
   – A heavy pair of shoes hangs from a clothesline. In terms of components,
explain why it is impossible to remove all sag from the line no matter how much you tighten it.

– Would it be possible with just one side of the line horizontal?

2. (8) The tension in the cord equals \( W \), the weight hung on its end.  
   a) What is \( L \), the magnitude of the force from the leg muscles?  
   b) How much does the leg weigh?  
   \[ \text{ans: } 67.9 \text{ N, } 39.2 \text{ N} \]

B. The horizontal force that holds the pendulum aside is 20.0 N.  If the cord makes an angle of 37° to the vertical, find the tension in the cord and the weight of the ball.  
   \[ \text{ans: } 33.2 \text{ N, } 26.5 \text{ N} \]

C. 1. (2 points) If a car is traveling westward with a constant speed of 20 m/s, what is the resultant force acting on it?

2. (8) Add the following displacement vectors by the trigonometric component method: Vector A: 8.00 m at 45°. Vector B: 8.00 m at 180°.  
   \[ \text{ans: } 6.12 \text{ m at } 112°. \text{ (Half credit for a correct graphical solution.)} \]

D. The picture shows the pulley on a car’s crankshaft.  The arrows represent the tension in a belt passing over the pulley.  (Unlike a freely turning frictionless pulley, the tension is not the same on each side.) Find the magnitude and direction of the single force which is equivalent to these two forces \( (\vec{F}_1 + \vec{F}_2) \).  
   \[ \text{ans: } 185 \text{ N at } 77.8° \]

E. The uniform metal plate is in a vertical plane, and weighs 50 N.  Rods A, B and C are being pulled; D is being pushed.  
   \[ \text{F}_A = 75 \text{ N, } \text{F}_B = 150 \text{ N, } \text{F}_C = 150 \text{ N and } \text{F}_D = 200 \text{ N}. \text{ Find the magnitude and direction of the net force acting on it.} \]  
   \[ \text{ans. } 372 \text{ N at } 138° \]
Sec. 4: More F = ma. Friction.

Read: Continue sections 4.5 – 4.7, and also section 5.1

A. 1. (2) In a world where all surfaces were completely frictionless, could you
a. walk across the floor?
b. climb a ladder? (It's attached to a wall so it won't slide off.)
c. climb a vertical pole?
d. jump straight up into the air?

2. (8) A 500 g box hangs by a string from another 500 g box, which hangs from another string. The system is accelerating downward at 1.20 m/s².
   a. What is P, the tension in the upper string?
   b. What is the tension in the connecting string?
   ans: 8.6 N, 4.3 N

B.1. (2) a. A box weighing 10 N is sitting on the floor in an elevator which has a constant upward velocity. The normal force on this box is ________ 10 N. (equal to? more than? less than?)
   b. A box weighing 10 N is sitting on the floor in an elevator which has a constant upward acceleration. The normal force on this box is ________ 10 N. (equal to? more than? less than?)

2. (8) A car weighing 12.4 kN, moving at 9.10 m/s slows uniformly to a stop in a time of 5.00 s.
   Find the magnitude of (a) the car's acceleration and (b) the net force on the car.
   ans: 1.82 m/s², 2.30 kN

C. 1. (2 pts) A car's driver steps hard on the brakes, locking the wheels so that it skids to a stop. Does this stop the car in the shortest possible distance? Explain.

2. (8) The coefficient of kinetic friction between a 4.00 kg box and the floor is .600. How large is the horizontal force needed to give the box an acceleration of 2.00 m/s²?
   ans: 31.5 N

D. A 500 gram block originally moving at 80 cm/s slides 60 cm across a table before stopping. Find (a) its acceleration, (b) the magnitude of the friction force that stopped it, and (c) μ_k
   ans: -.533 m/s², .267 N, .054

E. A woman at an airport is towing her 20.0 kg suitcase at a constant speed by pulling a strap which makes an angle of θ with the horizontal. She pulls the strap with a 35.0 N force, and the frictional force on the suitcase is 20.0 N.
   a. Draw a free-body diagram for the suitcase.
   b. What is θ?
c. What normal force does the floor exert on the suitcase?
   ans: 55°, 167 N

(Sections 5 - 14 will be handed out later, and are available now at http://faculty.genesee.edu/macrittenden/phy121.htm)