

Physics and Trigonometry A

2011-2012

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Course Description and Primary Objectives

Physics is the study of the way the physical world works. More accurately, it is the study of the principles and laws that God has designed to govern the way the physical world works.

Trigonometry is the mathematical study of angles and angular relationships. Its impact on the world can be observed as far back as the Babylonian and Greek empires, especially in the science of astronomy. Galileo stated that the language of the universe is written in numbers. Thomas Jefferson wrote that “trigonometry... is most valuable to every man” and that “there is scarcely a day in which he will not resort to it for some of the purposes of common life.” As with all of the science courses at MCA, this combination of studies will offer innumerable opportunities to better understand Romans 1:20: “For since the creation of the world His invisible attributes, His eternal power and divine nature have been clearly seen, being understood through what has been made.”

The goal of the course is to introduce students to various aspects of physics and trigonometry from the high school to the early college level. The main objective is that they would gain a mastery level of understanding of these subjects. Optional problems and special projects will be offered to those students who want to achieve beyond the mastery level. Class topics will alternate between physics and trigonometry to reinforce both the practical and mathematical aspects of both subjects.

Class Preparation

The student will be required to steward their own work according a course syllabus. It is the student’s responsibility to refer to the syllabus, prepare for each upcoming class period and to stay advised on syllabus revisions. The syllabus provides:

- 1) The schedule of reading assignments from the textbooks
- 2) The assigned homework problems to turn in at the beginning of class
- 3) A schedule of likely pop quiz dates to test student preparation

Students are expected to complete the above preparation before class. As a Level IV subject, class participation counts for 30% of a student’s grade. As a 4-hour credit, Physics and Trigonometry should roughly require **8 hours per week** of outside preparation time.

Class Time

Class time will be spent discussing concepts dealt with in the textbooks that students have read before class. Class time will also focus on working practical problems to reinforce the concepts addressed in the text. Students will be chosen randomly to go to the board and explain assigned “class participation problems”. Hands-on labs will also provide practical demonstrations. Physics and Trigonometry are “problem intense” subjects, that is, there are many practical applications of

the concepts that are best understood by working through example problems. Thus, these subjects place a premium on discipline to methodically work problems and understand concepts. Tutors and teaching assistants will make themselves available for individual and small group help on homework problems. Students are encouraged to work together to understand homework problems, but all students are expected to do their own work.

Secondary Objective

Physics and Trigonometry are challenging subjects. They will create differing levels of adversity for the students throughout the year. Aside from the main objective of understanding these subjects, a secondary objective of the class will be to help the students face and overcome these adversities in order to grow in personal confidence and character. This class, as well as all classes at MCA, provides an opportunity for tutors to disciple young men and women to follow Christ in every area of life. Because of this, some activities, class discussions and personal tutoring will focus on developing character as well as understanding Physics and Trigonometry. In the end, the students may find that achieving the secondary objective is more valuable than achieving the first.

List of Books

Conceptual Physics (Third Edition) by Paul G. Hewitt is the text for Physics. As the title indicates, it lays out the concepts of physics in an organized and relatively simple manner. Classroom questions and problems as well as some of the homework problems are found at the back of each chapter.

Problem-Solving Exercises in Physics by Jennifer Bond Hickman is a supplemental text for Physics. This workbook provides many example problems and skill building exercises that will be used for classroom discussion and for many homework problems.

Plane Trigonometry (Seventh Edition) by E. Richard Heineman and J. Dalton Tarwater is the text for Trigonometry. This book will provide conceptual discussions, example exercises and all homework problems that will be used in the course.

Grading

Students will be monitored on the following three areas to observe mastery of the subjects: homework, major tests and class participation. The tutor will evaluate work according to completeness, logic and correctness, assigning points for homework, test and class participation. A minimum point total will be assigned for Mastery of the class. Students desiring a higher grade on returned homework and quizzes may re-submit work to increase the point grade. Unfortunately, participation points cannot be revised after class. Points will be entered in the MCA record weekly, and students can monitor their progress to Mastery.

Mastery (M) will require a total in excess of 85% of the total points for the class. *Mastery With Honors (MH)* (MQ for fall semester) will be achieved by the student attaining above 92.5% of the total points and by completing a service-oriented class project sometime in the course of the year. Students may initiate their own project idea or build upon suggestions offered by the tutors or classroom assistants.

The relative value of the homework, quizzes and class participation is as follows:

Class Participation:	30%
Homework:	35%
Tests:	35%
Total	100%

Class Participation: 30% of a student's grade is based on class participation. Class participation quizzes will be given at regular intervals to provide an objective evaluation of a student's class preparation. Class preparation involves pre-class reading as well as finishing the assigned homework on the day it is due according to the class syllabus. These actions prepare a student for constructive classroom discussion. A subjective grade will also be taken by the tutor on a regular basis to reflect a student's contribution to classroom discussion and classroom atmosphere. Each student begins each class at 90% participation and may go up or down based on their contribution.

Good questions, a teachable attitude and respect for other students are keys to achieving a 100% daily participation grade.

Homework: 35% of a student's grade will be based on homework. The possible points for each assignment will vary. Deductions will be taken for incorrect work, late submittal and/or failure to follow homework directions (see attached *Sample Homework* page). Homework is not deemed "late" unless it is turned in after the Friday class period of the week it is due. However, failure to turn in assigned homework at the beginning of class on the day it is due will result in deductions from the class participation grade. A 30% deduction is automatically taken for late homework turned in after Friday of the week it is assigned. This includes homework assignments due at the beginning of class Friday. Homework will be graded and returned promptly. A homework basket will be available to place homework in as the students enter the classroom.

Tests: 35% of a student's grade is based on major tests throughout the semester.

Homework and Test Revisions: All homework and most tests (see below) may be revised for a higher grade for a period of time communicated on the syllabus. A student is never required to revise anything! Corrected homework or tests will receive 70% of the points lost and may be turned in anytime before a fixed deadline communicated clearly on the syllabus. Additionally, point deductions may be taken for late assignments. Late point losses may not be made up. If a student does not achieve a score of 70% or higher on a test, no revision points are entered into the grade book until the following process occurs:

1. The student must revise the test and arrange for a time to sit down one-on-one with the tutor to go over these revisions to ensure understanding. The second test will be given only after this process has occurred. The student must initiate this one-on-one tutoring session at the tutor's convenience.
2. At the tutor's discretion, if sufficient understanding cannot be demonstrated, the student may be required to revise certain homework problems that are creating difficulty, then review these problems as well as the test revisions with the tutor in a one-on-one session at the tutor's convenience.
3. The student must pass a second (usually more difficult!) version of the test with a score of greater than 70% or the process repeats.
4. On the last retaken test, no revision points will be allowed.

If the student never retakes the test, their initial score will stand. From this process, it should be obvious to the student that it is **MUCH** easier to understand a problem the first time it is turned in for homework, study all their homework problems prior to taking the first test, and **pass the test the first time** with a score above 70% so that they can freely revise for an even higher score. If this is not done, the student usually falls so far behind the general class that it becomes difficult to pass the course with a grade of 85%.

Extra Credit Assignments and Special Projects: Additional points may be earned through the completion of extra credit assignment or special projects. These will require a special request to the tutor and may differ according to student. Assignments may involve additional homework, research or an in-class presentation. Special projects will allow the students to explore an area of interest more deeply with the purpose of sharing or demonstrating insights to the rest of the class.

Homework Guidelines

On the *back* sheet of the completed homework, folded in half lengthwise, the following format should be used:

Name

Physics Section (A or B if more than one section)

Homework Assignment Number (From Syllabus) and

Homework Assignment (what problems are assigned)

Each homework, to receive full points for neatness and organization should follow the following guidelines:

- 1) Write the problem number and problem statement out as it is stated in the textbook or handout. (This may be abbreviated if it is a long problem)

- Show all work and calculations to arrive at the answer.
- ***Partial credit will be given for showing your work!***
- ***Answers without work will be counted wrong!*** (Often the answers will be given and the students will be required to show their work to arrive at the given answer).
- If a simple math error results in a wrong answer, showing your work will achieve most of the credit for the problem.

Box the Answer!

Other guidelines:

Use “8.5 X 11” paper

Use notebook or engineering paper – do not tear pages out of spiral notebooks

Use multiple sheets of paper if necessary. Do not crowd the work.

Be neat.

Use only one side of the piece of paper.

Staple multiple pages together with the staple in the *upper left* corner.

Fold the paper in half lengthwise and label it on the outside as stated above.

These homework guidelines will be reviewed with the students in class. Some grace period will be allowed before these standards will be used to deduct points. An example of homework using the accepted format is attached.

Tutor and Tutor Hours

The tutors for this class will be Jon Snell and Aaron Russell. Office hours will be posted on the office doors early in the year. If you need to contact Mr. Snell, his contact information is as follows:

Jon Snell	2802 Metz	Home Phone: 689-9374	Cell Phone: 978-7042
		E-mail: jsnell@mcaknights.org	
		Also available on facebook.com	

As a rule, Mr. Snell is generally present at MCA beginning at 6:30 am or at the latest 7:00 am every morning except Tuesday. If a student requires help with their homework or in studying for a test, they should take advantage of these early office hours to get help.

Parents and students are invited to communicate with the tutor frequently via phone, E-mail, office visit or lunch.

Assignment for the First Day of Class

An algebra review packet should have been received by the student in the mail. The first three pages of the algebra review packet are due on the first day of class. The rest of the review packet may be done for extra credit. The student is strongly encouraged to review their algebra skills and get help before school begins if any difficulties are encountered. Once the semester begins, the class

moves quickly. If it is necessary to review too much algebra as the course progresses, the student often falls too far behind to gain an understanding of the new physics and trigonometry material.

The first two chapters of the trigonometry textbook and the first six chapters of the physics textbook are crucial to the student's success in the class. The student is strongly encouraged to work as far ahead on the homework as they can. If difficulties arise, contact the tutor and get help before school officially begins.

The student is required to place book covers on the textbooks for the first day of class. Class participation points will be deducted for each day the textbook remains uncovered

Supply List

Engineering paper is nice, but not required IF the student is neat in their work. There is a lot of graphing early in the course, and drawing pictures throughout the course, so engineering paper makes it easy. Please try to get some, but again, IF the student shows their work neatly (including graphs) is it not necessary.

A calculator is necessary, but basic calculators with trig functions are all that are required. High powered graphing calculators are not required. Save the money and invest in a cheap laptop computer with Excel and PowerPoint on it. Again this is not necessary, but the student will have the opportunity to learn a lot about programming and graphic presentations if they have the right equipment. I do not recommend a laptop with internet.

After paper, and a calculator (and of course a pencil with a good eraser), just bring curiosity, humility and maturity to class and things will go fine!

Overview and Vision

Physics and Trigonometry Course

General Description

Physics and Trigonometry at MCA is a 10th grade level class. It is taught as one unit because the two subjects overlap and reinforce each other. Both subjects deal with solving right triangles, solving non-right triangles, vector addition and algebraic manipulation. It consists of 6 hours in class each week to provide students hands-on lab time (it is credited on college transcripts as a lab science), as well as much in-class time to interact over course problems with tutors and peers.

The course covers the following basic concepts of physics:

Projectile Motion	Friction	Stress and Strain
Vector Addition	Ramps	Buoyancy
Newtons Laws	Momentum	Hydrostatic Pressure
Pressure	Energy	Heat and Temperature
Force Diagrams	Circular Motion	Basic Gas Laws
Statics and Equilibrium	Torque	Expansion

And the following basic concepts in trigonometry:

Sine, Cosine and Tangent	Right Triangles	Angular Velocity
Cofunctions	Law of Sin, Cos	Trigonometric Identities
Related Angles	Arc Length	Double and Half Angles
Negative Angles	Radian Measure	Trigonometric Equations

Vision and Intentions

There is one overall intention of the MCA Physics and Trigonometry course and a number of minor sub-intentions.

The overall intention of the MCA Physics and Trigonometry course is to round out a student's classical education by introducing them to basic concepts of physics that help them explain how the physical world works. When finished with physics, a student receiving a grade of mastery should be able to discuss these practical aspects of physics that they see at work in their everyday lives. With mathematical equations provided, they should also be able to solve for physical unknowns using simple algebraic manipulations.

The class is designed with numerous extra-credit opportunities available. This provides the science-oriented student the opportunity to explore these concepts further and develop a vision for their future. At the same time, the extra credit provides the less science-oriented students the opportunity to pass the class and enjoy learning about the physical world.

One sub-intention of physics is to challenge 10th graders to grow up, mature, accept responsibility, and become leaders. This occurs as many face the challenge of applying the algebra they learned in

7th-9th grade. For many, physics and trigonometry is the most difficult course they have faced to this point at MCA. While it is a difficult class, 95% of students taking this course ultimately pass it, in large part to the extra credit provided in numerous areas.

A second sub-intention of physics is to teach and disciple character. New concepts, higher academic expectations and the age of the students sometimes combine to create a teachable “season” in a student’s life. Students learn true *perseverance* as they manage the nightly workload, *humility* as they are forced to seek help, and *honesty* as they orient themselves to a new goal of understanding rather than just trying to get the homework done and out of the way. The character trait of *excellence* (not perfection!) is emphasized throughout the class in classroom conversations.

A third sub-intention is to reward students who have a spiritual walk. Extra credit in participation is provided for students that submit short verses and their thoughts on them as part of their daily homework assignments.

Finally, a fourth sub-intention is that the students would learn study skills and develop confidence that would benefit them for the rest of their time at MCA and on into college. Although the course is difficult, it is not meant to be impossible. By asking for help, working diligently and walking spiritually, many students at the end of the year find it to be the most satisfying course they take at MCA.

Assignment for the First Day of Class: Algebra II Practice Exercises

The Algebra II Practice Exercises packet (attached) will be due the first day of class. Its purpose is to review key algebra concepts that will be used on a regular basis in the Physics/Trig curriculum. A tentative 2011-2012 class syllabus is attached. Actual class days and dates are subject to change. Call Mr. Snell or Mr. Russell if you need assistance or tutoring. Start early so you have time to get help before the first day of class.

Students can also make their life much easier and the subject much more enjoyable if they start working on assignments from the syllabus before school begins. The trigonometry book can be picked up from MCA early and is fairly self-explanatory. Again, please feel free to contact Mr. Russell or Mr. Snell if you want to start early and need some summer tutoring. Mr. Snell’s cell phone is 978-7042. Arrangements can be made to meet students at Barnes and Nobles for pre-course tutoring if desired.