CaFD

Fall 95

Curriculum **a**nd **F**aculty **D**evelopment Newsletter for Two-Year College Physics Teachers

Part of a workshop project

Supported by

National Science Foundation

Joliet Junior College (IL)

Lee College (TX)

Interactive, Conceptually Based Multimedia Instruction for Introductory Mechanics on CD-ROM*

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This two year project will develop interactive multimedia tutorials for the calculus-based introductory physics. They will be distributed on CD-ROMs that can be used by students at school or elsewhere on equipment that will be available to most students upon completion of the project.

Extensive testing at many colleges has shown that students enter physics with many misconceptions about motion and force and that conventional physics instruction produces little change in these beliefs. Not understanding the most basic concepts, they cope by rote memorization of isolated fragments and algorithms for solving problems.

Physics education research indicates that the most effective learning occurs when students are active participants and construct their own conceptual models, in contrast to the passive environment of traditional physics lectures.

This project will make use of new technologies and findings in physics educational research to provide a computer based learning environment that will facilitate students actively constructing the conceptual framework of Newtonian mechanics. They will be introduced to basic concepts through short video clips of actual events. This will be done using QuickTime, which only requires

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Preparatory Physics for Scientists and Engineers

Oshri Karmon
Diablo Valley College
Pleasant Hill, CA

Introduction

Community colleges have an “open door policy”, which means that all willing students are accepted. This policy implies that incoming students’ preparations may vary greatly. All physics and engineering students at Diablo Valley College (DVC) are required to complete sequences in physics and calculus. These sequences present a major hurdle to beginning students. The completion rate in first semester physics and calculus at DVC is approximately 60%.

About 25% of the students who would like to take the engineering physics sequence at DVC need more preparation before attempting the calculus-based physics. These students constitute a self-selected group. They have worked their way through math up to first semester calculus, yet have not had high school physics or have only a weak

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INSIDE...

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the proper software; no additional hardware is needed. Computer animations and graphics will help illustrate various interpretations and develop the principles involved. Many of these will involve confrontations with common misconceptions.

Students will interact with simulations and physical representations such as vectors, force diagrams, and graphs, with appropriate feedback and help, enabling them to compare predictions made from their conceptual models with those of the Newtonian model and the real world.

After learning the concepts, students will be led through multiple-representation problem solving procedures (e.g. free-body diagrams, graphical analysis, etc.), step by step

"adaptable to courses of different mathematical levels"

with feedback, and use mathematical models that are appropriate for their background and ability. These modules will be designed so that instructors can add their own examples. The programs will be adaptable to courses of different mathematical levels, ranging from high school to university.

Many of the video clips will be taken from the extensive collection produced at Valencia Community College in Orlando, FL. Video editing, additional production, and animation will be done at a local high school which has a nationally recognized electronics arts program that has received extensive support from Silicon Valley companies. Simulations will be provided by an Interactive Physics player, licensed from Knowledge Revolution, and by programs developed during the project.

The final product will have both Macintosh and Windows versions. Initial programming will be done with HyperCard and Macromind Director. The programming of the final product depends on the most appropriate cross-platform authoring program available at that time.

During development, modules will be tested with our students at San Jose City College, who are mostly minority. Two university professors and two community college instructors will each evaluate the initial overall design and later the preliminary version of the complete program. Also, we will hold a workshop at SJCC for community college instructors to obtain their evaluations of the preliminary version.

Karmon continued from page 1

physics background. The only available option for these students is a one semester "conceptual physics" course, which does a woefully inadequate job of preparing students for the rigors of engineering physics.

This problem was recognized by Oshri Karmon who instituted a preparatory physics class for incoming science and engineering students at DVC. This course is aimed at students who are interested in exploring careers in engineering or physics. It assumes that the students have had little or no physics and it is taught concurrently with first semester calculus. The course is a composite of research findings of successful physics education methodology. It utilizes three effective methods of physics instruction that have been disseminated through several TYC workshops:

1. Overview and case studies
   (Van Heuvelen and Maloney)
2. Collaborative learning
   (Heller and Heller)
3. Interactive microcomputer based labs
   (Thornton and Laws)

The course has been developed and implemented over the past four years. Currently it offers two sections each semester (a total of 50 students). The results of an ongoing evaluation indicate greatly improved retention and successful transfer rates for its students.

Course description

The introductory physics course is a one semester course. It provides seven contact hours per week of which four hours are for lecture/problem solving and three hours for laboratory. The physics topics are presented in "mini-lectures" about ten minutes in length. Concepts are developed through multiple representations following Van Heuvelen, and "spiraling" from introductory to advanced problem solving techniques. Groups of students collaborate in solving context-rich problems developed by Heller which emphasize team responsibility. Computers are utilized for Euler Method applications, variations of parameters and graphing. The computers are also used for laboratory experiments as part of the MBL as developed by Thornton and Laws. The laboratory also includes traditional physics experiments and emphasizes data collection, error analysis and report writing skills.

Physics Topics

The physics topics are arranged to take advantage of essential concepts from the calculus as soon as they are introduced. For example, a discussion of static versus kinetic friction is used to illustrate and reinforce the

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concepts of the limit and continuity. Integrals are used to illustrate work and energy applications. This early infusion of calculus into the physics curriculum emphasizes the inherent interconnectedness of the two subjects, and provides the students with a stronger background when they start the engineering physics sequence.

The physics topics are arranged as follows:

1. Greek Astronomy
   - Using Geometry and Algebra
   - Calculating radii and distances for Earth, Moon and Sun
2. Geometrical Optics
   - Mirrors and lenses
3. Mechanics
   - Vector Algebra
   - Kinematics and Euler's Method
   - Momentum and Newtons Laws
   - Force as the Derivative of Momentum
   - Uniform Circular Motion and Gravitation
   - Work as the Integral of Force
   - Area under the Curve and the Reimann Sum
   - Work and Energy
4. Electrostatics
   - Coulomb Forces
   - Electrical Potential and Voltage
5. Vibrations and Waves
   - Spring and Mass
   - Mechanical Waves
   - EM waves (Micro and light)
6. Atomic Structure
   - Bohr Model
   - The Periodic Table
7. Thermo
   - Temperature and Heat
   - Ideal Gas and Avogadro's Number
   - Heat Transfer and Newtons Law of Cooling
8. Fluids:
   - Hydrostatics
   - Fluid Force as the Integral of Pressure

Computer Equipment and Experiments

With guidance from the TYC workshop and financial support from the NSF, Diablo Valley College purchased eight Power Macs, MBL equipment from Vernier Software, and Dynamics Carts and Tracks from PASCO Scientific. These incorporate Vernier software and hardware with Thornton's *Tools for Scientific Thinking*.

During last semester DVC compared *Mathematica* and *Mathcad* applications. The students seem to prefer *Mathematica*, even though it is more complex, since it is more

Karmon continued from previous column

capable of Euler Method applications and wave motion simulations. Next semester DVC will compare *Mathematica* and *Excel* for the same applications.

The following is a list of computer (MBL) experiments utilized in the course:

A. Body motions:
   1. Position vs. Time
   2. Velocity vs. Time

B. Forces:
   3. Force and Acceleration

C. Carts and Tracks:
   4. Collisions of carts
   5. Conservation of Energy (inclined plane)

D. Free Fall:
   6. A Falling Ball

E. Springs:
   7. SHM (mass on a spring)

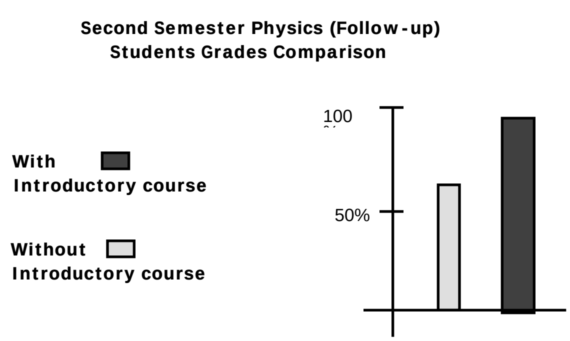
F. Thermo:
   8. Newton's Law of Cooling

Results

Assessment and evaluation are an integral part of the course. The "Force Concept Inventory" pre-tests and post-tests were employed to measure the success of the course for the mechanics section. The pre-test average over the past three years has been 36% and the post-test average 65%. Traditional exams and quizzes were used for the other topics.

A follow-up has been conducted to find out about transfer and retention rates for students who took this course. 90% of the course graduates passed the following physics course (Mechanics) compared with 63% of the students who did not take the preparatory physics course. The average success rates ("success" means a grade above C) calculated over a two year period are presented below.

The evaluation data verify that by incorporating MBL, Overview/Case Studies and Collaborative Learning, the retention and success rate of science and engineering students is highly improved.



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Digital Electronic Systems in Introductory Physics

Colin Terry
Ventura College
Ventura, CA

Introductory physics courses traditionally do not include electronics. This topic is usually left to those students who choose electronic or electrical engineering as a career and is offered in a separate course. However, the inclusion of at least some electronics in introductory physics courses (algebra-trig or calculus based) can be supported for a number of reasons:

(a) Electronics play an increasingly important part in everyday lives. Many of our students will find themselves using electronics in other courses and in a wide variety of future careers, from engineering to medicine.

(b) With appropriate curriculum design, electronics can give an opportunity for a new style of work which reflects an 'engineering' approach to problem solving. In our present physics courses, we attach much significance to the analysis of situations. This is not surprising since it reflects the approach of what might be termed 'pure science'. However in electronics, if presented in the right way, we can ask students to synthesize, to put things together to perform a certain predefined task or serve a specific purpose.

(c) Laboratory courses should extend beyond the 'recipe' type activities that have for so long typified physics curricula. It is often difficult to design completely open-ended laboratory activities, but using digital electronics we can provide students with investigations and challenges that move them away from the more structured activities into situations that require creative and cooperative problem solving.

The inclusion of digital electronics in an introductory physics course does not replace existing courses in electronics. Future electrical and electronic engineers need more than we would offer in the proposed course. These needs will be met later in the more specialized courses. We need to give students having a wide variety of career options opportunity to gain some firsthand experience of the new technology in an innovative design and problem-solving format.

Also, such a course should not approach electronics from a solid state physics standpoint; it should adopt a *systems* approach. This is because the user of electronics has a greater need to grasp what electronics can *do,* rather than understand the working of particular devices. Most people need to be able to choose systems that will perform a necessary function when combined in the right way. Designing the working parts is a different sort of task associated with the more specialized professions. And although the component parts available have changed dramatically over the years and will no doubt continue to do so (at an accelerating rate), what changes less rapidly is the *range* of tasks for which electronic devices are useful. Electronics will always be concerned with how gates, counters, registers, amplifiers, oscillators etc. are combined to perform desired functions. The need is to understand how a “system” works rather than the detailed operation of each component part of the system.

Modern electrical systems are either digital, analog or a combination of both. Industrial control systems are a good example of this mixture. A microcomputer might monitor signals from an industrial process. If these signals are continuously variable they may need to be changed to digital form for the computer to handle. A process may need analog information to control it. In this case the output from the computer has to be changed to analog form. Another example is the transmission of analog signals using pulse code modulation. These two examples illustrate the need for digital and analog circuits as well as circuits that can change signals from one form to another.

The aim then is to make available to all students of introductory physics the experience of open-end design and experimental problem solving using digital electronics. So how might we proceed?

At Ventura College we are putting together two modules. The first unit would be an introduction to digital circuits. Students would see how simple logic gates can be used to construct more complex systems involving counting, logical operations and control. At a later stage we plan to develop a unit concerned with linear systems, feedback and control based on the operational amplifier.

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Digital Systems
Students are introduced to the notion of digital systems using a few simple gates (invertor, NOR, NAND) after which they are challenged to construct other gates (OR, AND, 3-input gates). The transfer characteristics of a gate is examined followed by the construction of a half and full adder. Students are then introduced to pulse producing circuits. The final section challenges students to use what they have learned to solve a selection of practical problems.

We plan to include these activities after a section dealing with resistive circuits, potential dividers and RC circuits since they require students to use an oscilloscope and meters to monitor the output of circuits etc. Very little class time would be devoted to these activities — they will be almost totally lab based.

Experiments for Digital Systems

Introduction to the following gates:
  NOR gate, NAND gate, AND gate, OR gate, using truth table
Problem solving using the above gates
  e.g. 3 input NOR, exclusive OR and parity gates
Simulation of logic functions using a microcomputer
Arithmetic with logic gates
  e.g. half adder, full adder
Sequential logic
  Pulse generation, astable bistable
System Design

At this stage students will be given a selection of practical challenges which can be solved using the information and experience gained. Although students will need help and guidance, no recipes will be given. As mentioned previously, one of the important objectives of the course is for students to experience engineering as an inventive process. The tasks will range from the simple to the relatively complex, (a high temperature warning device, safety interlock, traffic signals etc.)

Few engineers and scientists work in isolation so in all of the above investigations, students will be encouraged to work in small groups and to share ideas so that solutions to problems grow out of discussion. Solving the problems requires students to produce designs and they are encouraged to produce their solutions on paper before trying them out.

Hardware Considerations

A digital electronics 'kit' is provided for each group of students, constructed using CMOS

Terry continued

integrated circuits. The kit is based on both NOR and NAND gate 'modules'. Problems presented to the students can be solved with either gate, but the objective is for students to become familiar with both gates. Each gate is self-contained in a 'black-box' with input/output connections made using ordinary banana plugs. There is no soldering or open-wire circuitry. We wished to avoid the 'breadboard' approach that is often used in more advanced courses. The simplicity of the apparatus makes the approach less intimidating to our students; also it follows on from a similar 'black-box' approach we use in introducing (passive) electric circuits.

We are at the design and implementation stage of this project and would like to hear from colleagues who might be interested in working with us to refine the hardware and print materials and help to produce the next set of activities involving analog systems. Details of the system we have put together so far are available upon request. ´

The CPU Project

The CPU Project aims to:
- create an exciting new physics learning environment that merges findings from research on teaching and learning with the latest computer technology;
- use this environment to improve student understanding of physics.

Through funding from the National Science Foundation, the CPU project is designing a learning environment supported by an innovative set of materials. The CPU materials will combine on CD-ROM a powerful set of software components for interactive physics simulations and instructional delivery and assessment.

To make the CPU workshops and materials available nationwide, twenty-four (24) geographically distributed leadership teams, each associated with an institution of higher education, will be identified to lead the dissemination of the project.

Each leadership team is to be composed of three members with strong physical science backgrounds and computer-usage skills. One member must be a college/university physics or science education faculty member. One member must be an experienced high school physics or physical science teacher. At least one member must have substantial experience in working with elementary school teachers.

For more information contact Stacy McGhee at (619) 594-2571, or at: cpu@public.sdsu.edu. ´

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Airbags and Physics

Dwain Desbien
Highland Community College
Highland, KS

Most physics teachers have used the phrase "it is not the fall that hurts but the sudden stop at the end" to describe why a person falling out of a plane is hurt if their parachute does not open. However, does that mean the student can make the correct connection to the idea of change in momentum or impulse? I asked my students this question, and it became evident that they could not. Therefore, I thought of a way to make it more visual.

This is a simple demonstration to show the effects of force verses time as the material that an object impacts changes. Take a Pasco track and put it at about a 7 degree angle. Attach a force probe to the top of a cart. At the low end of the track you will want to put materials for the cart to hit. Change Macmotion (or motion) to collect force data only and turn the data acquisition rate up (the data below was from a run with a collection rate of 1000 data points per second). Release the cart from rest at a constant point on the track. Let the cart impact several different types of materials and see if the students can correctly predict what the force vs time graph will look like.

Typical data can be seen below. This is for a run using foam rubber and a balloon as the materials impacted. It is readily obvious that the balloon does not exert as great a force on the cart as the foam does. Have students predict what will happen to the curves as the material gets harder and harder. Another interesting aspect of this experiment is to have the students integrate the curve. For this run the results exactly match with a value of .36 Ns (impulse).

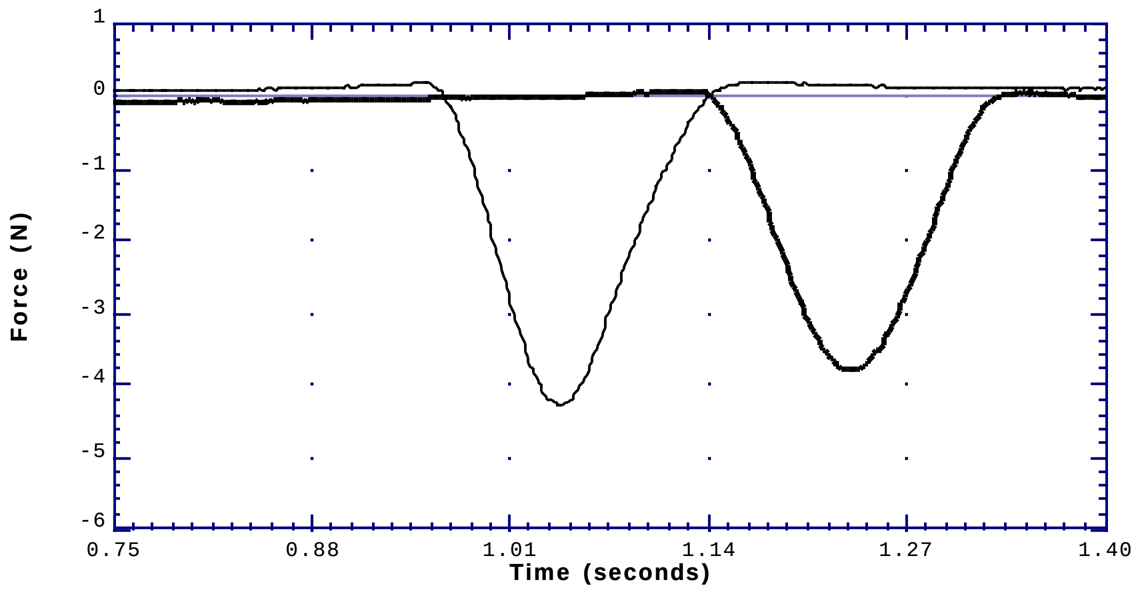

Figure 1. The dark line is the balloon impact and the lighter line is the foam.

Once the students have this idea down, ask them about the airbag in their car. Why is it there? What would a force vs time graph look like with and without it? Why do you need to know where to sit if you have an airbag? I hope you can use this idea in your classes. Please let me know if you have any comments or any variations on this experiment.

Special Thanks to . . .

Vernier Software for providing hardware, software, and post-workshop sessions refreshments and PASCO Scientific for providing carts and tracks for the MBL Workshops

News and Comments About MBL

Curtis Hieggelke
Joliet Junior College
Joliet, IL

Version 4.5 MBL Software Update

New updated versions of the Tufts-Dickinson-Oregon MBL software (Motion, DataLogger, Sound, and Temp) are available from Vernier Software (503-297-5317). Each software package costs $30 ($15 upgrade for previous purchasers) for the software, documentation, and site license. This updated version is available in Mac and DOS versions and will work on the original ULI s and is required for the new ULI IIs.

One of the nicest new features is the ability to replay or playback the data collection at faster, slower or normal speed. You are able to look at different graphs during replay including new ones such as kinetic energy that are built using the New Columns feature that was added in version 4.0. I feel that many students gain a great deal of understanding by looking at the time correspondence of events on screen as they unfold. Also, this playback feature will allow us to prepare data sample collection before a live demonstration—in case something goes wrong or to ask a "what if" question as an interactive demo and then display the answer using playback.

Another change is the graphical display which now has tick marks on each axis. This provides additional flexibility on the graphical display of the data. You can have lines or dots for the data points as well as square data point markers.

Another technical feature is the ability to integrate over variables other than time. In addition to integrating the force over time to get impulse, you can now integrate over space or position to get a value for the work done, for example.

A small but very useful new feature is found under the FFT (Fast Fourier Transform). It is the ability to copy it and paste it at a later time for printing.

In addition, there is more color which enhances the screen display (if you have color) and improved performance in data collection and display. There is also improved sensor calibration on DataLogger. We have used beta versions of this software in the past and they have been very reliable. Event Counter was released in a 4.0 version and is not expected to be upgraded soon.

New MBL Software

In addition to the new versions of the older MBL software, there are two new additions to the MBL set. One is called Electricity and the other Rotary Motion (still in beta testing). They include the features of 4.5 and are/will be available for the Mac and DOS machines for $30 each. Those of you who have attended the MBL follow-up workshops have already used the beta versions of these packages. These were also described in the last newsletter. To use the Electricity software, you will also need to purchase the electric current and voltage probes for $ 80 from Vernier. I would also recommend looking at PASCO's CASTLE supplies to buy battery and bulb holders as well as bulbs if you are planning to use the RTP - Electricity curriculum materials.

The Rotary Motion software will also need some rotary encoder hardware. At the low end you can use it with PASCO's smart pulley and at the other end you can use it with Team Labs (formerly IBM's) PSL rotary motion sensor for $198 (303-530-4043). Vernier also has some nice ones available for $150 which include the software (beta version). Or, you can wait until the PASCO version becomes available. At Joliet, we have been using the PSL rotary sensors and they work very well.

New ULIs

Vernier Software has introduced a new ULI called the ULI II. The good news is that the new ULI IIs cost the same as the old ULIs with some nice features. It uses the same power supply, cables between the ULI and computer, and sensors. One negative is that it requires the new 4.5 versions of most software. The changes (or new features) in the ULI II are:

- it uses a 12-bit A-to-D converter instead of 10-bit,
- has a new box, smaller, enclosed, better support for the connectors,
- has 4 analog DIN connectors (future software will support 4 analog inputs which will be very important in the electricity work),
- the digital inputs now have stereo phone sockets so that both PASCO and homemade photogates can plug in with no adapter or box needed, and
- features improved static protection on all inputs

The programs (Motion, Data Logger, MacTemp, Sound, Electricity, and Rotary Motion), which use the 12-bit A-to-D converter, require version 4.5 to work with the ULI II on either Mac or IBM. ULI Timer, Event Counter 4.0, andULI Starter Stack work with no change needed.

PROBLEM SCHEMATA

Ali Yazdi
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Birmingham, AL

"Observations indicate that novice students tend to store their knowledge in terms of memorized formulas, with little ancilary information, and often show gross difficulties in symbol interpretation. By contrast, experts have their knowledge stored in the form of problem schemata more readily applicable than mere statements of definitions or principles... By a "problem schemata" I mean the knowledge needed to solve routinely a particular class of commonly occurring problems."

As an example of the truthfulness of the above quotation from Frederick Reif which appeared in *The Physics Teacher*, May 1981, page 314, I found it interesting to mention a particular class of problems with no apparent relationship between them. The common characteristic of these problems is that usually there is a small change in one quantity, and then the question is asked to find out what happens to other quantities or how this change will affect the other quantities.

Let's consider the following problem and its solution: a pendulum clock with a steel suspension system has a period of one second at 20˚C. If the temperature changes to 25˚C, by how much will its period change?

Using the pendulum formula: $T=2\pi\sqrt{\frac{L}{g}}$

Find natural logarithm: $\ln(T)=\ln(2\pi)+\frac{1}{2}\ln(L)-\frac{1}{2}\ln(g)$

Then differentiate: $\frac{\Delta T}{T}=\frac{1}{2}\frac{\Delta L}{L}$

But $\frac{\Delta L}{L}=\alpha_{steel}\cdot(\Delta Temp.)=11\cdot10^{-6}(25-20)$ and $\frac{\Delta T}{T}=2.75\cdot10^{-5}$, since T= 1se

Then $\Delta T=0.0000275$sec

Students not knowing this "schemata" usually take on a more difficult approach which is very time consuming and inaccurate.

This method of solution which can be named "logarithmic differential" can be used for a lot of other problems in physics which involve small changes of one quantity. Of course, it does not mean that every problem involving small changes can be solved using this method, but for students, this would be at least a method to consider. If it does not work they would need to choose other methods.

What follows is a sample selection of problems which can be solved by the application of this method. All of these problems are taken from an updated version of Serway's Third Edition of *Physics for Scientists and Engineers* (Saunders).

(1-53) If the length and width of a rectangular plate are measured to be (15.30 ± 0.05) cm and (12.80 ± 0.05) cm, respectively, find the area of the plate and approximate uncertainty in the calculated area.

(13-31) A simple pendulum has a length of 3.00 m. Determine the change in its period if it is taken from a point where g = 9.80 m/s^2 to a higher elevation, where the acceleration due to gravity decreases to g = 9.79 m/s^2.

(14-68) It is claimed that a commercially available, portable gravity meter is sensitive enough to detect changes in g to 1 part in 10^{11}. At the earth's surface, what change in elevation would produce this variation? Assume the radius of the earth is 6 X 10^6m.

(15-15) What is the fractional change in the density of sea water between the surface (where the pressure is equal to 1 atm) and a depth of 4.96 km (where the pressure is 500 atm)?

(18-52) While attempting to tune a C note at 523 Hz, a piano tuner hears 3 beats per second between the oscillator and the string. (a) What are the possible frequencies of the string? (b) By what percentage should the tension in the string be changed to bring the string into tune?

Tech Physics at Henry Ford Community College

Richard Bailey
Henry Ford Community College
Dearborn, MI

The Technical Physics Project at Henry Ford Community College has been working closely with industrial and manufacturing contacts, according to Robert Eshelman, project director. The outcome of the project will be a course in technical physics that prepares students to enter the industry as lab technicians. The course is designed for associates degree students in electronics, automotive technology, manufacturing engineering technology, and architectural construction technology.

The revised course will make use of microcomputer-based labs and involve students in learning activities that encourage teamwork, problem solving, and communication skills. Eshelman, along with electronics instructor Stanley J. Briggs and English instructor Richard Bailey, recently brought twelve representatives to campus from General Motors, Ford Motor Company, Great Lakes Steel, and Defiance Corporation. Representatives were involved in a series of workshops and activities to provide input for cases the Project participants are developing. The case method approach, says Eshelman, will put students in industry-specific work situations and give them actual problems to think about.

As they work through these problems, students will learn about physics as well as get a glimpse of the workplace they soon will enter. Project participants have been getting a glimpse of the workplace, too. Following the workshop that took place on campus, participants visited a Defiance Corporation test facility as well as the General Motors Proving Ground. Additional visits and further collaboration are planned. Eshelman hopes to accumulate an archive of photographs and film footage to make the link between education and the workplace visible and relevant.

The new course in Tech Physics at Henry Ford Community College will be tested in the Fall semester of 1995. The course will give students a working knowledge of physics. Presenting students with industry-specific cases, the course will involve less lecture and more learning through discovery and hands-on activities. Eshelman feels strongly that the course will be the beginning of a larger reassessment of physics education at Henry Ford Community College.

CE/OCS Follow-Up Workshop Conference on Introductory Physics

Curtis Hieggelke
Joliet Junior College
Joliet, IL

The major goal of the CE/OCS Follow-Up Workshop Conference on Introductory Physics held at Lee College on June 19-24, 1995 was to develop a test or tests that could be used in pre/post modes to measure the basic conceptual understanding of electric and magnetic interactions (excluding circuits since there are several tests available).

As a result of this conference, a preliminary test version was developed for electric concepts and another one for magnetic concepts. These versions are neither complete nor finished but a good start has been made.

Much of the work on this project was inspired and in part based on earlier work by Dave Maloney and Dennis Albers (Columbia College, Columbia, CA). Attending the conference and working on this project was Mark Bunge (San Jose City College, San Jose, CA), Dwain Desbien (Highland Community College, Highland, KS), Curtis Hieggelke, (Joliet Junior College, Joliet, IL), David Maloney (Indiana University-Purdue University at Fort Wayne, Fort Wayne, IN), Marv Nelson (Green River Community College, Auburn, WA), Tom O'Kuma (Lee College, Baytown, TX), Marie Plumb (Jamestown Community College, Jamestown, NY), Alan Van Heuvelen (Ohio State University, Columbus, OH), and Myra West (Kent State University - Stark Campus, Canton, OH).

The TYC Physics Workshop Center at Joliet Junior College will serve as the collection point for feedback and information regarding these electric and magnetic test instruments. This center will then redistribute information to team members for advice and comments in addition to monitoring the development and progress of this project.

Preliminary testing is currently being done by several team members. Dave Maloney is going to review these results and make suggestions regarding modifications with final decisions on test items made jointly by Tom, Dave, Alan, and myself after consulting with the other team members.

As these tests are further refined, all TYC workshop participants will be invited to use the tests to provide baseline data.

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TYC Physics Workshop Project Update

As of September 1, the TYC Physics Workshop Project which is supported by Joliet Junior College, Lee College, and the National Science Foundation has held 20 workshops at 10 different community colleges in 8 states. There have been a total of 409 participants involving 238 different faculty members from 199 community colleges located in 40 states. There have been 11 Microcomputer Based Labs workshop including 2 MBL Follow-up workshops and 9 Conceptual Exercises and Overview Case Studies workshops including 3 CE/OCS Follow-up workshops.

There are two more workshops scheduled. One on Implementing and Developing Effective Physics Simulations to be held on October 5-7, 1995 at Joliet Junior College (44 applicants for 20 slots) and a MBL Follow-up at Seminole Community College near Orlando on Nov. 30-Dec. 2 (it is not too late to apply). Recently completed and being distributed to all participants is a booklet of Selected Ranking Tasks which were contributed by previous CE/OCS workshop participants. Funding has been requested for several more years but information about the continuation of this project has not yet been received.

For additional information write--

TYC '95
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