



PHYSICS

Program Review

2006 - 2007

Spring 2007

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FACULTY

FULL-TIME FACULTY:

James McClain

Gloria Ramos

Chris Scott

ADJUNCT FACULTY:

Kent Miller

LIST OF CERTIFICATES/AWARDS OFFERED

This program does not currently offer any approved certificates or skill awards.

06-07 certificates offered: None offered

06-07 skill awards offered: None offered

LIST OF DEGREES (none)

PHYSICS SEQUENCE OF COURSES

PHYS 106 Chemistry and Physics for Educators (4 units)

PHYS 110 Introduction to College Physics (4 units)

PHYS 201 Physics (5 units)

PHYS 202 Physics (5 units)

PHYS 203 Physics (5 units)

CLASSES NOT OFFERED IN LAST TWO YEARS

PHYS 105 Physical Science

PHYS 111 General Physics

PHYS 112 General Physics

The Physics program has adopted the Institutional General Education Competencies of Citrus College. The General Education Competencies (as set forth in the Academic Senate minutes dated August 25th 2004) are as follows:

INSTITUTIONAL GENERAL EDUCATION COMPETENCIES

General education competencies serve as a common set of core curricular components identified and defined by faculty. Student learning outcomes are behaviors based on these competencies.

Any student transferring, completing a degree or certificates from Citrus College, must demonstrate effectively assessed awareness, understanding, knowledge, skills, and abilities in the selected competencies.

1. Communication (personal expression and information acquisition)
Examples:
Reading analytically and critically Speaking articulately
Writing with clarity and fluency Listening actively

2. Computation
Examples:
Technology Computer proficiency
Math proficiency Decision analysis
Analyzing and using numerical data (synthesis and evaluation)
Application of mathematical concepts and reasoning

3. Creative, Critical, and Analytical Thinking
Examples:
Curiosity Research
Analysis Learning Strategies
Synthesis Problem Solving
Evaluation Decision making
Creativity Aesthetic awareness

4. Community, Global Consciousness
Examples:
Respect for others beings Citizenship
Cultural awareness Interpersonal skills
Ethics Lifelong learning
Community service Self esteem
Integrity Empathy

5. Technology/information competency
Examples
Basic computing and word processing

6. Discipline/subject Area Specific Content Material - Project Plan

PROGRAM DESCRIPTION

The mission of the Physics program is to provide students an understanding of both the mechanics and dynamics of the physical world in both the language of concepts (written and verbal) and also in the language of mathematics. Because physics is the most basic science, it provides a foundation for biology, chemistry, astronomy, and all disciplines of science. Our Physics program is tailored to meet the needs of students in three distinct categories: (1) technical majors in science and engineering, (2) teacher preparation, and (3) general education. The faculty accomplish this pedagogically through a combination of classroom lectures, demonstrations, laboratory, and the extensive use of technology.

PROGRAM GOALS

The goals of the program are:

- Provide general education science courses required for students to complete an Associate's Degree and/or for transfer credit to four-year colleges and universities.
- Meet the student learning outcomes and core competencies delineated by Citrus College.
- Provide students with the knowledge and skills necessary to develop an understanding of the conceptual structure of physics.
- Provide students with the knowledge and skills necessary to develop an understanding of interactions in the physical world.
- Provide students with the knowledge and skills to express their understanding and interpret information in multiple forms (including verbal, pictorial, graphical and mathematical).
- Provide knowledge and skills for students to develop problem-solving skills applicable in various life and career paths.

PROGRAM STUDENT LEARNING OUTCOMES

Students completing courses in the Physics department will have acquired understanding, knowledge, skills and abilities in the following competencies:

Communication

Physics students will use proper vocabulary and notation when describing physics concepts. They will be able to communicate these concepts to others both verbally and in written form. They will be able to critically analyze scientific information found in print, visual or online media such as scientific and non-scientific books, journals, articles, web pages, television and film.

Computation

Physics students will apply physics concepts in mathematical form using the appropriate computational skills for the course. This may include numeric calculation using simple algebra, graphical analysis and/or the evaluation of calculus expressions.

Creative, Critical and Analytical Thinking

Physics students will develop an understanding of, and curiosity toward, the physical world. Students will develop problem-solving and decision-making skills. Students will apply critical thinking skills to develop an understanding of interactions in the physical world.

Community, Global Consciousness

Students will think logically and coherently about technical/scientific issues and gain an appreciation for the global social and political impact of scientific endeavors. By working together in lab and/or on projects, students develop interpersonal skills and respect for others.

Technology/Information

Physics students will be adept at using computers for word processing, data analysis, tutorials, simulations and/or web-based research as appropriate for each course. For laboratory courses, students will demonstrate fundamental aptitudes in the proper use of mechanical and/or electrical devices.

Discipline Specific Content

Physics students will demonstrate an understanding of the fundamental principles of physics. Students will distinguish between scientific and non-scientific questions and methods and understand science as a process. Students will understand the complex problems involved in real science and engineering.

SLO TIMELINE

The Physics Department will develop student learning outcomes for all Physics classes offered at Citrus College based on the following schedule.

Course Title Projected date to develop course outline

PHYS 105 Physical Science	Fall 2007
PHYS 106 Chemistry and Physics for Educators.....	Fall 2007
PHYS 110 Introduction to College Physics.....	done
PHYS 111 General Physics.....	Fall 2008
PHYS 112 General Physics.....	Fall 2008
PHYS 201 Physics.....	Fall 2007
PHYS 202 Physics.....	Fall 2007
PHYS 203 Physics.....	Fall 2007

Any new classes created will include student learning outcomes.

The department will work with the curriculum development committee to ensure that the course outlines are being developed according to standards developed by the committee.

MISSION

COMMENDATIONS

- 1.The program provides lower division coursework leading to an associate's degree.
- 2.The program delivers a high quality education that provides students the opportunity to transfer to four-year institutions and compete in that environment.
- 3.All courses in the program articulate with UC, CSU and other schools.
- 4.The program provides both general education and major courses to meet the diverse academic needs of Citrus students.
- 5.The Physics faculty has become more diverse in recent years.

PREVIOUS RECOMMENDATIONS COMPLETED

1. Course outlines of record for all Physics courses should be re-valuated for appropriate content and title. *Outlines have been reviewed and revisions made where needed. The revision of all physics course outlines to better reflect student learning outcomes is on schedule according to plan.*
2. Revise the description of Physics 105 to establish level of rigor expected in the course, lessening the emphasis of the entertainment aspect of the course. *Physics 105 has been revised and upgraded to include student learning outcomes.*
3. Science Department faculty should become more familiar with industrial and municipal needs in science with the community and consider Saturday classes or seminars to address any specific needs. *The faculty regularly attend industry conferences and are tracking developing fields in nanotechnology for curriculum development.*

RECOMMENDATIONS

1. Complete the revision of all physics course outlines to better reflect student learning outcomes according to the timeline.
2. Faculty should continue to research industrial needs for education in emerging technologies (e.g. nanotechnologies) and consider courses to address new career paths.
3. Consider offering Physics 105 Summer '08.
4. Faculty should increase participation in activities with local high schools to stimulate physics enrollment.
5. The department should consider developing a new honors course, possibly for Physics 110.
6. The physics courses are populated by a large number of Asians relative to the general ethnic background of Citrus College students. The Department should consider investigating similar trends in nearby community colleges.

NEED

COMMENDATIONS

1. Courses are offered in a manner that allows students to finish the sequence of courses (PHYS 201, 202 and 203) in two years.
2. Prerequisites are consistent with transfer institutions.
3. The curriculum reflects that of transfer institutions.
4. Physics 110 continues to meet the need for a transfer General Education Physical Science course.
5. Physics 201-203 continues to meet the needs of students who transfer as Engineering and Physical Science majors (as well as that of pre-meds, pre-dentistry, etc.) at four-year institutions.

PREVIOUS RECOMMENDATIONS COMPLETED

1. Evaluate the need for a Physics 204 course which would include Quantum Mechanics and elementary particles. *The need for a course of this type is not supported by current enrollments in the prerequisite, Physics 203.*
2. Determine if the students in Physics have similar needs to those in Chemistry and Biology where a course will be offered to assist in data interpretation, graphic analysis, and report writing. *The department has developed a new course, Physics 106, as part of the Teacher Prep Program to address these needs which were especially evident among students preparing for teaching careers*

RECOMMENDATIONS

1. Expose students to science and engineering employment opportunities.
3. Continue to develop web pages for the program, classes and specific instructors.
4. Offer the new Physics 110 hybrid distance education course in fall '07.
5. Consider additional Distance Education offerings. Explore the feasibility of developing a DE course for Physics 111 and 112.

6. Evaluate the need to re-design Physics 111 and 112 as a physics for biology majors course with or without calculus.

QUALITY

COMMENDATIONS

1. Lecture and lab units for courses are consistent with surrounding institutions.
2. The faculty have developed grading standards, critical thinking methods, problem solving, and written assignments consistent with college-level work.
3. Physics faculty members are taking leadership roles in Academic Senate and the Faculty Association.
4. Faculty regularly participate in division meetings and serve on shared governance committees.
5. Staff development funding is sufficient for faculty to attend 1-2 regional conferences annually.
6. Prerequisites for courses are validated by student success and a grade of 'C' or better.

PREVIOUS RECOMMENDATIONS COMPLETED

1. Labs should continue to upgrade to utilize state-of-the-art equipment. *Labs have been upgraded with state-of-the-art computer and safety equipment.*

RECOMMENDATIONS

1. Complete the revision of physics course outlines to better reflect student learning outcomes according to plan.
2. Labs should continue to maintain state-of-the-art equipment.
3. Faculty should continue regular contact with peers at other institutions.

FEASIBILITY

COMMENDATIONS

1. The department uses computer applications in traditional physics labs.
2. Physics faculty have updated and improved educational and scientific technology in their instructional program.
3. Computer tutorials are available for student use.
4. Security procedures have been implemented to protect lab equipment.
5. Some instructor computers have been updated to improve support for distance education instruction.
6. Details of the remodel have been completed.
7. Use of the "source room" has been optimized: it's now the dean's office.
8. Courses have been scheduled under the compressed calendar in several formats (day, evening, online...) to continue to attract different student audiences.
9. The department is working with counseling to correctly place students.
10. The department has been successful at attracting high quality faculty.
11. Library resources are adequate.

12. Physics faculty received a NASA-NOVA (NASA Opportunities for Visionary Academics) mini-grant of \$3000 for expenses related to the enhancement of the teacher prep course, PHYS 106.
13. The Physics Department is fiscally sound as per program indicators.

PREVIOUS RECOMMENDATIONS COMPLETED

1. Need computer programming projects for development of data analysis routines for student use. *Physics 202 and 203 labs have incorporated computer based simulation labs that more aptly demonstrate the principles taught in lecture and in the textbook.*
2. Re-evaluate PS building security (i.e. labs, stockroom, computer lab). *Installation of card key and security systems has improved PS building security.*
3. Re-evaluate safety features for labs and stockroom. *Labs have been upgraded with state-of-the-art safety equipment.*
4. Need multimedia/technical specialist support. *Increased technical specialist support has improved classroom effectiveness of multimedia equipment.*
5. Investigate subscribing to electronic journals for student research. *Campus intranet and science computer labs now provide excellent access to the web for students' research.*
6. Faculty members are encouraged to apply for foundation grants to fund the purchase of media equipment for the department. *A grant from NASA was obtained to aid in the implementation of the new Teacher Prep physical science course.*
7. Comprehensive Physics tutorials for Physics 201-203. *Tutorials for Physics 201 are now being used.*
8. Need to keep instructor desktop machines updated to handle new software demands. *All instructor computers are now on a replacement schedule. Some have been upgraded ahead of schedule to meet educational software requirements.*
9. Some details of the remodel were left unfinished. *Remodel details have been completed.*
10. Faculty should consider appropriate use of former source room. *This room has been converted to the dean's office.*
11. Need to be able to darken rooms for some physics experiments but still comply with emergency lighting standards. *Lighting in labs has been improved to enable dimming for some physics experiments yet compliance with lighting standards.*

RECOMMENDATIONS

1. Faculty members should research grants funding for program development in emerging technologies such as nanotechnologies.
2. Determine need for equipment in the area of electricity, magnetism and modern physics that does not deal with circuit theory.
3. Incorporate self-correcting computer tutorials such as Mastering Physics into the Physics 202 and 203 discussion sections.
4. Despite repeated maintenance requests, air balance and temperature are still not maintained adequately in the PS building. PS 101 is sometimes below 60

degrees at class time and PS 113 does not receive adequate ventilation. A/C ducting should be cleaned of soot.

5. Utilize basement area (behind PS113 and PS107) to store frequently used lecture demonstration equipment.
6. Determine the best utilization of PS121. Consider renovating for use as a seminar/conference room.

COMPLIANCE

COMMENDATIONS

1. Course requisites meet Federal, State and District requirements
2. New Course Outlines meet all current requirements, and existing Course Outlines are on a schedule to be updated to reflect new requirements.

PREVIOUS RECOMMENDATIONS

none

RECOMMENDATIONS

1. Review safety features on natural gas shutoffs in lab rooms.
2. Install first aid kits in lab rooms.

Key Program Performance Indicator	<u>01-02</u> Year 1	<u>02-03</u> Year 2	<u>03-04</u> Year 3	<u>04-05</u> Year 4	<u>05-06</u> Year 5
<i>Program Access</i>					
Majors	N/A	N/A	N/A	N/A	N/A
New Majors	N/A	N/A	N/A	N/A	N/A
Courses Offered					
Day (based on lectures)	8	8	8	8	10
Evening (based on lectures)	2	2	2	2	2
Weekend	0	0	0	0	0
Short Term	0	0	0	0	0
Distance Education	0	0	0	0	0
Classes Offered (# of sections)					
Day (based on lectures & labs)	31	32	32	32	34
Evening (based on lectures & labs)	8	8	8	8	8
Weekend	0	0	0	0	0
Short Term	0	0	0	0	0
Distance Education	0	0	0	0	0
Registrations					
Weekly Student Contact Hours	2,356	2,382	2,616	2,706	2,545
Full-Time Equivalent Students	72.7	73.7	80.8	84.1	78.8
Non-Traditional/Special Populations	0	0	0	0	0
Available Jobs	70 average annual openings for postsecondary physics teachers and 80 average annual openings for physicists in California (estimated years-projected, 2004-2014). Source: www.labormarketinfo.edd.ca.gov .				
<i>Program Resources</i>					
Full-Time Equivalent Faculty	2.75	2.80	2.80	2.85	3.00
Credit Reimbursement Rate	2,794.76	2,850.73	2,790.53	2,922.30	3,259.71
Revenue-FTES x Reimbursement Rate	219,482	226,348	243,334	263,591	276,532
Total District Program Budget (includes Physical Science and Earth Science)	651,736	533,735	524,826	570,109	609,474

Key Program Performance Indicator	<u>01-02</u> Year 1	<u>02-03</u> Year 2	<u>03-04</u> Year 3	<u>04-05</u> Year 4	<u>05-06</u> Year 5
<i>Program Resources (continued)</i>					
Personnel (includes Physical Science and Earth Science)	542,854	450,922	471,297	529,437	531,218
Grants	0	0	0	0	3,000
Supplies (includes Physical Science and Earth Science)	8,635	2,858	9,446	12,448	11,870
Industry Contributions	0	0	0	0	0
VTEA	0	0	0	0	0
<i>Program Efficiency</i>					
Productivity – WSCH/FTEF (525=good)	428.4	425.4	467.1	474.7	424.2
Average Class Size	33	33	38	38	31
Fill Rate at Census	74%	78%	88%	88%	76%
FTES per FTEF	26	26	29	29	26
Cost per FTES	7,232	5,864	5,679	6,343	6,723
Cost per Major	N/A	N/A	N/A	N/A	N/A
<i>Program Success</i>					
Course Retention (D or better)	87%	88%	90%	88%	87%
Course Success – Any Course (C or better)	74%	81%	80%	78%	79%
Course Success – Next Course (C or better) (based on PHYS 202 & 203)	90%	86%	88%	76%	86%
Course Success – Advanced Course (C or better) (based on PHYS 203)	89%	86%	82%	63%	91%
Major Persistence	N/A	N/A	N/A	N/A	N/A
Degrees Awarded	N/A	N/A	N/A	N/A	N/A
Certificates Awarded	N/A	N/A	N/A	N/A	N/A
Skills Awards	N/A	N/A	N/A	N/A	N/A
Licenses	N/A	N/A	N/A	N/A	N/A
Transfers	No Data				
Performance Following Transfer	No Data				
Student Satisfaction*	N/A	N/A	N/A	N/A	N/A

Key Program Performance Indicator		<u>01-</u> <u>02</u> Year 1	<u>02-</u> <u>03</u> Year 2	<u>03-</u> <u>04</u> Year 3	<u>04-</u> <u>05</u> Year 4	<u>05-</u> <u>06</u> Year 5
Program Success (continued)						
Employment Rate*		N/A	N/A	N/A	N/A	N/A
Employment Retention*		N/A	N/A	N/A	N/A	N/A
Employer Satisfaction*		N/A	N/A	N/A	N/A	N/A
Student Demographic Data						
Gender	Female	121 (37%)	135 (40%)	154 (40%)	122 (32%)	109 (32%)
Gender	Male	208 (63%)	204 (61%)	228 (60%)	259 (68%)	233 (68%)
Age	< 17	9 (3%)	10 (3%)	10 (3%)	11 (3%)	11 (3%)
Age	17 - 19	127 (39%)	124 (37%)	133 (35%)	127 (33%)	126 (37%)
Age	20 - 24	139 (42%)	139 (41%)	176 (46%)	169 (44%)	162 (47%)
Age	25 - 29	39 (12%)	41 (12%)	34 (9%)	36 (9%)	28 (8%)
Age	30 - 39	10 (3%)	22 (7%)	14 (4%)	24 (6%)	8 (2%)
Age	40 - 49	3 (1%)	2 (1%)	12 (3%)	12 (3%)	5 (2%)
Age	50 - 59	1 (.3%)	0 (0%)	0 (0%)	1 (.3%)	2 (.6%)
Age	60 - 69	1 (.3%)	1 (.3%)	3 (.8%)	1 (.3%)	0 (0%)
Ethnicity	Hispanic	63 (19%)	63 (19%)	67 (18%)	78 (20%)	91 (27%)
Ethnicity	Caucasian	73 (22%)	86 (25%)	118 (31%)	112 (29%)	92 (27%)
Ethnicity	Black	7 (2%)	16 (5%)	9 (2%)	17 (4%)	8 (2%)
Ethnicity	Asian	163 (50%)	133 (39%)	145 (38%)	126 (33%)	117 (34%)
Ethnicity	Filipino	9 (3%)	16 (5%)	18 (5%)	13 (3%)	13(4%)
Ethnicity	Native American	4 (1%)	2(1%)	0	0	1
Ethnicity	Pacific Islander	0	0	3 (1%)	1	0
Ethnicity	Other Non White	6 (2%)	8 (2%)	11 (3%)	14 (4%)	8 (2%)
Ethnicity	Unknown	4 (1%)	15 (4%)	11 (3%)	20 (5%)	12 (4%)
ED Goal	AA or AS Degree	21	16	22	20	31
ED Goal	Degree & Transfer	137	115	135	137	129
ED Goal	Transfer No Deg	111	134	164	150	131
ED Goal	Certificate	7	10	3	5	4
ED Goal	Job Skills	3	2	4	9	3
ED Goal	Personal	47	55	45	50	30
ED Goal	Unknown	3	7	9	10	14

*Vocational Programs Only