

Physics & Astronomy Annual Program Plan

March 29 2013

Canāda College Mission Statement

It is the mission of Canāda College to ensure that students from diverse backgrounds have the opportunity to achieve their educational goals by providing quality instruction in general, transfer, career, and basic skills education, and activities that foster student's personal development and academic success. Canāda College places a high priority on supportive faculty/staff/student teaching and learning relationships, responsive support services, and a co-curricular environment that contributes to personal growth and success for students. The College is committed to the students and the community to fulfill this mission.

Canāda College Vision Statement

Canāda College ensures student success through personalized, flexible, and innovative instruction. The College infuses essential skills and competencies throughout the curriculum and assesses student learning and institutional effectiveness to make continuous improvement. Canāda responds to the changing needs of the people it serves by being involved in and responsive to the community, developing new programs and partnerships and incorporating new technologies and methodologies into its programs and services.

0 Key Findings

The physics and astronomy program continues to grow. At the time of this writing, the College has announced plans to hire a full-time Astronomy(emphasis)/Physics instructor. In general, enrollments are high for most sections of Physics and all sections of Astronomy. We are experimenting with adding extra sections of the entry courses PHYS 210 and 250 to see there is additional demand. There does seem to be some demand we will track and report next year.

Student success is problematic in the entry courses PHYS 210 and 250. Roughly 50% of the students that start these courses do not complete them successfully. The cause is not known, we are considering ways to improve the success rate.

1 Planning Group

Martin Partlan.

2 Writing Team

Martin Partlan.

3 Program Information

3.1 Program Personal

Full Time Faculty

Name	Subject
Martin Partlan Ph.D.	Physics

Adjunct Faculty

Name	Subject
Jeanne Digel Ph.D.	Physics & Astronomy
Anita Fors	Physics
Violeta Grigorescu	Physics
Akilles Speliotopoulos Ph.D.	Physics
Gabriel Prochter	Astronomy

Classified Staff

Name	Position
Roslind Young	Physical Sciences Lab Technician
Justine Walsh	Physical Sciences Lab Technician

3.2 Program Mission and Vision

The Physics & Astronomy Department endeavors to prepare students for successful transfer to four-year institutions, to provide the prerequisite foundation in physical sciences for further work in engineering and the sciences, to foster critical thinking and active learning, and to fulfill the needs and interests of students by having a well rounded curriculum of lecture and laboratories.

3.3 Program Student Learning Outcomes

The Physical Science Program Learning Outcomes are:

Program Student Learning Outcome	Means of Assessment
The Scientific Method - Students completing this program will be able to use the scientific method and appreciate its importance to the development of scientific thought	An observational research project, Success criterion - 75% of students who complete the observational research project will correctly identify, collect and analyze relevant data
Effective Communication and Documentation of Work - Students completing this program will demonstrate the ability to document and communicate their work effectively	Portfolio - Students will submit a portfolio of laboratory work conducted throughout the semester Success criterion - The average grade of students who completed the portfolio is 70% or above Or: Laboratory reports - Success criterion - Students who completed all laboratory reports scored an average grade of 75% or higher
Critical Thinking and Analysis of Physical Systems - Students completing this program will demonstrate critical thinking and the ability to analyze physical systems in terms of scientific concepts	Embedded questions on the final exam Success criterion - 70% of students answer the selected question(s) correctly

These program SLO's are supported by the course level SLO's shown in subsections below.

4 Response to Previous Program Plan & Review

The Comprehensive Program Review for the physical Sciences Department was completed in Spring 2012. No specific response for the Physics/Astronomy was required.

5 Curricular Offerings

5.1 TracDat and Curriculum Data

5.1.1 *Physics/Astronomy Student Learning Outcomes Assessment*

Physics/Astronomy SLO's The following list contains all of the physics student learning outcomes, Data for student learning outcomes has been collected since 2009.

- Physics 210
 - SLO 1 :Perform an analysis of a physical system in terms of forces, velocities displacements and accelerations and time using Newton's laws
 - SLO 2 :Analyze the motion of a body (rotational or linear) in terms or momentum, kinetic energy, and potential energy
 - SLO 3 : Perform an analysis of isobaric, isochoric, isothermal and adiabatic processes in their relation to work, heat transfer, and changes in internal energy
- Physics 211
 - SLO 1 :Describe and Calculate kinematical variables as derivatives and integrals
 - SLO 2 :Use integrals to calculate work by a varying force
 - SLO 3 :Use differential equations to analyze simple, damped and driven oscillations
- Physics 220
 - SLO 1 :Analyze and explain the behavior of simple DC circuits with resistors, capacitors, and batteries
 - SLO 2 : Analyze the reflection and refraction of light in terms of geometrical optics in different media
 - SLO 3 : Describe the photo-electric effect, the Compton effect, quantization of energy and the Bohr model of the atom
- Physics 221
 - SLO 1 :Use surface integrals and Gauss' law to obtain the electric field for symmetric charge distributions
 - SLO 2 :Use line integrals and Ampere's law to obtain magnetic fields
 - SLO 3 :Use differential equations to analyze RLC circuits
- Physics 250
 - SLO 1: Perform an analysis of a physical system in terms of forces, velocities displacements and accelerations and time using Newton's laws
 - SLO 2: Analyze the motion of a body (rotational or linear) in terms or momentum, kinetic energy, and potential energy
 - SLO 3: Setup, perform, analyze, and document an experiment. Evaluation is based on the submitted laboratory reports
- Physics 260
 - SLO 1 :Analyze electric forces and fields created by a system of charged particles
 - SLO 2 : Analyze and explain the behavior of simple AC and DC circuits with resistors, capacitors, and inductors
 - SLO 3 : Solve problems involving induced electric and magnetic fields
- Physics 270
 - SLO 1 :Perform an analysis of isobaric, isochoric, isothermal and adiabatic processes in their relation to work, heat transfer, and changes in internal energy
 - SLO 2 : Analyze the reflection and refraction of light in terms of geometrical optics in different media
 - SLO 3 : Explain the principle assumptions of Special Relativity and able to perform calculations involving relativistic kinematics
 - SLO 4 : Describe the photo-electric effect, the Compton effect, quantization of energy and the Bohr model of the atom
- Physics 405
 - SLO 1 :Identify and distinguish electromagnetic radiations in terms of properties of frequency, wavelength, and energy
 - SLO 2 :State the principles of electromagnetic induction and apply them to the x-ray circuit

- SLO 3 :Identify the factors that affect the x-ray emission spectrum and explain what effect these factors have on the emission spectrum

- ASTR 100

1. Students will be able to correctly predict the location of the Sun in the sky at different times and dates and to relate that to the tilt of the Earth and the cause of the seasons
2. Students will know the difference between the inner and outer planets and the cause for these differences
3. Students will be able to correctly identify different classes of stars based their position in an HR diagram

- ASTR 101

1. Students will demonstrate an understanding of the size and scale of the solar system
2. Students will be able to accurately collect and analyze scientific data
3. Students will be able to identify changes in source temperature based on spectral shifts

5.1.2 Physics/Astronomy SLO Results

The following table summarizes the Physics/Astronomy SLO results for 2012 (Spring and Fall) (Aggregated from student that passed the course)

Institutional Learning Outcome #4 is:

“Represent complex data in various mathematical forms (e.g., equations, graphs, diagrams, tables, and words) and analyze these data to make judgments and draw appropriate conclusions.”

Course	SLO	Spring 2012	Fall 2012	Comments	ILO
PHYS 210	1	NA	73%		4
	2	NA	87.7%		4
	3	NA	85.5%		4
PHYS 211	1	NA	85%		4
	2	NA	85%		4
	3	NA		Not evaluated	4
PHYS 220	1		NA		4
	2		NA		4
	3		NA		4
PHYS 221	1		NA		4
	2		NA		4
	3		NA		4
PHYS 250	1				4
	2				4
	3		77%		4
PHYS 260	1			83% Fall 2010	4
	2			78% Fall 2010, 71.7% Fall 2009	4
	3			70% Fall 2010	4
PHYS 270	1		NA		4
	2		NA		4
	3		NA		4
	4		NA		4
PHYS 405	1	NA	74%		
	2	NA	79%		
	3	NA	60%	Below expectations	
ASTR 100	1			60% Fall 2010 Below expectations	4
	2			72% Fall 2010	4
	3		75%		4
ASTR 101	1	83%			4
	2			79% Fall 2011	4
	3			88% Spring 2011	4

5.2 Identify Patterns of Curriculum Offerings

The following tables contain the physical science courses, the latest Course Outline of Record (COR) date and the date of the completion of the most recent SLOAC cycle.

Physics and Astronomy

Course	Name	Latest COR Date	SLOAC Date
PHYS 405	Rad tech Physics	5/8/2009	3/25/2013
PHYS 210	General Physics I	5/11/2009	3/25/2013
PHYS 211	General Physics I Calculus Supplement	5/11/2009	3/25/2013
PHYS 220	General Physics II	5/11/2009	
PHYS 221	General Physics II Calculus Supplement	5/11/2009	
PHYS 250	General Physics I w/Calculus	5/11/2009	
PHYS 260	General Physics II w/Calculus	5/11/2009	3/9/2011
PHYS 270	General Physics III w/Calculus	5/11/2009	
ASTR 100	Introduction to Astronomy	2/24/2012	1/10/2013
ASTR 101	Introduction to Astronomy	2/24/2012	1/10/2013

Course	Spring 2012	Summer 2012	Fall 2012	Notes
<i>Astronomy</i>				
ASTR 100	2	1	3	Hybrid
ASTR 101	2	1	2	Hybrid
<i>Physics</i>				
PHYS 405	0	0	1	1 section in Friday-only format
PHYS 210	0	0	4	
PHYS 211	0	0	1	
PHYS 220	3	0	0	
PHYS 221	1	0	0	
PHYS 250	2	0	2	
PHYS 260	1	1	1	
PHYS 270	1	0	0	

In general curricular offerings are consistent with demand. We continue to experiment with adding additional sections of PHYS 210 and 250 and ASTR 100/101 to see if there is enough un-met need for additional sections.

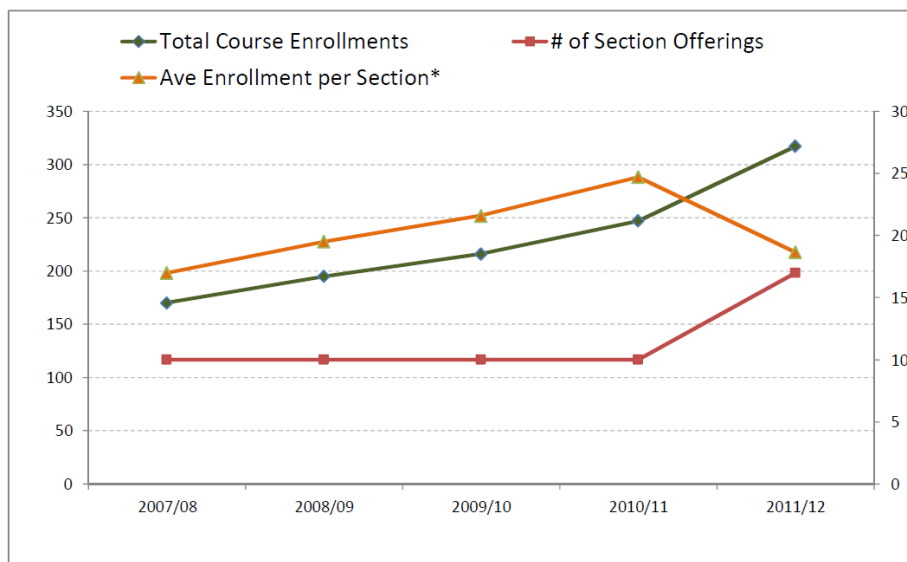
6 Program Level Data

6.1 Data Packets and Analysis from the Office of Planning, Research & Student Success and any other relevant data.

6.1.1 *The Physics Program*

Among the previous goals were increasing appreciation and comprehension of physical phenomena, physical laws and the scientific method. This will, of course, be perennial goal.

Physics Course Enrollments

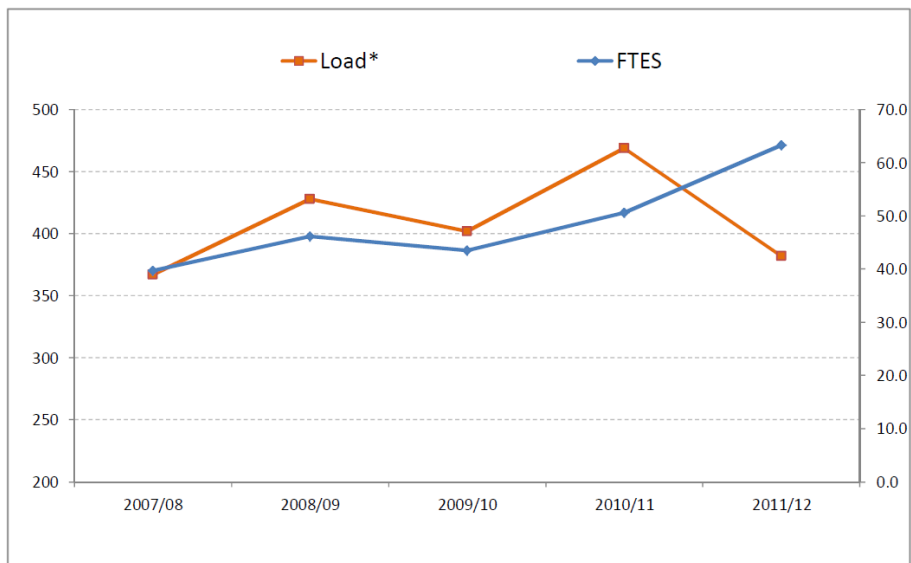


Department	Metric	Academic Year				
		2007/08	2008/09	2009/10	2010/11	2011/12
PHYS	Student Headcount	132	158	172	194	246
	Total Course Enrollments	170	195	216	247	317
	# of Course Offerings	9	9	9	9	11
	# of Section Offerings	10	10	10	10	17
	Ave Enrollment per Section*	17.0	19.5	21.6	24.7	18.6

Findings:

- The physics course enrollments are approaching their maximum. The limit for all physics courses (except PHYS 405) is 24 because they are laboratory courses. PHYS 405 is not limited but the demand for this course comes only from the Radiation Technologist program which is limited to about 20

Physics Department Efficiency

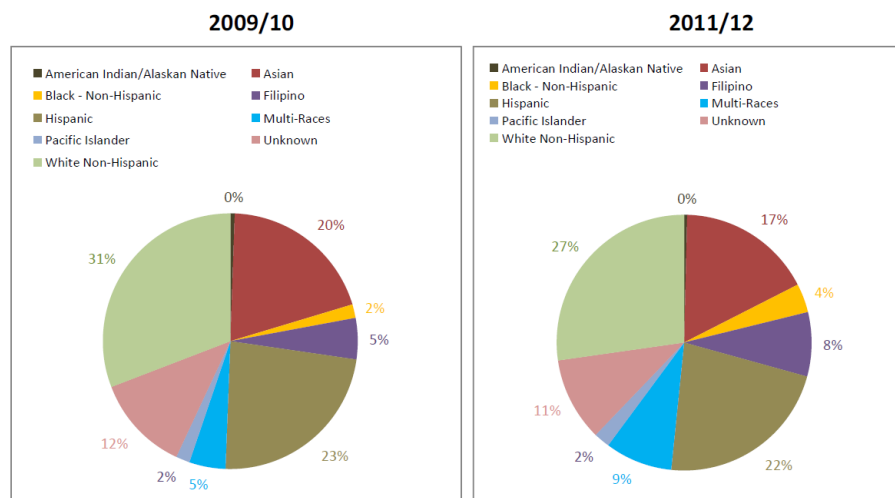


Department	Metric	Academic Year				
		2007/08	2008/09	2009/10	2010/11	2011/12
PHYS	WSCH	1190	1387	1304	1518	1900
	FTES	39.7	46.2	43.5	50.6	63.3
	FTE	3.2	3.2	3.2	3.2	5
	Load*	367	428	402	469	382

Physics Student Status

Department	Metric	Academic Year				
		2007/08	2008/09	2009/10	2010/11	2011/12
PHYS	First-Time Student	10	15	25	21	23
	Continuing Student	102	117	125	141	181
	Returning Student	18	19	20	18	32
	Concurrent Enrollment	2	7	2	14	10
	Percent First Time	8%	9%	15%	11%	9%
	Percent Continuing	77%	74%	73%	73%	74%
	Percent Returning	14%	12%	12%	9%	13%
	Percent Concurrent	2%	4%	1%	7%	4%

Physics Student Demographics



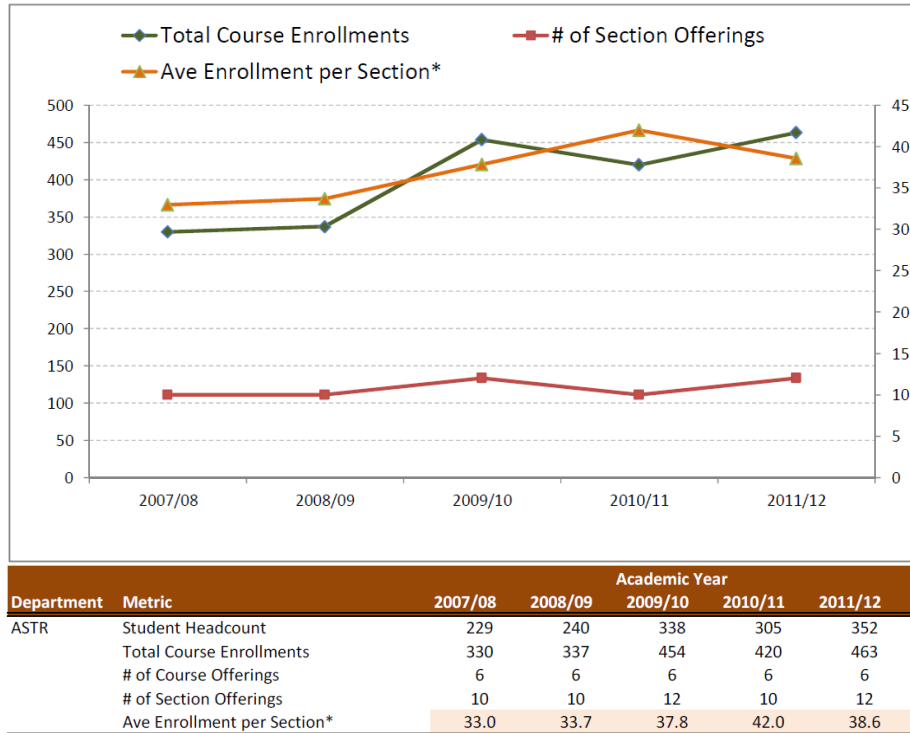
Department	Metric	Academic Year				
		2007/08	2008/09	2009/10	2010/11	2011/12
PHYS	Female	48	55	68	74	88
	Male	82	99	96	112	154
	18 & 19 Yrs Old	12	36	32	32	41
	20 - 24 Yrs old	67	67	72	88	107
	25 - 29 Yrs old	22	20	39	33	45
	30 - 39 Yrs Old	24	21	18	16	29
	40+ Yrs old	5	9	6	8	12
	% Female	36%	35%	40%	38%	36%
	% Male	62%	63%	56%	58%	63%
	% 18 & 19 Yrs Old	9%	23%	19%	16%	17%
	% 20 - 24 Yrs old	51%	42%	42%	45%	43%
	% 25 - 29 Yrs old	17%	13%	23%	17%	18%
	% 30 - 39 Yrs Old	18%	13%	10%	8%	12%
	% 40+ Yrs old	4%	6%	3%	4%	5%

Findings:

- The makeup of the student population is relatively unchanging

6.1.2 The Astronomy Program

Astronomy Course Enrollments



Findings:

- The astronomy enrollments are high with about 40 students/ section. The enrollments have been slowly but steady increasing.

Astronomy Student Performance

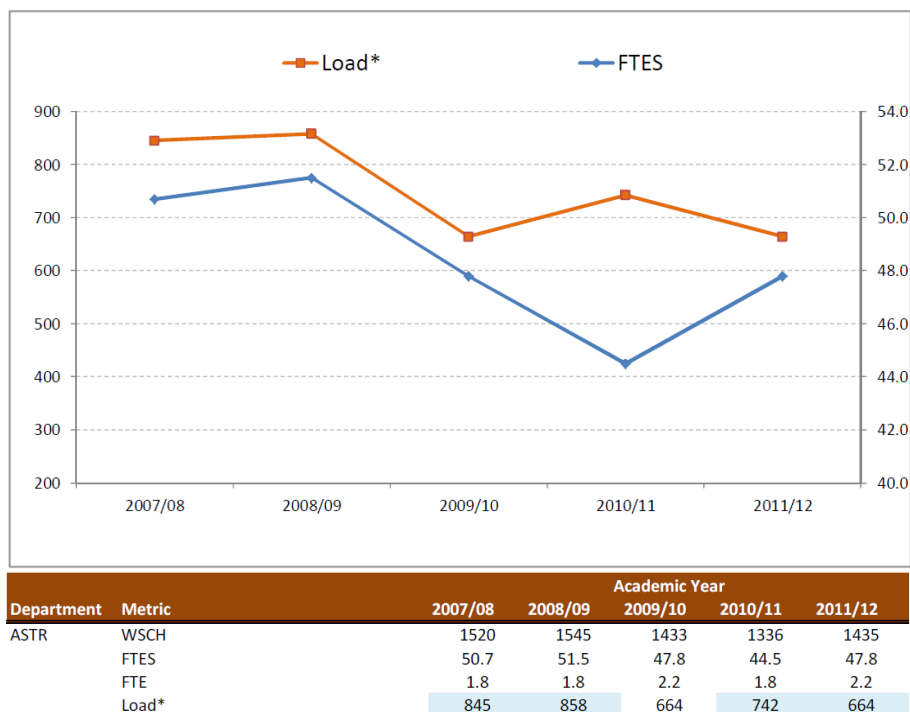


Department	Metric	Academic Year				
		2007/08	2008/09	2009/10	2010/11	2011/12
ASTR	Success Rate*	79.0%	82.0%	75.0%	81.0%	77.0%
	Retention Rate*	90.0%	90.0%	89.0%	92.0%	89.0%
	Ave Units Attempted this Academic Year	10.7	9.6	9.6	9.7	9.5
	Ave Units Earned this Academic Year	8.49	7.8	6.87	7.62	7.41
	Ave Academic Year GPA	2.7	2.72	2.66	2.65	2.72
	Ave Cumulative GPA	2.82	2.76	2.69	2.78	2.73

Findings:

- Student performance is relatively constant

Astronomy Department Efficiency



Department	Metric	Academic Year				
		2007/08	2008/09	2009/10	2010/11	2011/12
ASTR	WSCH	1520	1545	1433	1336	1435
	FTES	50.7	51.5	47.8	44.5	47.8
	FTE	1.8	1.8	2.2	1.8	2.2
	Load*	845	858	664	742	664

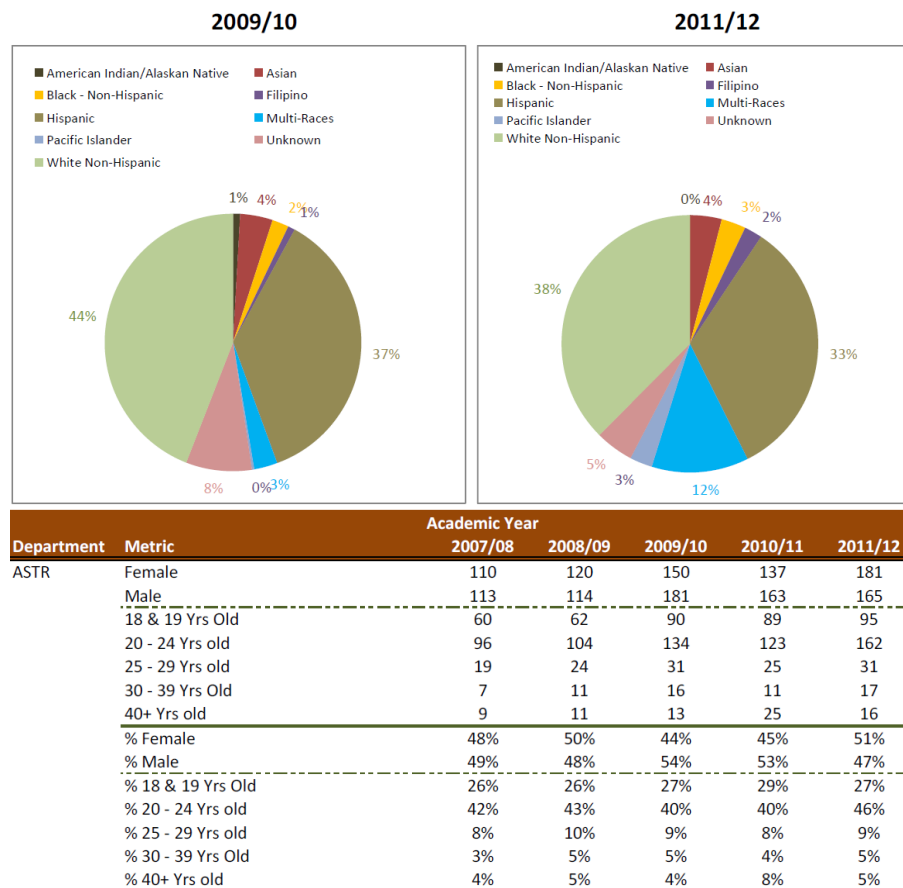
Findings:

- The astronomy WSCH, FTES, LOAD have fallen form the 2007-09 time frame but are still high.

Astronomy Student Status

Department	Metric	Academic Year				
		2007/08	2008/09	2009/10	2010/11	2011/12
ASTR	First-Time Student	20	24	19	31	33
	Continuing Student	142	160	231	212	241
	Returning Student	25	27	34	23	47
	Concurrent Enrollment	42	29	54	39	31
	Percent First Time	9%	10%	6%	10%	9%
	Percent Continuing	62%	67%	68%	70%	68%
	Percent Returning	11%	11%	10%	8%	13%
	Percent Concurrent	18%	12%	16%	13%	9%

Astronomy Student Demographics



Findings:

- The makeup of the student population is relatively unchanging

6.2 Analyze evidence of Program performance. Explain how other information may impact Program (examples are business and employment needs, new technology, new transfer requirements)

6.2.1 Physics

Physics enrollments have been increasing, in part because we are making the course available in the evenings and in Friday-only formats. In response to the increase in enrollments, we have opened additional sections. This has caused the LOAD to drop a bit.

Success in the entry courses PHYS 210 and PHYS 250 continues to be a problem. It seems like about 50% of the students are not ready for the work-load that these courses demand.

The overall success rate shows a steady drop. The cause is not known but could be due to one or more of the following:

- Higher population of under-prepared students
- Increased competition, as the number of students increases, the average quality of the student increases raising the level of the courses
- More realistic expectations of what level the students need to be at to succeed in college courses

6.2.2 Astronomy

Generally, 2 sections of ASTR 100 and 101 are offered each semester. For ASTR 100, one section is offered during the day and the second one is offered at night. Both sections of ASTR 101 are offered at night. There are no plans to change this schedule. We have added a day section of ASTR 101 for the fall 2011 as an experiment.

Astronomy courses tend to be full or overfull, with high retention. ASTR 100 generally has 40-60 students and the lab (ASTR 101) has 30-35. These courses fulfill science credit for transfer and many students complete these courses with this in mind. Astronomical equipment is always in short supply (e.g. CCD cameras for telescopes), but the existing equipment is sufficient for completing the stated goals of both classes. We have purchased a new telescope with digital camera and a separate solar telescope for viewing the sun.

In the spring 2009, we offered a pilot of a learning community combining ASTR 101 (the lab) with MATH 120. The feedback from faculty and students in this class has been positive, but there are still ongoing discussions about the need for this type of class. The original plan was to offer this class each spring semester, but we decided to skip the spring 2011 semester to continue these discussions.

6.3 Other Considerations

None at this time

7 Action Plan

7.1 Physics

Student success in the entry courses PHYS 210 and PHYS 250 continues to be a problem. About 50% of the students in these courses seem to not be ready for the work-load that these courses demand. Consequently these students get behind, get frustrated and drop/fail. The department has tried a diagnostic pre-tests in the past to see if we could determine who is ready physics and who is not. The results were inconclusive, some students who seemed not likely to pass rose to the challenge while others who should have done fine did not succeed. This seems to suggest that the key element in student success is motivation. Thus a possible resolution is to offer a supplementary physics course that could be taken simultaneously with PHYS 210 and PHYS 250 that would reinforce the material presented in those courses and develop the skills needed to succeed in those courses. This would certainly benefit the motivated but unprepared student.

- Continue with SLOAC at the course and program level.
- Improve student learning outcomes
- Develop a Conceptual Physics course
- Develop an auxiliary physics course, and/or make structured use of tutoring to help improve student success in PHYS 210 and PHYS 250

7.2 Astronomy

An on-line ASTR 100 course will be offered in summer 2013. And, Trustee's Fund money has been received to buy equipment for an on-line Astronomy Lab course, though that won't be offered before next Spring.

The enrollments in the ASTR 100 have remained quite high and we expect that there is sufficient interest to support 2 classes. There does seem to be increased demand for the GE science classes in the spring semester, so spring 2012 we will add a second day section of ASTR 100.

We would like to continue to connect math and astronomy/physics to show students the applicability of math to the real world.

8 Resource Identification

8.1 Faculty and Staff Hiring Requests

None at this time

8.2 Professional Development Needs

None at this time

8.3 Classroom & Instructional Equipment Requests

The following instructional equipment is requested:

Item description	Cost per unit	Units requested	Total Cost	Vendor
Pasco Xplorer PS-2002	\$359	8	\$2872	PASCO PS-2002
High sensitivity light sensor PS-2176	\$159	8	\$ 1272	PASCO PS-2176
Magnetic Field Sensor PS-2112	\$60	8	\$480	PASCO PS-2112
Classroom spectrometer with scale	\$6.95	30	\$208.50	Edmund Scientifics 3052521
Hubbard Scientific Celestial Star Globe, Transparent MEP-300	\$137.84	15	\$2067.60	Hubbard Scientific 795721100671
Gas discharge Tube Argon	\$38.90	12	\$466.80	CENCO WLS68755-30A
Gas discharge Tube Helium	\$38.90	12	\$466.80	CENCO WLS68755-30F
Gas discharge Tube Hydrogen	\$38.90	12	\$466.80	CENCO WLS68755-30G
Gas discharge Tube Mercury	\$38.90	12	\$466.80	CENCO WLS68755-30K
CENCO Spectrum Tube Power Supply	\$218.90	6	\$1313.40	CENCO WL2393D
Tablet PC replacement for use in lecture	?	1	?	?

8.4 Office of Planning, Research & Student Success Requests

None at this time

8.5 Facilities Requests

None at this time