11/24/2009

Program Review Self Study for Astronomy/Physics Department

Part 1: Preamble

The MPC Astronomy/Physics department consists of three full time faculty members: Homer Bosserman, Gary Mekarski, and Lijuan Wei. While this is a small department, our range of education and expertise allows us to cover a broad range of courses. In addition, we have enlisted numerous members of the community with teaching expertise or research experience, including retired faculty, to further augment our ability to offer a diverse curriculum.

The primary functions of the Astronomy/Physics Department at MPC are to:

1. provide university transfer level classes to address the particular needs and requirements of science and engineering majors
2. provide university transfer level laboratory introductory astronomy and physics courses to satisfy general education requirements both for MPC graduates and those transferring to the CSU and UC systems.
3. provide courses and programs of general interest in the fields of astronomy and physics designed to promote continued life long learning for community members.

These are some of the outstanding characteristics of our program:

a. We have an experienced and dedicated faculty who constantly update curricula in terms of both content and pedagogy, who strive to implement the use of technology and multimedia in their classrooms and labs, who see the value in attending conferences and workshops to refine their own knowledge and skills and who choose to actively participating in campus committees that shape the future of the institution.

b. Recognizing that most students taking courses in the department are not astronomy or physics majors, we have developed our curriculum to address the specific needs of this diverse audience, whether it be as a general education requirement or a technical requirement for a major such as medicine or engineering.

c. The courses that we teach to our majors in Astronomy or Physics continue to exceed the expectations of the four-year institutions with proven results and successes among its graduates. Students interested in pursuing undergraduate degrees in Astronomy or Physics, and in most cases continuing on to graduate or professional programs, are given a rigorous education through lecture and extensive lab studies that are both current and practical. Based upon the success of its graduates, students entering the

series anticipate a challenging and transformative experience, and have every reason to expect to be extremely well prepared for upper level courses upon transferring. Faculty colleagues at UC Santa Cruz and CSU Monterey Bay readily acknowledge these student's exceptional academic skills and high level of preparation.

d. The two technicians who serve the Department play an integral role in student success. Both Allen Andrews and Tim McKnew exert considerable effort toward facilitating a high-caliber learning environment for our students and much can be said of their initiative and commitment to the sics Department. Both of these technicians carry out their responsibilities with both short and long-range views of maintaining the quality of our programs in areas ranging from organizing the prep room facilities to how to best maximize our limited resources confined to a wholly inadequate space.

Part II: Analysis

1. Implementing the philosophy, goals and objectives of the college:

The table below compares the Astronomy/Physics department's goals with the appropriate institutional goals. Currently we are meeting our departmental goals, but it is an on-going process to improve.

INSTITUTIONAL GOALS	ASTRONOMY/PHYSICS DEPARTMENT GOALS
Enhance or maintain MPC's instructional programs, its comprehensive, high quality curriculum, and the student services which support them to keep pace with the changing needs of student learning and the community.	1. Meet equally the needs of transfer students, associate degree students and general interest students. 2. Offer a diverse curriculum in Astronomy/Physics to inspire interest in the subject. 3. Respond to the community with courses, information and resources. 4. Improve recruitment at high schools, especially of prospective engineering majors 5. Offer the highest quality education, including up to date content and instructional methods. 6. Add more on-line classes. 7. Increase resources for maintenance, supplies, for upgrading instruments and equipment. Please see Section III of this self-study for details. 10. Continuously revise the Astronomy lab manual to keep it up-to-date and increase its usefulness.
Promote diversity throughout the college, its curricula, campus environment, and students served, and expand and improve efforts that promote staff diversity through equal employment opportunity.	11. Continue to train our staff to be sensitive to cultural differences between our students and to incorporate into the curriculum the contribution of as wide a range of cultures as possible within the framework of a science course.
Ensure effective leadership,	12. Continue to participate in campus

communication, and collaborative skills of faculty, staff, students, and administration, and promote effective committee decision-making.	committees that enable Astronomy/Physics faculty to shape the future of the institution in terms of its physical and academic environments.
Build and/or strengthen partnerships with business and industry, community organizations, governmental agencies, public schools, universities and others that are mutually beneficial and that maximize resources in meeting the educational needs of the community.	13. Maintain good relations with four-year institutions. 14. Continue to work with the engineering department to gather more guaranteed transfer agreements with transfer institutions
Implement measures to maintain up-to-date technology (hardware & software), adequate levels of well-trained technical support personnel, and effective staff development programs designed to provide dynamic and accessible education and work environments for the college's students, faculty and staff.	15. Continue to improve the technical skills of our faculty and technical staff to take advantage of revolutionary changes in both the disciplines we teach and the methods of presentation of course materials. 16. To maintain technology as a budget priority and procure, as resources allow, the latest equipment and pedagogical aides.

2. Curriculum review:

All the Astronomy/Physics course outlines are being updated to comply with the most up-to-date formats.

3. Scheduling:

Our classes are offered during the day, evenings, weekends, and in summer. The specific scheduling for each class depends on the class, the type of student, demand, and compatibility with other classes which the students are most likely to be taking. For example, engineering majors taking our Physics 3 series are very likely to be simultaneously enrolled in Calculus and Chemistry courses. Scheduling patterns change very little from term to term because we are constrained by:

a. The necessity to schedule around other classes taken by Astronomy/Physics majors, including chemistry and physics.

b. The availability of classrooms and labs large enough and with the appropriate facilities to support specific classes.

c. The demand for class enrollment to meet the minimums prescribed by the administration. Accordingly, Physics 2A, 2B, 3B, and 3C are offered only once a year, whereas Physics 3A and 10, and Astronomy 10 are offered each semester. The latter is taught as both a traditional lecture/lab course and as a living room/lab course. The latter section is offered on Friday nights and Saturday mornings to meet the needs of special student populations (such as DLI students) who cannot attend our traditional class times.

d. The scheduling of our Astronomy 10 class has additional challenges. The class over-fills every semester and there is always a long list of folks hoping to add. Because the lab portion of the class requires many hours of nighttime observations, we are typically outside with students 4 nights a week. In the event of cloudy weather (an all too common fact of life in this area) we must leave lots of unscheduled time to accommodate re-scheduling of events cancelled by bad weather.

e. Even during the daytime astronomy labs, we are using a lab that was designed for 24 students, but are frequently letting in about 30 – 32. While this helps satisfy the great demand for the course, it obviously results in a reduction of the quality of instruction. Hopefully, when our building is remodeled, an expanded lab capable of handling 32 students will be available.

4. Student satisfaction

a. Indicators of student satisfaction include the direct feedback given to us by our students (some teachers give out informal surveys and questionnaires to solicit feedback) and the formal student evaluation forms done when each teacher is evaluated. In addition, we often hear from our students who have transferred that they are well prepared for the advanced Engineering, Physics and Astronomy classes at their transfer university. By maintaining an open and comfortable communication style, we are more likely to have our students come to us with both complaints and kudos.

b. Feedback from colleagues at transferring institutions provides criticism, praise and guidance that inform curriculum changes.

c. We have learned from our students that overall we are doing an excellent job, but we always encourage constructive feedback. For example, in our astronomy labs dealing with orbital motion, based on many student gripes

and suggestions, we made major revisions that make the procedures much easier to follow without detracting from the rigor of the methodology.

d. When complaints do arise, they are handled following the chain of authority. If an instructor does not or cannot deal with a student issue, dispute or complaint, the division chair will be asked to step in, followed (if necessary) by the dean. Sometimes, as in the case of a student discipline or cheating problem, the vice president of student affairs will be consulted.

5. Faculty and staff satisfaction:

a. Our faculty members are able to choose the classes they teach based on their personal preferences, training and expertise as long as they are compatible with the many restraints we face in scheduling. We have tried to do an fairly orderly rotation in our teaching assignments, but this has not been successful in recent years.

b. While our staff is generally well-satisfied with our ability to meet student needs, there are some things that we would like to change. The issues of outdated and worn equipment and computers are a perennial problem. With increasing enrollments (especially in astronomy) we have had difficulties in finding enough lab space. The cramped conditions in the physics/astronomy stockroom are deplorable, especially for our technical support staff.

c. We would like to improve our ability to recruit and retain diverse high school students, especially for the fields of engineering. We generally feel that we are not doing an adequate job in this area. While student satisfaction with our astronomy courses is very high and results in full classes every semester, this same satisfaction has not made a discernable impact on recruitment in physics.

6. Promoting student success, access and equity.

a. We are aware of the diverse needs of our students, and have been willing to work with Supportive Services to ensure success for those with disabilities of any kind.

b. We have a nice but aging computer-tutorial lab (PS-205) which is open many hours during the week. There students can get help with physics homework problems or can work on computer assignments in both astronomy and physics. Unfortunately, at the current time, the lab is generally under-utilized.

7. Demographics:

a. In our general education courses (Physics 10 and Astronomy 10) the student population represents quite accurately the diverse cross-section of ethnicities, reflective of the broader campus and community demographics.

b. On the other hand, our majors' curriculum (especially engineering) appears to lag behind in minority participation. This phenomenon extends to all transfer level courses in the sciences and appears to be an extension of the dynamics and circumstances occurring within the local high schools, and lower levels of public education. While greater efforts on the part of our campus to recruit a more diverse student population into these programs may provide some improvement, meaningful progress on this issue will probably only occur when larger social and educational issues are addressed within the community.

8. Students expectations:

The majority of our students are trying to meet general education requirements for transfer. A few are here for life long learning opportunities. Our Astronomy/Physics majors expect to be well prepared for transfer, and for making decisions on areas of specialization. They require exposure to different disciplines to make informed decisions. Classes must be sufficiently rigorous that students are able to decide whether they should continue in science or move into other areas. While courses are not intended to deliberately weed out weaker students, students are aware of the fact that poor performance in these courses does not bode well for their continued aspirations to become scientists. Often these students benefit from the more supportive learning environment afforded by a high level of interaction with faculty in a small classroom setting and are able to develop the skill they need to succeed. Whether they remain in the sciences or change their direction, it is generally understood that the experience of taking courses within the Astronomy/Physics Department has been a meaningful one, and that in either case, faculty were helpful and supportive.

9. Faculty and Staff:

We had three full time Astronomy/Physics teachers:

Homer Bosserman has a Master's degree in Physics from UC Berkeley; Lijuan has a PhD in Physics from _____. Gary Mekarski, who retired at the end of the Fall 2006 semester, had a master's degree from UC Santa Barbara

Our astronomy lab technician Allen Andrews has an MA in Ichthyology from San Jose State University and is currently working on his doctorate in that area

from Rhodes University, South Africa. Our physics lab technician, Tim McKnew, is currently completing his work on a BS in Physics at UC Santa Cruz.

10. External factors influencing the program:

Enrollment in the traditional version of Astronomy 10 is always strong, but the enrollment in the Living Room Series version is in large part dependent on the priorities which the military places in their students at the DLI completing their general education requirements.

11. Involvement with the community at large:

We frequently hold astronomy open houses, to which the public is invited, when special viewing opportunities present themselves. Homer Bosserman is on the Board of Trustees of the Monterey Institute of Research in Astronomy (MIRA). We have a good relationship with that organization, some of whose staff have taught for us part time. We also help to sponsor talks by renowned astronomers who are brought to the campus by MIRA.

All these interactions help keep classes tied to the community and help improve the visibility of our programs.

12. Areas of concern:

A. Lack of Adequate Sites for Observing:

A vital and integral part of the lab component of our course is instruction in the use of telescopes and actual observations of the heavens. Whenever possible, we try to do these activities on campus to avoid the logistical and student transportation problems associated with observing off-campus. For observing the fainter objects, like comets, the outer planets, nebulas, star clusters and galaxies, we have no choice but to go off-campus to a dark-sky site.

(1) Lack of an On-Campus Site:

Before the construction of the new library-technology building, along with its entrance plaza, we had the whole large, fairly dark space to the east of our building. Setting up equipment there was relatively easy. With the construction of the new Center, we lost that space. At that time, we were promised that when our new Math-Science Wing was completed, there would be an observing deck atop the structure, along with elevator access for students and equipment. When the decision was made to scrap the new wing, gone with it was the deck. Every other need that was to be accommodated in the wing was reconfigured into the plans submitted as an FPP last spring, but not the need for an on-campus observing site, in spite of our constant reminders to the various planning groups.

All we got was a vague assurance that some suitable space would be found, somewhere.

In Fall 2006, some progress has been made in this regard with the promise that an area to the southeast of our building can be leveled and built into the hillside for our purposes, but nothing has actually happened. We are frankly pessimistic about whether adequate funding to create a truly useful observing space there will be provided,

(2) Lack of an Off-Campus Observing Site.

The purpose of our off-campus observing field trips is to allow our students to observe and study objects like binary stars, star clusters, nebulas, galaxies and comets. All of these objects are very faint and cannot be seen in the light-polluted urban skies of our campus. Many years ago we regularly went to the top of Chews Ridge (a 5,000' mountain in upper Carmel Valley and the current home of the Monterey Institute for Research in Astronomy's observatory.) The site we used was the cleared area around the fire lookout tower. Long ago that lookout was abandoned, and since then the clearing has all but disappeared with new growth. More recently, we used a campground at Lake San Antonio. This site is over 100 miles away and is no longer feasible for our students to go to for a 4-hour observing session. At the current time we do not have an ideal location. In Fall 2006, we took the class to Fremont Peak Observatory, located about 45 miles away at the center of a triangle formed by Salinas, Hollister and Gilroy. This site has many attractive features, the chief being the availability of using their 32" diameter Newtonian reflector. The chief disadvantages are the long drive and the considerable light pollution from the growing cities surrounding it. Our best bet for the future may be a site down the coast – the Brazil Ranch is a possibility – within a 20-mile drive, but even there conditions are not ideal due to frequent coastal fog.

B. Obsolete and Aging Equipment

The two most important kinds of equipment we use in teaching astronomy are telescopes (surprise!) and spectroscopes.

All of our telescopes are old and cranky. Small but vital parts are breaking all the time, and keeping them in repair is becoming more and more difficult, since the manufacturers basically no longer support them. Meanwhile, a revolution in telescope design has occurred: almost all of the newer scopes use GPS technology, which vastly simplifies the process of setting up the scopes and locating objects.

Many of the spectroscopes we use were purchased around 1960 and are in very bad shape. When we replaced some of these about 10 years ago with supposedly identical (but new) models, we found these to actually be of inferior quality, and most of the "newer" ones are actually in worse shape than the "old" ones. Each

year we put in our action plans a request for funds to purchase a whole new (and hopefully better) set. One year we were actually granted to money only to find that the only spectroscopes now made are either very cheap "toys" or astronomically (hah!) expensive "professional" models which, even if we could afford them, are so complex that introductory astronomy students probably couldn't use them.

C. Out-of-Date Video Lectures for Living Room Version

Anyone who reads the papers or watches TV knows that the field of astronomy is undergoing an era of amazing discoveries forcing us to rethink and revise our ideas of the cosmos. Our staff tries very hard to keep abreast of these developments and to bring the new ideas, where appropriate, into the classroom. Sadly this is not the case for the video lectures we use in the living room version of the course. They are hopelessly out of date and are only available on rapidly deteriorating VHS format. Frankly, using these, semester after semester, is a disgrace to the integrity of our program, and is, at best, ludicrous! A new set, up-to-date as of 2006 is now available in crisp, DVD format, and needs to be purchased ASAP.

D. Crowding in Lab and Stockroom

When the Physical Science building was designed and built around 1968, the astronomy/physics lab was designed for 24 work stations (4 students at each of the 6 lab tables). The PC had not yet been invented, and, since the astronomy program was miniscule, the college owned 1 medium-sized telescope. We had a single lab technician.

Because of the great demand by students to take the modern astronomy course, several years ago we arbitrarily increased our lab size to 30, anticipating that in the remodeling of our space, we would end up with a larger lab space, eventually capable of handling 32 students (4 students at each of 8 lab tables.) This expansion has not yet occurred and may be several years in the future. Meanwhile, we operate in less than optimal conditions.

Our stockroom, which was not large to begin with, now has to accommodate about 16 telescopes (some of them quite large), a large number of computers and ancillary equipment, and three lab technicians. The place is a claustrophobe's nightmare, is extremely inefficient, and makes for much frustration and low morale. We are in a position similar to what the physical plant folks had to content themselves with when they were in the old Quonset huts. Now they have nice facilities, to say the least. Hopefully when our building is remodeled the situation will be less grim for our staff.

E. Finding a New Astronomy/Physics Instructor

At the end of Fall 2006, one of our instructors, Gary Mekarski retired. The senior instructor, Homer Bosserman, is still going strong, but is well past retirement age and will, at some as yet unknown future date, leave MPC. Thus there is an urgency to find an outstanding new instructor for the very large introductory course. It is difficult to find qualified physics instructors. It is even more difficult to qualified astronomy instructors. It is almost impossible to find an astronomy/physics instructor who is willing to go out 3 or 4 hours a week with a bunch of general education students, under less than ideal conditions, on the field trips the course requires.

We are presently awaiting applicants to replace MR. Mekarski. We are very hopeful that an adequate replacement can be found, but not overly confident. *Only time will tell!*

F. Completing the Refurbishment of LF-102

When we began planning for our new Math/Science Wing, one of the key components was a modern science lecture hall equipped with all the multimedia needed to present a truly superior educational experience. When the wing went out the window, so did the lecture hall, but we were assured by our administrators and campus planners that an equivalent space would be found in the Lecture Forum building. As it turns out, that space is probably going to be LF-102.

Several years ago LF-102 was extensively remodeled with vastly improved seating and acoustics. However, like most MPC projects, the job was not completed and much needs to be done to convert it into a truly effective science lecture hall. Among the improvements needed are

1. Centralization of controls into the podium and elimination of switches and remotes whose functions are both flaky and inscrutable.
2. Better, dimmable lighting, especially towards the back of the room, which is in almost total darkness now.
3. Replacement of the "hippopotamus sarcophagus" podium with and ergonomic and user-friendly one.
4. Installation of wireless technology that will free the lecturer from being a prisoner behind the podium.
5. Installation of infrastructure to allow the room to be used for effective lecture demonstrations in the sciences and an adjacent storage/prep room for preparing these demonstrations.

An overriding general concern is whether we can keep up with changes dictated by advances in science. Here, money is the main issue. We want to keep our lecture presentations, facilities and lab/field trip equipment up to date and maintain state of the art labs on a very limited budget.

13. Similar programs:

All the nearby community colleges have Astronomy/Physics departments. The main difference between our astronomy program and that at most other colleges is that the course is offered as a full 4-unit laboratory science.

14. Coordination with other programs on campus:

There is a very healthy level of coordination and communication between faculty teaching our astronomy course and faculty teaching similar introductory science courses on campus. This relationship has enabled productive dialogs to occur between colleagues that have strengthened course objectives and increased the relevance of course content to match our mutual general education objectives. These discussions have also impacted scheduling in positive ways.

We are all currently working with the other staff in Physical Sciences and in Life Sciences in the planning for the new Math/Science project and are hoping these discussions will establish a more unified feeling among faculty and students engaged in the sciences. So far this has been a challenging planning effort, to say the least.

15. Support from other programs:

We work often with Supportive Services and Library staff, the latter especially when our students are doing their research papers. We rely heavily on the resources of the instructional technology and audio-visual staff in keeping our lecture presentations and computer usage running smoothly.

16. Quantifiable factors:

Our enrollments are generally very stable. The traditional version of the class reliably fills every semester, and we usually allow additional students to enroll to the extent that we can accommodate them in the lab. The only way we could increase enrollment would be to add additional sections, which we feel we cannot do for a host of staffing, facility and logistical reasons. As an example, our instructor and our lab technician are generally working 4 nights with

students in our night labs and field trips. When weather problems cause cancellations and reschedulings, the number of nights we must be obligated increases to more than 4 nights per week. Going beyond this is something we cannot reasonable expect and employee to do.

The enrollment in the living room series version has been somewhat erratic during the last few semesters. This may be due in part to changes in the educational commitment of the Defense Language Institute, which has been the major source of students for this course. In Fall 2006 it was low because – due to prior instructor commitments – the course ran for essentially the full 16-week semester, making it impossible for most DLI students to enroll. This situation has been avoided in our Spring 2007 scheduling.

The following table, extracted from Rosaleen Ryan's survey, summarize FTES per FTE and enrollments for our program:

Semester	Fall 2002	Spring 2003	Fall 2003	Spring 2004	Fall 2004	Spring 2005	Fall 2005	Spring 2006
FTES	29.96	34.56	29.18	29.81	31.38	32.22	30.75	30.8
FTE	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
FTES/FTE	26.05	30.05	25.37	25.92	27.29	28.02	26.74	26.78
Enrollment	307	355	299	304	323	330	314	312
# Sections	7	7	7	7	7	7	7	7

17. Adequacy of supplies, etc.

Within the constraints of the budget, resources are divided in our Division equitably. We have adjusted our requests accordingly. Great effort is being made to use resources efficiently. However, the amount of money the division receives is not sufficient to meet all needs, and there are some particular areas of concern, including our computer facility. The computer lab is in constant use by as many as ten classes in the division per semester, so that the equipment is in constant need of maintenance and attention. This high usage places unreasonable demands on our technical staff, especially Dave Albright. We need some additional hours of computer tech time to avoid overburdening him.

Our teaching staff is adequate at this time.

Part III Recommendations and Goals

Our goals were listed completely, under Part II, Analysis. Here are some of our plans for reaching them.

1. We will meet the needs of our students by keeping our curriculum as up to date as possible, with continuous improvement by our faculty.
2. We are considering how we might offer the lecture portion of Astronomy 10 as an on-line class.
3. We would like to remodel the main Astronomy/Physics lab (PS – 107) and its support/stock room to accommodate a larger number of students in a more efficient configuration. Our lecture room, LF-102, was partially refurbished several years ago, but much needs to be done to complete the job and make it truly effective.
4. Our previous program review mentioned several areas of concern. One was with our personal well-being, given the number of hours we worked. This hasn't changed much. We mentioned the large amounts of time required to develop lectures and labs in a multimedia format.

Prioritized specific program goals for the next five years:

1. Continue the development of course materials and current content for the introductory astronomy course
2. Continue to update and refine the lab manual
3. Consider adding an on-line class
4. Obtain and integrate up-to-date video lectures for the living series version.
5. Update and replace obsolete equipment.
6. Find a suitable site for meaningful on-campus observations.
7. Find a suitable dark-sky site for off campus observations.
8. Continue planning the Math/Science building project with emphasis on maximizing the utility of both new and remodeled space.
9. Consider re-structuring and re-vitalizing the advanced astronomy course.
10. Reach out to the local community, promote our programs, and facilitate recruitment ands retention, especially of under-represented students.
11. Work very hard to find a quality, committed replacement for Gary Mekarski.
12. Work to make sure that our lecture facilities (presumably LF-102) are brought up to the standards needed to provide for an effective, ergonomic, quality learning environment.