A. Content – Goals

The question “are physics majors learning physics?” is of course quite broad, and so we start with a general outline of what we as a physics department would like to ask as part of our departmental review. The following list is by no means complete.

General questions to address in our departmental self-study

1. What are the characteristics and goals of students in our program?
   - What is the entry level state of knowledge of our students?
     How do we obtain this knowledge? - placement test?
     What steps do we take to challenge students who are very well prepared?
     What steps do we take to assist students whose preparation is weak?
   - What goals do our students seek to achieve by obtaining an undergraduate major in physics?
     What do they intend to do with their education? This should be of vital interest to the department
     Is the department providing them what they need?
     What mechanisms do we have in place for collecting feedback on current students’ perception of the physics program?

2. Does the department’s curriculum help students to fulfill their goals?
   - How do we decide which faculty members teach particular courses? How do we examine their effectiveness?
   - Do we encourage faculty members to try innovative pedagogies in their courses?
   - Is the content of our courses and laboratories current?

3. Do we have adequate resources to support our physics program?
   - Are the department personnel adequate for maintenance of a high-quality physics program?
   - Do we have appropriate instructional technology? Laboratory equipment? Equipment for extra-curricular research? Computing resources (hardware and software)?
   - Are our laboratories and classrooms properly equipped? Do we have an adequate annual budget for purchase and maintenance of necessary capital equipment?

4. What support outside of the classroom and laboratory does our program provide to help students meet their goals?
   - Advising support – both curricular and career
   - How do we maintain connections with alumni?
   - How do we relate with companies that employ our students?
   - How effective are we at involving students in scholarly research?
   - How do we support students who aspire to teach K-12?
5. Does the climate in our department effectively support and energize physics students?
   - Promotion of student-faculty interactions – picnics, home gatherings, field trips
   - What steps are we taking to promote a “community” of physics and engineering students?

B. Institution Service – Goals
1. Are we providing appropriate instruction to students from other science departments?
   - Are their physics needs being met relative to their necessary curricular preparation?
   - Are the laboratories equipped properly for the types of experiments these students ought to be exposed to? (eg. Life-science students – EKG experiments, etc.)
2. Is the department properly educating students from the non-science areas of the college?
   - Preparation of teacher-credential program students
   - Communication of the “scientific method” (if there is such a thing!), and science’s “ways of knowing”
3. There’s obviously a lot more we can ask and address in this topic …

C. Learning and Developmental Outcomes
The following lists some of the current activities as well as future plans for this area.

Current activities

Exams, Homework and Laboratory  Through the administration of homework, exams and laboratory assignments, we are currently able to obtain a fairly accurate assessment of students’ learning and development through the years. We meet together fairly often to discuss progress of individual students in our program in an effort to tailor our attention to their individual needs. We regularly speak with students about their future educational or career goals advise and seek to advise them based on our assessment of their strong and weak points.

Summer research activity  Some of us regularly work with students during the summer in one-on-one research activity. The value of maintaining this program is shared by us all, and assessment of the impact of this activity is ultimately manifest in success students find in graduate school admittance and job placement, for which research activity as an undergraduate is an integral part of their training.

Future plans

Standardized tests  We are in the process of searching for standardized national tests with which to gauge the success of our educational program. At present, there don’t appear to be any widely used and approved instruments in physics as there are in the field of chemistry. The National Science Foundation is presently investing much time, effort, and money to build up the quality of undergraduate education in physics. With agencies like the American Physical Society and the American Association of Physics Teachers working toward similar goals, we anticipate the possibility of such a testing instrument being available sometime in the near future.
Teaching assessment  We plan to be more concerted about internal review our own successes in the classroom, both by sharing experiences, seeking advice, and maintaining a tighter accountability among ourselves. This would be supplemented with occasional administration of student evaluations.

Research assessment  We have employed several students during the summer for over 10 years, and keep a record of their names and research projects, as well as publications on which their names appear and their conference presentations. A database such as this can serve to document instruction beyond the classroom in ways that train and prepare students for graduate school and career in the physical sciences. We would like to be able to assess the impact of research activity in tangible ways, perhaps by tracking students after Westmont and querying them from time to time.

D. Qualitative and Quantitative Assessment Measures

Current activities

E. The Physics Department and Student Learning Outcomes

We plan to assess the ways our department is addressing each of the following student learning outcomes adopted by Westmont College. Each standard would be considered in light of our department’s strengths and weaknesses as a physical science department, with an eye toward how we can contributed uniquely to the fabric of the Westmont College community, both for the sake of our majors and for those outside the department.

1. Christian Orientation Standard
2. Critical Interdisciplinary Thinking Standard
3. Diversity Standard
4. Active Societal and Intellectual Engagement Standard
5. Written and Oral Communication Standard
6. Research and Technology Standard

F. Some Specific Department Goals

Astronomy  We are currently working toward the goal of building up the astronomy component of our program. We feel this goal sits squarely in the liberal arts tradition and represents an opportunity for Westmont College to lead the Christian Colleges in astronomy course and research opportunities. Toward this end, we are currently in the process of writing a proposal to the W.M. Keck Foundation to replace our current 16” Newtonian Cassegrain telescope with a 24” research grade instrument. We plan to use the new instrument to expand the presence of astronomy instruction inside and outside the major, and to conduct publishable research with students.

ABET accreditation  A large number of our incoming students desire to study engineering, and at present we offer a 3/2 program, offering them 3 years of training at Westmont, to be followed up by an additional 2 at a school with an ABET accredited engineering program. A possible goal of ours is to seek ABET accreditation, though the
number of units in the required major would most probably make this unfeasible at Westmont.

**Recruiting** We have a plan to put more effort into recruiting in a systematic fashion, including phone calls to prospective students, better tracking of preview days students, etc.

**Internships** Place a larger emphasis on some sort of research or internship experience for all students in our program. We plan to do a better job at polling them to find interest, and encouraging and assisting them in this venture.

**Exit exam** We are looking into the possibility of forming some sort of exit exam for all our seniors, perhaps in the form of an oral exam to be administered by the three full time faculty members. We’re talking perhaps 12 students/year, and so we would need to think carefully about how we can schedule this appropriately.

**Social activities** In order to engage our students more personally, we plan to increase the opportunities for social interaction between departmental students and faculty. This year we are holding occasional Friday afternoon pizza socials about three times a semester. We usually hold a fall barbeque (which we have done most years) to welcome first year students (even though they don’t tend to show up as much as the upper class students) and welcome back returning students. We are seeking ways to increase the success of this event. We also hold a Spring Superbowl party for majors and non-majors alike, which has met with great success and has been a long standing tradition.

**Comparison with other programs** We would like to visit some local colleges and universities, meet their departments, and learn what “works” at other places that we might want to pursue. There is also a lot of available research through agencies such as the American Institute of Physics (AIP) and the American Association of Physics Teachers (AAPT) which regularly publish

**External review** Our department has not had an external review for at 15+ years. While we recognize the significant cost to the college in commissioning such reviews, we also recognize the inherent value of such an undertaking. We hope at some point in the near future to secure funds to organize an external review for purposes of outside assessment of our program, and to solicit suggestions for improvement. While we feel that there is a lot of good constructive activity happening in our department, nevertheless a fresh set of outside eyes trained in the operation of successful physics departments would prove incredibly valuable to us, especially as we look forward to moving in the new academic building in the next several years.