Physics Department Assessment Plan

August 20, 2008

Common Core Learning Objectives (Shared By All Sequences)		
Common Core Introductory Level (PHY 107, 110, 110, 112)		
The learning objective is:	**The assessment tools to be used are:**	**Accomplishment of this objective will be judged by and in:**
Basic understanding of physical laws	Exams, online exercises, other assignments, pre/post tests	Successful completion, with 'C' or better, of PHY 110,111, and 112.
Become comfortable and competent with required tools: math, computer and experimental analysis		
Math (calculus and vector analysis)	Exams and other assignments	Successful completion of pre-and co-requisite math courses (MAT 145, 146, 147) and competent use of those methods in physics courses.
Computer analysis (elementary programming and graphical visualization of data)	Computer assignments in physics courses. Assignments and exams in ITK 165 programming course (highly recommended for all sequences)	Successful completion of programming assignments in PHY 107 -112. Successful completion of ITK165 for those who take it.
Experimental analysis (elementary measurement techniques)	Reports of basic lab assignments in physics courses.	Successful completion of the laboratory component of PHY 110, 111, and 112.
Begin to be able to model and solve real-world problems.	Qualitative problems (exams, quizzes, online exercises) focused on translating problems into physics models. Integrative problems covering several aspects of real-world physics. Out-of-class assignments and projects in some classes. Initiation of research experiences for some students.	Successful solution of qualitative and integrative problems in PHY 110, 111, 112. Progress on research projects for those students participating in research.
Begin to be able to communicate methods and results.	Written lab and computer project reports and homework writing assignments.	Successful performance on PHY 107 writing assignments and lab and computer project reports in PHY 110, 111, and 112.

Common Core Intermediate Level (PHY 213, 220, 240, 270, 284)		
Acquire an understanding of physical laws at the next deeper level, further strengthening physical intuition.	More sophisticated homework problems, exams, and other assignments	Successful completion of PHY 217, 220, 240, 270, 284.
Deepen skills with tools: math, computer and experimental analysis.		
Math (vector calculus, linear algebra, elementary differential equations)	Homework problems involving proofs and/or rigorous derivations, exams, and other assignments	Successful completion of MAT 175, PHY 217, and MAT 340 and competent use of those methods in physics courses.
Computer analysis (more sophisticated numerical methods, symbolic computing, 2-D visualization)	Computer projects involving analysis and solution of physics problems by numerical methods.	Successful solution of computer assignments in physics courses and in research projects.
Experimental analysis (error analysis, more sophisticated measurement techniques)	Experiments and lab reports	Successful completion of PHY 270, in which assessment mainly involves formal lab reports.
Sharpen modeling and approximation skills and the ability to use symmetry as a tool for understanding and problem solving.	Homework problems requiring these skills, exams, and other assignments	Successful completion of PHY 217, 220, 240, 270, 284. Performance on research projects for those involved in them.
Sharpen communication skills	Explanatory writing in homework problems, lab reports and computer project reports. Oral and poster presentations in some classes and for research experience participants.	Competent writing of lab reports and other written reports in PHY 217, 220, 240, 270, 284. Giving quality presentations (oral or poster) for in-class assignments or for research. Research presentations at regional undergraduate physics conferences, for research participants.

Advanced Learning Objectives for ***Computer Physics*** Sequence		
Broaden and deepen understanding of physical laws at the advanced undergraduate level with a focus on computational methods and simulation.	Emphasis shifts toward detailed and more complex homework problems, but exams and other assignments are still used.	Successful completion of 300 level physics courses and computational-specific courses PHY 318 and 388.
Deepen skills with tools: *math* (partial differential equations, Fourier analysis, eigenanalysis), *computer analysis* (simulation methods, symbolic computing, 3-D and stereo visualization), and *data analysis*.	Primarily advanced problem solving and computer projects. Exams.	Successful completion of problems and projects in 300 level classes including PHY 318, 388 and advanced elective computer physics (e.g. 380.01, 380.03), math, and computer courses and competent application of those methods in the solution of physics problems. Successful completion of advanced special projects for courses or for computational/simulation research.
Sharpen computational modeling and physical system simulation skills	Homework problems and computer projects requiring (1) modeling of reality, (2) development of a solution methodology, and (3) using that methodology to solve the problem.	Successful completion of ITK 254 and physics course assignments or projects designed to model and simulate a particular physical system in advanced computer physics courses or in computational/simulational research projects.
Sharpen communication skills	Computational assignment write-ups, in-class presentations, research presentations.	Generation of quality write-ups and in-class presentations for computational assignments in PHY 318 and 388. Students involved in research projects should present their results at the highest appropriate venue (local, regional, national/international conferences).
Develop research experience with capstone course	Formal report, in-house presentation, external presentation if possible.	Large-scale computational research project in PHY 390.