

**Applied Science Accreditation Commission
Accreditation Board for Engineering and Technology
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**Program Self-Study Report
for Review of the Idaho State University
Health Physics Masters of Science Program
Based upon the 2002-2003 Criteria for Accrediting Applied Science
Programs Effective During the 2002-2003 Accreditation Cycle**

Submitted by
Idaho State University
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to the
Applied Science Accreditation Commission

TABLE OF CONTENTS - MS

1. BACKGROUND INFORMATION 1

 Background 1

 University Role and Mission 1

 Health Physics Program Background 2

 Health Physics Program’s Role and Mission 2

 1. Degree Titles 3

 2. Program Modes 3

 3. Actions to Correct Previous Shortcomings 4

2. ACCREDITATION SUMMARY 5

 1. Students 5

 1. Student Trends 5

 2. Acceptance and Placement of Graduate Students 6

 3. Acceptance and Placement of Transfer Students - Classifications of Graduate Students Degree-seeking Students 9

 4. Program Requirements 11

 5. Institution Evaluates, Advises, and Monitors Students and Assures that all Students Meet All Program Requirements 12

 2. Program Goals and Educational Objectives 14

 1. Overview 14

 Figure One 15

 2. Program Educational Objectives 16

 3. Program Constituency 16

 4. Establishment and Continuous Development of Program Objectives ... 17

 5. Assessment of Achieving Programmatic Objectives; a System of Ongoing Evaluation that Considers the Level of Achievement of Programmatic Objectives 19

 Table Two 20

 6. Examples and Documentation that this Process is Working and Producing the Desired Results 21

 1. Modification of Nuclear Instrumentation Lab 21

 2. Addition of Elective Courses 21

 3. Modification of Statistics Requirements 21

 4. Inclusion of Technical Writing 21

 Table Three 22

 Action Items for Next Assessment Cycle 23

 3. Program Outcomes and Assessment 24

 Table Three 25

 4. Professional Component and Program Criteria 26

 1. Health Program Criteria 26

	Table Four	27
	Table Five	28
5.	Faculty	29
6.	Facilities	31
	1. University Library	33
	Table Six	34
7.	Institutional Support and Financial Resources	37
8.	Program Criteria	37
9.	List of Attachments	38
	Attachment One - Forms from Files	39
	Attachment Two - Alumni Employers' Addresses	43
	Attachment Three - List of Student's Published Papers	45
	Attachment Four - HP Program Report 1999	49
	Attachment Five - ISU HPP Outcomes Assessment	50
	Attachment Six - Minutes of Advisory Committee Meeting	68
	Attachment Seven - ISU Undergraduate Catalog Course Descriptions	71
	Attachment Eight - Faculty Curriculum Vitae	73
	Attachment Nine - List of Grant and Contract Awards	83
10.	List of AC2001 Requested and Optional Tables	84
	Requested Tables	
	Table I-1A - BS	85
	Table I-1B - MS	86
	Table I-2 - Course and Section Size Summary	87
	Table I-3 - Faculty Workload Summary	88
	Table I-4 - Faculty Analysis	91
	Table I-5 - Support Expenditures for HP Program	92
	Optional Tables	
	Table II-1 - Faculty and Student Count for Institution	93
	Table II-4 - Supporting Academic Departments	94
	Table II-5 - Personnel and Students for HP Program	95
	Table II-6 - Faculty Salary for Entire Institution	96

I. BACKGROUND INFORMATION

Background

Idaho State University has served the citizens of the state since 1901 when the institution was first established as the Academy of Idaho. Renamed the Idaho Technical Institute in 1915 and reorganized as the Southern Branch of the University of Idaho in 1927, it was established as Idaho State College in 1947. By action of the 37th Idaho Legislature, the institution became Idaho State University on July 1, 1963.

Bachelor's and master's degrees in a variety of fields are awarded by the College of Arts and Sciences, College of Business, College of Education, College of Engineering, Kasiska College of Health Professions, College of Pharmacy, and the Graduate School. Terminal degrees offered at ISU include Master of Business Administration, master of Fine Arts, Doctor of Philosophy, Doctor of Arts, Doctor of Education and Doctor of Pharmacy. Certificate programs of varying lengths and an Associate of Applied Science degree are included in the curricula of the College of Technology.

University Role and Mission

Idaho State University is a broad-based regional public doctoral university, providing a broad range of educational services to a culturally diverse population of students and to the state. The university is Idaho's center for education in the health professions. Idaho State University offers a wide array of academic programs: in the health professions and related biological and physical sciences and educator preparation (its areas of primary emphasis); in business and engineering education and technical training (its areas of continuing emphasis); and in the liberal arts. It is committed to maintaining a strong liberal arts and sciences program as the basis of other academic disciplines and as an independent, multifaceted field of inquiry. The university offers graduate programs in a number of fields and is a national center for the Doctor of Arts degree. Its College of Technology provides high-quality education and training in response to the needs of students and private industry. Idaho State University is dedicated to excellence in teaching. The university engages in sustained and significant research as an essential component of its academic and public service programs. It views public service as an integral part of its mission. Idaho State University is committed to providing accessible, high quality education to the diverse citizenry of its region and state, and delivers comprehensive and creative outreach programs using the latest available technology. The university works in collaboration with other state and regional post-secondary institutions in serving its constituencies. The university offers a range of academic and support services to help all students succeed. It encourages student and public participation in its cultural, recreational and athletic programs, and welcomes the continuing involvement of alumni and other friends in its endeavors.

ISU Health Physics M.S. Program Self-Study Report

Health Physics Program Background:

The ISU Health Physics Program was established during 1989 with the creation of the emphasis in Health Physics within the Baccalaureate of Science in Physics Degree. This was followed with establishment of the Health Physics Master's program during 1993. Since its inception nearly 100 scientist have earned their degrees from this program. The Health Physics program also participates in the ISU Engineering and Applied Science Ph.D. program that is jointly administered by the ISU College of Engineering and Department of Physics.

The program is currently supported by three senior faculty. Two of these three are Certified Health Physicists, the third a current member of the National Council of Radiation Protection (NCRP), represents over 25 years of exceptional professional experience, 10 of these with the Department of Energy, the balance in academia and is a world renown expert on the subject of environmental radioactivity. The university has previously committed to a fourth tenure track junior faculty position. Although this position has been temporarily frozen due to a extenuating state budget crisis, there is every indication that the university will resume its commitment to this new position as state economic conditions improve.

The Health Physics Program's philosophy and mission are based upon the University's commitment to provide high-quality teaching, research, and service to benefit the citizens of Idaho. Public disclosures of the program, its mission, goals, and objectives are provided in the University General Catalog, in various departmental, college, and university publications and brochures, and on our computer world wide web sites:

Idaho State University	http:// www.isu.edu
College of Arts and Sciences	http://www.isu.edu/departments/artsci
Department of Physics and Health Physics Program	http://www.physics.isu.edu

This self-study describes the Health Physics M.S. Program at Idaho State University that awards Master of Science degrees in physics with an emphasis in health physics. This self-study is based upon the 2002-2003 Criteria for Accrediting Applied Science Programs effective during the 2002-2003 Accreditation Cycle. Supplemental materials, mainly supporting documentation, will be available to the ASAC-ABET review team during their 2002 accreditation visit.

Health Physics Program's Role and Mission:

Our mission is educating students so they can achieve the highest standards of the health physics profession, and solving important problems for the people and industries of Idaho and the Nation through teaching, research, and service.

1. Degree Titles

Awarded Degree

Master of Science
Physics

Indication on Transcript

M.S. Physics
Health Physics Emphasis

2. Program Modes

The university operates on a semester system for course instruction. The fall semester begins in August and ends in December. The spring semester begins in January and ends in May. Each semester consists of 15 weeks of instruction and one week of final examinations. The university also offers several accelerated pace summer school classes where students may earn full semester credits for courses taken during the summer.

Discipline specific core classes for the Graduate Health Physics Program at Idaho State are offered exclusively during the fall and spring semester. Graduate students in the Health Physics Program may earn credits for special projects conducted during the summer session or in other academic areas relevant to their holistic education.

Discipline specific classes are conducted during the day and evening in two modes:

- I. Traditional - students and instructor present at the same facility
- II. Closed-circuit two-way live broadcast using either microwave communication or broadband Internet II technology serving constituents in Idaho Falls or at the Idaho National Engineering and Environmental Laboratory (INEEL).

The mode II normal program practice is for instructors to broadcast the class transmission from Pocatello to Idaho Falls roughly 50% of the time and from Idaho Falls to Pocatello roughly 50% of the time during each semester. This approach is advocated by the College of Arts and Sciences Outreach Office which funds all travel expenses and additionally compensates instructors for the extra logistical responsibilities imposed by this type of arrangement. The exchange of hard copy materials between instructors and students is accomplished by courier, fax, e-mail, and normal postage as appropriate for each circumstance.

This practice is rarely changed unless dictated by externally imposed constraints such as scheduling demands or security restrictions. As examples; the instructor may be required to teach a traditional class back to back with a closed-circuit two-way broadcast in which the 50-minute plus transient time restricts broadcast to just one location, or the course is offered to employees in a secured-restricted facility at the INEEL which would prohibit open access by instructors to the facility due to security considerations. Due to capital equipment expenses,

laboratory classes are offered exclusively on the Pocatello campus.

Full time graduate students have completed their M.S. degree within two years. This is highly dependent on a student's individual initiative relevant to completion of a degree. All required course work, by design, may be completed within two years for those students who have adequate undergraduate preparation. There are a few instances where completion of a degree requires substantially longer than the two year expected time. The primary reasons for longer times to graduation are:

Inadequate academic preparation of incoming graduate students.

The rigor of the health physics M.S. curriculum within the department of physics requires students to complete a minimum of 30 credits, therefore, even students with appropriate academic preparation choose to tailor their course load in such a way that class completion stretches beyond two years.

Part time students who must work to finance their education often find it difficult or impossible to succeed with a full semester course load, and further, those whose day time schedules include full time work often find the sequential scheduling of classes with prerequisites difficult, and because of their schedule conflicts must extend this course work beyond two years.

The academic retooling of students who transfer into our program from other disciplines or from other institutions often subjects students to longer completion times for a M.S. degree associated with curriculum mis-match. These students often end up with extra, non-applicable credits or lower division course credits that cannot be used toward their M.S. degree.

Protracted research projects sometimes cause the extension of program completion beyond two years.

3. Actions to Correct Previous Shortcomings

Not Applicable

II. ACCREDITATION SUMMARY

1. Students

Consistent with Criterion 1 of AC 2001, the quality and performance of students and graduates of the ISU Health Physics Program are a fundamental consideration of the ISU Outcomes Assessment Process. The following paragraphs detail the processes by which the university considers acceptance of both traditional and transfer students, validates courses taken for credit elsewhere, and assures that all students meet all program requirements. The ISU specific approach to each of these sub-requirements are considered in this section as subtitled.

Criterion 1 also requires that the institution evaluates, advises, and monitors students to determine its success in meeting programmatic objectives. The section additionally discusses the schedule for academic advising and implicit student monitoring. Other aspects of the very detailed student evaluation scheme are highlighted within other sections, but mainly within the section entitled Program Goals and Educational Objectives as student and alumni evaluation processes are central to understanding and assessing the accomplishment of programmatic outcomes and consequently programmatic goals.

A. Student Trends

Graduate students are admitted to the Health Physics program in the following ways:

- A) Idaho State University Health Physics Program Baccalaureate Students continuing their education in the ISU HP graduate program.
- B) Change-of-major students who enter the health physics program from other Idaho State University programs. This category includes individuals working on dual majors.
- C) Students admitted from other colleges of universities with Baccalaureate degrees. This frequently includes those with baccalaureate degrees from biology, engineering, or non-physical science programs such as those students who have studied radiographic sciences degrees or even in one case theology. This often includes students from non-American universities.

B. Acceptance and Placement Graduate Students

Admission Requirements For Degree-Seeking Students

Degree-seeking students must meet the following requirements:

11. A baccalaureate degree from a college or university accredited in the United States or its equivalent from a school in another country.
12. An earned grade point average of at least 3.0 or higher for all upper division credits taken at the undergraduate level, regardless of the institution at which the credits were earned, for those seeking a master's degree. In the case of those students who have not completed the baccalaureate degree, the grade point average shall be recalculated on all upper division credits once the bachelor's degree is completed.
13. Degree-seeking applicants must submit official scores on the aptitude portion of the Graduate Record Examination (GRE).
14. It is possible within the Department of Physics to admit degree-seeking students to Conditional status without submission of test scores. However, in such cases, the test must be taken in the first semester or summer session of enrollment. Applicants who have achieved at least the 35th percentile in one of the aptitude sections of the GRE (Verbal, Quantitative, Analytical), or a raw score of at least 38 on the MAT are eligible for admission as degree-seeking students if the earned grade point average for all upper division credits taken at the undergraduate level is 2.0 or higher.
15. GRE/GMAT/MAT scores are used for other purposes in addition to admission. The Physics Departments also use these scores as part of the criteria for awarding graduate assistantships, fellowships, or scholarships.
16. **NOTE:** Students admitted to conditional status may not be eligible for federal financial aid.
17. Approval by the Physics Department.
18. Approval by the Dean of Graduate Studies.

Admission Requirements For Non-Degree-Seeking Students

Non-degree-seeking students who apply for admission must meet the following conditions:

19. A baccalaureate degree from a college or university accredited in the United States or its equivalent from a school in another country.
20. Proof of graduation must be shown by evidence of a degree. Students must submit one of the following: copy of an unofficial transcript showing proof of degree, copy of the diploma, copy of Idaho Teacher Certification, or a letter from an appropriate college or university official.
21. A properly completed application form which includes signing an agreement that

- the applicant will provide evidence that he/she holds a baccalaureate degree.
22. International students do not qualify for Unclassified status.

Admission Requirements for Professional Development Students (597 Courses)

The Graduate School recognizes the need for individuals in their particular occupations to improve their professional capabilities by taking particular courses which would provide that service. Many of these students, particularly public school teachers, are best served if these courses are offered for graduate credit. In some cases the courses are workshops or short courses which can be taken in a short time period. These types of courses are "advanced" with respect to the students who enroll but are not courses which a particular discipline offers to a student with the goal of earning an advanced degree. Therefore, professional development courses are offered by many departments to meet the perceived need and are treated differently in the following respects:

23. Students may enroll in professional development courses offered under the 597 number without the necessity of being admitted to Graduate Studies. However, they must hold a baccalaureate degree from an accredited institution at the time they enter the class or receive special permission from the Dean of Graduate Studies if they are last semester seniors.
24. The credits earned will not count toward an advanced degree nor may they be petitioned to count at a later date.
25. There is no limit to the number of 597 credits which a student may earn.
26. All instructors of 597 courses must have an advanced degree.
27. Students must certify for each 597 course for which they enroll that they possess a baccalaureate degree and agree to the conditions by which they are permitted to register for the course.
28. Students who have not been admitted previously to Graduate Studies at Idaho State University will be classified as Unclassified, Master's, Professional Development students. They will not be permitted to register for any graduate level courses except 597 courses unless they apply for admission and are accepted into Graduate Studies.
29. Students who have been admitted into Graduate Studies are permitted to take 597 courses but must register for these courses by signing the special registration form in addition to the regular procedures for registration.
30. Departments shall determine if and when professional development courses are to be offered with their prefix.

Admission of International Students

ISU Health Physics M.S. Program Self-Study Report

Applications for admission to graduate studies will not be processed in the Graduate School until cleared by the International Admissions Clerk in the Office of Admissions. Applications will not be processed until the application fee has been received.

In addition to the admission requirements listed previously, international students must meet the following conditions:

31. International students must submit a financial statement to the graduate School verifying that they will be able to support themselves financially for one year while attending Idaho State University. This must consist of a statement or letter from a bank indicating that funds are available and accessible. The amount of money available to the student must be listed on the financial statement. A graduate assistantship or fellowship awarded by a department or college may be used as part of this amount.
32. International students who have not graduated from an accredited college or university in the United States and whose native language is not English, normally must achieve satisfactory scores on the Test of English as a Foreign Language (TOEFL). Specifically, students must achieve a total score of 550 and a score of 55 on Section I (Listening Comprehension). **PHOTOCOPIES OF TOEFL SCORES WILL NOT BE ACCEPTED.**
33. International students may not enter the United States for graduate study without a U.S. Immigration (I-20) form. This form will be supplied by the International Admissions Clerk in the Office of Admissions after a department or college chooses to accept a student and items 1 and 2 above are met in addition to the admission requirements listed previously. International students are urged to remain in their own countries until they receive notice of acceptance.
34. International students transferring from a school within the United States must be "IN STATUS" with Immigration and Naturalization Services to be issued an I-20 form from ISU. A transfer form will be sent after the application has been received, to be completed as verification of acceptable immigration status.

Admission of Last-Semester Seniors

Seniors in residence at ISU, with permission of the Graduate School, may register for no more than 6 graduate credits during the semester or summer session in which they will complete the work for a bachelor's degree at ISU. This option is reserved for outstanding seniors who are seriously considering attending ISU for graduate studies. The option must be approved not only by the Office of Graduate Studies but also by the student's advisor, the department chairperson, and the course instructor. **ONLY COURSES NUMBERED 500-599 MAY BE TAKEN WITH THIS OPTION.** If a senior admitted to graduate study under this provision fails to complete graduate requirements for a bachelor's degree, all graduate credits earned revert to undergraduate credit. The student's load, including both graduate and undergraduate credit, may not exceed 16 credits, or 9 credits in the case of summer school. A senior selecting this option must file an Application for Admission with the Graduate School when he/she requests permission to take

graduate level courses. Application deadlines for admission of last-semester seniors are the same as those for degree-seeking graduate students.

C. Acceptance and Placement of Transfer Students - Classifications of Graduate Students
Degree-seeking Students

Classified Status

Graduates of accredited institutions who have earned grade point averages of 3.0 or higher for all upper division credits taken at the undergraduate level, regardless of the institution at which the credits were earned, are eligible, upon submission of official GRE scores, to be admitted to classified status in graduate masters programs.

Students who achieve at least the 35th percentile in one of the aptitude sections (Verbal, Quantitative, Analytical) may be eligible for this classification if the earned grade point average for all upper division credits taken at the undergraduate level is 2.0 or higher.

Conditional Status

A department/college may, at its discretion, admit students in a degree program on a trial basis to Conditional status to ascertain their ability to do graduate work within a particular curriculum. Students admitted to Conditional status are those who do not have acceptable undergraduate grade point averages and/or GRE scores for admission to the university.

Conditional status also may be used by a department for students whose credentials do not meet specific departmental requirements. Conditional students must adhere to regulations established by the Graduate Council.

Change from Conditional to Classified Status

The following criteria must be met by the student before the Conditional status can be changed to Classified:

35. The student must complete at least nine credits and maintain a 3.0 GPA or better;
36. If the GRE was not taken by the student at the time of admission to Conditional status, the student must take the GRE during the first semester of enrollment.

Upon completion of the above two criteria, a request to change the student's status to Classified may be submitted to the Dean of Graduate Studies. The following steps must be followed to accomplish this change:

37. At any time after meeting of the above criteria a student may initiate an Approval for Change of Student Status in the Graduate School. However, the department/college may also initiate the change and should do so by written request when the student has met the required criteria. The department/college

ISU Health Physics M.S. Program Self-Study Report

also has the option of requesting the change to Classified status before the student has completed nine credits.

38. If the student's credentials at the time of the request for change in status to Classified status reveal a GPA of less than 3.0 for all upper division credits taken at the undergraduate level, regardless of the institution at which the credits were earned, and GRE scores lower than the 35th percentile for each of the aptitude sections (Verbal, Quantitative, Analytical), then admission to Classified status must be approved by the Graduate Council.
39. The change from Conditional to Classified status must be approved by the Dean of Graduate Studies.

The Physics Department may request that students be shifted to Classified status by written request. If a student admitted to Conditional status fails to meet the conditions for admission stated on the Approval for Admission form, the student will be dismissed from the program.

Non-degree Seeking Students

Unclassified Status

Applicants holding a bachelor's degree who desire to take courses for graduate credit for personal or professional enrichment but who do not want to pursue a graduate degree are eligible to apply for admission to Unclassified (non-degree-seeking) status. Courses may be taken only in those departments that have approved a student's Unclassified admission. Students who are admitted to Unclassified status are allowed to register for a maximum of 7 credits per semester.

If the student wishes to pursue a graduate degree within the university, the student must

- (1) notify in writing the department/college of his/her intention to seek admission to Classified status and
- (2) apply for change of student status in the Graduate School. The student must also meet application and admission requirements of degree-seeking students described previously or below.

At the option of the departments, students may petition the Dean of Graduate Studies to transfer course work taken while under Unclassified status to a degree program. The total number of such credits transferred shall not be more than 30% of the credits of the program of work required of each student for the degree. International students do not qualify for Unclassified status.

D. Program Requirements

The Health Physics Emphasis of the M.S. in Physics is a thesis program that will prepare students for radiation protection careers leading to upper technical and management levels in industry, universities, medicine, national laboratories, government, nuclear power and radioactive waste management.

The minimum admission requirements are admission to the Graduate School and a baccalaureate degree as approved by the department. The basic program minimum requirements are 30 credits of which 15 credits must be at the 600 course level. Six of the fifteen 600 level credits may be thesis. The normal core program is listed below. Students who are prepared with some education and experience in Health Physics will likely not need all of the elective health physics courses. Therefore, the program of the student will be determined in consultation with the student's advisor and committee and can include electives to meet their needs. An oral examination in defense of the thesis is required.

<u>Required Courses</u>	<u>Credit</u>
PHYS 601 - Quantitative Methods in Physics	3
PHYS 605 - Rad. Enviro. Mon. & Surveillance	3
PHYS 610 - Radiation Regulations	3
PHYS 650 - Thesis	6

Electives - That are required if not taken at the undergraduate level.

PHYS 516 - Intro to Nuclear Measurements	3
PHYS 531 - Radiation Physics I	3
PHYS 532 - Radiation Physics II	3
PHYS 533 - External Dosimetry	3
PHYS 534 - Internal Dosimetry	3
BIOS 507 - Radiation Biology	3

<u>Other Electives</u>	<u>Credit</u>
<i>Health Physics Rotating Electives Courses*</i>	
PHYS 511 - Accelerator Health Physics	3
PHYS 512- Environmental Health Physics	3
PHYS 513 - Fundamentals of Industrial Hygiene	3
PHYS 517 - Industrial Ventilation & Aerosol Physics	3
PHYS 518 - Non-ionizing Radiation Protection	3
PHYS 519 - Radiological Emergency Planning	3
PHYS 520 - Reactor Health Physics	3

ISU Health Physics M.S. Program Self-Study Report

Other Electives

PHYS 555 - Topics in Health Physics I	2
PHYS 556 - Topics in Health Physics II	2
PHYS 592 - Colloquium in Physics (may be repeated)	6
PHYS 509 - Intro Nuclear Physics	3
PHYS 599 - Medical Applications	3
NS&E 571- Intro to Nuclear Engineering	3
PHYS 501 - Modern Physics	3
PHYS 503 - Advanced Modern Physics	3
PHYS 504 - Advanced Modern Physics	3
PHYS 597 - ABHP Certification	**
PHYS 590 - Advanced Radiation Dosimetry	3

Many other graduate credits may be taken to fulfill the 15 credit elective requirements of the M.S. program. Selection of these is highly dependent on the students research project, advice from the students major advisor, and students previous academic preparation. Under no circumstances are lower division credits allowed to be used toward an MS degree. However, to improve inadequate preparation some graduate students are required to complete lower division undergraduate courses even if they do not apply toward their MS degree.

* One of these courses is offered each semester in a continuous rotation. Other electives are offered at other frequencies or upon demand.

** This is a continuing education course which students are encouraged to take, however, credits from this class are not applicable toward the MS degree.

E. The Institution Evaluates, Advises, and Monitors Students and Assures that all Students Meet All Program Requirements

We assure that all students meet all program requirements in the following ways:

(1) The Physics Department/ Health Physics Program maintains records of the course work attempted and accomplished by each student, significant accomplishments achieved by the student during their tenure at Idaho State University and any other details about the student that faculty deem important. This file contains unofficial grade transcripts as maintained on the university's electronic records system, curricular advising sheets, and course inventory work sheets completed during semi-annual faculty/student advising meetings by the program director or the student's major professor. Attachment One provides example copies of the type of forms maintained in our student files. Thus, a track record of courses completed, and planned, is maintained for reference. The university uses a modern, web-based pre-registration system that is accessed by students as the final step in course selection. Students are provided guidance on course selection and informed of specific graduation requirements; however, to maintain an atmosphere of academic freedom to the extent possible, the responsibility of selecting the courses taken each semester is ultimately left to the student.

ISU Health Physics M.S. Program Self-Study Report

The primary tool used to evaluate student progress in our Health Physics Program is the application of the traditional letter assignment (A through F) combined with a plus-minus grade system for performance in each class attempted by the student. The addition of the plus-minus system to the traditional letter grade occurred about two years ago. At the time of the introduction of the plus- minus system, the students enrolled at ISU were given the option of including that system on there transcript. Students enrolling after the introduction of the system uniformly have the system applied to the grades of their transcript. Grades are assigned at the completion of each semester based upon clearly defined course objectives outlined in class syllabi and a predetermined grade scale which is developed by each instructor of record for each class. University policies for student withdrawal procedures, incomplete grades, or repeating a course to replace a grade are published in the ISU Graduate Catalog.

All thesis credits and some research courses may be graded on a satisfactory (S) or unsatisfactory (U) basis. Also *in progress* (IP) grades may be given to students who have initiated but not completed thesis project research work No graduate courses are offered on a Pass/No-Pass basis.

Midterm grades are available at a date posted within the published university time schedule of classes (printed each semester) for all graduate students receiving a C or less in any particular class. Faculty academic advisors are notified of these situations shortly after the grade postings. Graduate health physics students in these circumstances are formally encouraged to meet with their academic advisor to discuss any potential problems and solutions to those problems that may be available. An example of the typical letter sent to students in this circumstance may be found in Attachment One.

At the end of each semester, graduate students who do not achieve the cumulative GPA of 3.0 are automatically placed on academic probation for the next semester of enrollment and are referred to the appropriate academic dean for advising by the staff of the Registrar's Office. Probationary status serves notice that if a student's cumulative record at the end of the next semester in unsatisfactory, he or she will be disqualified and ineligible to continue at Idaho State University. To register at the university after being academically disqualified, students must be reinstated according to university policy published in the ISU Graduate Catalog.

At the beginning of a student's final semester of their M.S. program, (a point in time when both the student and the student's major professor agree that their thesis is at or sufficiently close to final form that defense of the thesis is likely during the semester) an application for graduation is filed with the Registrar's Office. This application prompts an audit of the students transcript by the staff of the Graduate School Office to verify completion of the graduate requirements and the Students approved plan of study. The completion of the Students M.S. thesis with formal approval from all members of the examining committee is also considered.

The result of this audit, if the student has successfully completed all required course work, is that the student is recommended for the degree by the Dean of the Graduate School.

2. PROGRAM GOALS AND EDUCATIONAL OBJECTIVES

According to Criterion 2 of AC 2001 an institution seeking accreditation must have in place:

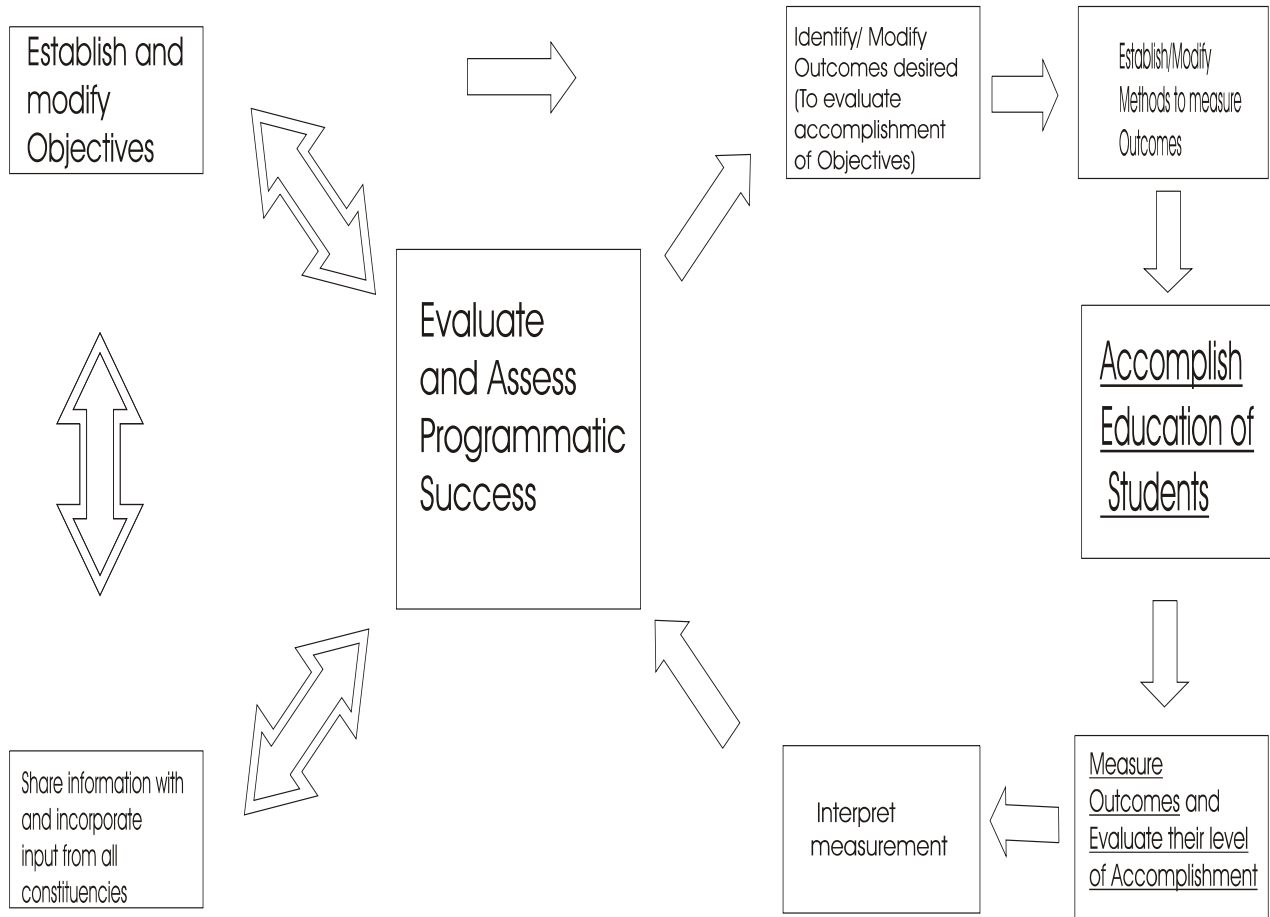
- (a) Detailed published educational objectives that are consistent with the mission of the institution and these criteria**
- (b) A process based on the needs of the program's various constituencies in which the objectives are determined and periodically evaluated**
- (c) A curriculum and process that ensure the achievement of these objectives**
- (d) A system of ongoing evaluation that demonstrates achievement of these objectives and uses the results to improve the effectiveness of the program**

A. Overview

As part of the programmatic commitment to the Outcome Assessment Process, faculty of the ISU Health Physics Program have agreed to meet approximately monthly during the academic school year to assess the current activities of the program, identify key focus areas for development, and plan the implementation of steps to be taken to improve program performance and output consistent with our programmatic objectives. At these meetings, information is documented about how well the educational objectives of the program are serving our constituent groups and how well the objectives are being met. The assessment of programmatic objectives conducted at these meetings is based upon evaluations of an ongoing outcomes assessment process involving class grades, surveys of program alumni, surveys of alumni employers, and student class evaluations. All of these assessment tools themselves are under constant review and revisions to answer the questions arising from this review and continuous improvement/modification process. At least annually, a meeting with the program's advisory committee is conducted where the activities of the monthly faculty assessment meetings are summarized with the intention of soliciting feedback from the committee on the continued efficacy and appropriateness of the program objectives. All information generated, observations developed, and interpretations of the universe in which the health physics program functions are synthesized into a continuous assessment of programmatic objectives. With the direct input of the program's advisory committee, objectives are developed, modified, or deleted with the goal of improving the program and enhancing the efficacy in which it accomplishes its mission. This procedure is consistent with the ABET-2000 concept of feedback loops for program evaluation and assessment. Figure One, provided below, is a diagram depicting the Outcomes Assessment Process committed to by the faculty of the ISU Health Physics Program.

ISU Health Physics M.S. Program Self-Study Report

Figure One, The Idaho State University Health Physics Program's Out-comes Assessment Process.



B. Program Educational Objectives

The educational objectives of the ISU Health Physics program are to produce Health Physicists with

- 1) broad, fundamental technical knowledge,
- 2) written and verbal communication skills
- 3) professional judgement and capability to think critically
- 4) practical experience in solving applied health-physics problems
- 5) the ability to work independently
- 6) a professional ethic

of magnitude sufficient for them to productively and successfully work in a variety of health physics settings.

Idaho State University is a regional public institution, providing a broad range of educational services to a culturally and ethnically diverse population of students. The university is Idaho's center for education of the health professions and supporting sciences; in business and engineering; and in the liberal arts. Health physics, an allied health discipline that draws strongly on the physical sciences, fits perfectly into ISU's role and mission. Idaho State University is dedicated to excellence in teaching and committed to providing accessible, high quality education while fostering the economic growth of the region, and enhancing development of the human resources infrastructure of Idaho.

The stated goals and objectives of the Health Physics program and the program itself are consistent with Idaho State's role as Idaho's lead institution for education in the health professions and related biological and physical sciences. These objectives are also supportive of Idaho State University's mission to offer an array of undergraduate and graduate academic programs with a dedication to excellence in teaching. They are also consistent with the Health Physics Program's mission:

Our mission is educating students so they can achieve the highest standards of the health physics profession, and solving important problems for the people and industries of Idaho and the Nation through teaching, research, and service.

C. Program Constituency

The Constituency of the Health Physics Program currently consists of the following groups:

1. Students
2. Advisory Group Members

3. Alumni

(Alumni are considered in categories based upon their graduation date, this allows us to consider different stages of programmatic development when analyzing data.)

4. Alumni Employers (See Attachment Two)

5. Faculty

The constituency groups described above are consistent with a major goal of Idaho State University which is “to welcome the involvement of alumni and other friends”

Idaho State University’s extended community includes its alumni and other friends-citizens of Idaho and from around the world who maintain an active interest in, and who may wish to support, the development and progress of the university. Idaho State University welcomes their ongoing involvement in its endeavors. The university strives to keep them informed about its activities, and to provide them with opportunities for participation in a range of programs serving the educational needs of the state and region.

D. The Establishment and Continuous Development of Program Objectives

The educational objectives of our Health Physics program have been established and are periodically revised as a collaborative effort between program faculty and the program advisory board. The educational objectives are based upon the perceptions of constituency needs formulated by both the advisory board and faculty after reviewing program history, considering student employment trends, student class evaluations, and interpreting alumni and alumni employer survey information.

Because of this collaborative arrangement and the data considered during the decision making process; alumni, alumni employer and student surveys, grades, etc., our supposition is that there is extensive constituency involvement in this process by which program objectives are determined and assessed.

Before establishing a new course, modifying an existing course description, or changing programmatic requirements in any substantial way, approval of the Idaho State University Curriculum Council must first be obtained. The Curriculum Council is composed of representatives from all major academic groups on campus.

The ISU approach to course development is entirely consistent with several accreditation systems and is influenced by a university-wide outcome assessment system. As taken directly from the Idaho State 2001-2002 Graduate Catalog, page 6:

ISU Health Physics M.S. Program Self-Study Report

Idaho State University is accredited by the Northwest Association of Schools and Colleges. In addition, the university is accredited or approved for specific programs by the following organizations:

*Accreditation Board for Engineering and Technology, Inc.
Accreditation Council for Graduate Medical Education
American Assembly of Collegiate Schools of Business
American Association for Accreditation of Laboratory Animal Care
American Association of Colleges of Nursing
American Association for Health Education
American Association of Medical Assistants
American Association of Museums
American Chemical Society
American Council on Pharmaceutical Education
American Dental Association Commission on Dental Accreditation
American Dietetics Association
American Health Information Management Association
American Psychological Association
American Speech-Language-Hearing Association
Association for Computing Machinery
Association of University Programs in Health Administration
Automotive Standard Excellence
Commission for the Accreditation of Allied Health Education Programs
Commission on Accreditation in Physical Therapy Education
Commission on Collegiate Nursing Education
Computer Science Accreditation Board for Engineering and Technology, Inc.
Council for Education in Public Health
Council for Education of the Deaf
Council for the Accreditation of Counseling and Related Educational Programs
Council on Social Work Education
Farm Service Agency Curriculum Vendor
Federal Aviation Administration
Idaho Board of Nursing
Idaho Bureau of Occupational Licenses
National Accrediting Agency for Clinical Laboratory Sciences
National Association of Radio Telecommunication Engineers
National Association of School Psychologists
National Association of Schools of Music
National Association of State Directors of Teacher Education and Certification
National Council for Accreditation of Teacher Education
Northwest Association of Schools and Colleges
State of Idaho Peace Officers Standards and Training*

E. The Assessment of Achieving Programmatic Objectives; A System of Ongoing Evaluation that Considers the Level of Achievement of Programmatic Objectives

The assessment of programmatic objectives is conducted at monthly faculty meetings and at least annually with meetings of the program faculty and the Program Advisory Board. The assessment of programmatic objectives is based upon evaluations of an ongoing outcomes assessment process. Several different outcomes assessment tools are used as appropriate during the review process. Not all tools are required to be used during each review cycle. The frequency of application of a specific outcomes assessment metric is the decision of the faculty group completing the assessment cycle. The outcome assessment tools used include but are not limited to class grades, surveys of program alumni, surveys of alumni employers, student class evaluations, and cumulative outcome assessment examinations given annually to program seniors. All of these assessment tools are under constant review and revision to answer the questions generated during the review and continuous improvement/modification process. An array of the Outcome Assessment tools is employed, as delineated below in Table Two, to quantitatively evaluate the level of success that has been accomplished while pursuing the objectives.

However, the assessment does not stop after an evaluation is completed. This is a feedback process. Based upon the quantitative evaluation of the outcomes, the institutional approach of the program: the courses offered, course sequence, and course content are revisited. If there is information to justify a modification of the program that would lead to the hypothesis that the change will enhance performance of the objectives, then the program is modified. This internal loop allows for optimization of efforts to accomplish the stated objectives.

Consideration of comments from alumni, alumni employers, and student surveys, faculty perspectives, and Advisory Board perspectives allows for modification of objectives over time so that a program, that is to the maximum extent possible, relevant to the constituency can be maintained.

ISU Health Physics M.S. Program Self-Study Report

Table Two: Outcome Assessment Tools used to evaluate achievement of objectives.

Objective 1: broad, fundamental technical knowledge

Outcome Assessment Tools:

- ✓* Students pass core courses
- * Graduates pass ABHP certification examination
- ✓* Surveys of Program Constituency indicate appropriate knowledge base
- * Advisory Board Curriculum review

Objective 2: Written and verbal communication skills

Outcome Assessment Tools:

- ✓* Students pass applicable communication courses
- ✓* Students laboratory reports
- * M.S. Thesis
- ✓* Professional papers, presentations and posters

Objective 3: Professional judgement and capability to think critically

Outcome Assessment Tools:

- * Performance in classes, problem solving and approaches to “defective problems”, laboratory performance
- * Assessment of M.S. Thesis supervisor
- * Performance in work/research experience as reported by supervisor
- * Surveys of students and alumni, alumni employers

Objective 4: Practical Experience in Solving Applied Health physics Problems

Outcome Assessment Tools:

- * Performance in classes, problem solving, laboratory performance
- * Assessment of M.S. Thesis Project Administrator
- * Performance in work/research experience
- * Surveys of students and alumni, alumni employers

Objective 5: The Ability to Work Independently

Outcome Assessment Tools:

- * Performance in class problem solving exercises and laboratory performance
- * Assessment of M.S. Thesis Project Administrator
- * Performance in work/research experience
- * Surveys of students, alumni, and alumni employers
- * Professional papers, presentations and posters

Objective 6: A Professional Work Ethic

Outcome Assessment Tools:

- * Performance in classes
 - * Performance in work/research experience
 - * Surveys of alumni employers
 - * Assessment of students as observed in letters of recommendation
-

F. Examples and Documentation that this Process is Working and Producing the Desired Results

The Idaho State University Health Physics Program has collected, evaluated, and taken actions based on an “Outcomes Assessment Process” essentially since its inception. The process was partially formalized on behalf of the ISU Physics Department in 1993 with development of an Outcome Assessment Examination. The information considered during these early more informal cycles included student grades, student class evaluations, and Outcome Assessment Examinations administered to students in Physics 456, input from faculty, and input from the program’s Advisory Board. This process was not formalized, but nevertheless based on what are currently referred to as “outcome assessment principles” faculty responsible for the program worked toward continuous programmatic improvement. Remnants of these efforts may be observed in the available data sets for student grades, student class evaluations, and Outcome Assessment Examinations. Attachment Four is an example of a more recent presentation made to the program’s Advisory Board. Actions evolving from this process as examples include:

- 1) Modification of the Nuclear Instrumentation Laboratory from a lower division undergraduate average laboratory experience to a dual level upper division/graduate level experience of great intensity. Because of the comments and advice of the Advisory Board, Students, and Alumni, the ISU Health Physics Program developed this into a class where students receive significant hands on experience in operation, trouble shooting, and application of nuclear detection instrumentation, data analysis, experimental design, and professional writing.
- 2) Addition of an organized set of elective courses offering students exposure to advanced topics in health physics and occupational health and safety.
- 3) Modifications of the statistics requirements from Math 252 to Math 352 or Bios 315 which are more rigorous statistics courses and more beneficial to the graduates.
- 4) Inclusion of more technical writing emphasis in all health physics classes.

Attachment Five of this document (Page 50 through 67) is the Outcomes Assessment report for the ISU Health Physics Program from the period of July 1, 2001 to July 1, 2002. Table Three (next page) summarizes the Objectives Evaluated, the Outcomes Assessment Tools Employed, interpretation of the outcomes assessment data relative to meeting objectives, and specific action items taken with respect to the outcomes, assessment tools and objectives evaluated. This document was presented to the Advisory Board during the June 2002 meeting along with a draft copy of this report. Attachment Six is the formalized minutes from this meeting.

The Current Assessment of the Idaho State University Health Physics Program is that it is a strong program with substantial depth meeting all of its programmatic objectives and fulfilling its mission.

ISU Health Physics M.S. Program Self-Study Report

Table Three: Summary of the 2001-2002 Outcomes Assessment Report; Objectives Evaluated, the Outcomes Assessment Tools Employed, interpretation of the outcomes assessment data relative to meeting objectives, and specific action items taken with respect to the outcomes and objectives evaluated.

Objectives and Outcome Assessment Tools	Results/Interpretation	Actions
<u>Objective 1: broad, fundamental technical knowledge</u>		
Outcome Assessment Tools:		
* Students pass core courses	Satisfactory	No New Action
* Students perform well on outcome assessment examination	Satisfactory	No New Action
* Surveys of Program Constituency indicate appropriate knowledge base	Satisfactory	Further evaluation of “computer confidence” Required (See report Attachment Five)
<u>Objective 2: Written and verbal communication skills</u>		
Outcome Assessment Tools:		
* Students pass applicable communication courses	Satisfactory	No New Action
* Students laboratory reports	Satisfactory	No New Action
* Professional papers, presentations and posters	Satisfactory	No New Action
<u>Objective 3: Professional judgement and capability to think critically</u>		
Outcome Assessment Tools:		
* Performance in classes, problem solving and approaches to “defective problems”, laboratory performance	Satisfactory	No New Action
* Surveys of students and alumni, alumni employers	Satisfactory	No New Action
<u>Objective 4: Practical Experience in Solving Applied Health physics Problems</u>		
Outcome Assessment Tools:		
* Performance in work experience	Satisfactory	No New Action
* Surveys of students and alumni, alumni employers	Satisfactory	No New Action
<u>Objective 5: The Ability to Work Independently</u>		
Outcome Assessment Tools:		
* Surveys of students, alumni, and alumni employers	Satisfactory	No New Action
* Professional papers, presentations and posters	Satisfactory	No New Action
<u>Objective 6: A Professional Work Ethic</u>		
Outcome Assessment Tools:		(Outcome assessment tool is weak - requires improvement see report -Attachment Five)
* Performance in classes	Satisfactory	No New Action
* Performance in work experience	Satisfactory	No New Action
* Assessment of students as observed in letters of recommendation	Satisfactory	No New Action

Items for improvement are detailed below and also in Attachment Five.

ACTION ITEMS FOR THE NEXT ASSESSMENT CYCLE

The responsibility for accomplishing action items is ultimately that of the HPP Director. These are ultimately collaborative agreements to be accomplished as a team effort.

1) A consideration of the outcome assessment tools indicates that some tools need further refinement.

A) One glaring item was the inability of survey information to be easily correlated among the different groups surveyed. This information will be used during the design of the next set of surveys to be conducted.

B) A second item which seemed to require a better process with respect to defining a quantified outcome assessment tool was the objective of developing within students -A professional work ethic.

1. This will become a specific item to ask employers about in the next survey.
2. Specific report requirements, quizzes, and questionnaires will be developed by which students can specifically be assessed with regard to this objective.
3. Further course development with respect to this area is expected.

C) A third item to be revised includes the alumni and alumni employer surveys with respect to questions involving computer confidence. The program's goal is to further evaluate this initial indication observed in the latest survey results to determine the root cause of this issue. Once identified aggressive steps to remedy this item will be conducted.

2) Student Course Evaluations indicate a reoccurring trend with respect to the belated return of classroom assignments. Faculty agreed to work harder at reducing this valid criticism.

3. PROGRAM OUTCOMES AND ASSESSMENT

Applied Science Programs must Demonstrate that Graduates have *the following attributes*:

- a) an ability to apply knowledge of mathematics, science, and applied sciences
- b) an ability to design and conduct experiments, as well as to analyze and interpret data
- c) an ability to formulate or design a system, process or program to meet desired needs
- d) an ability to function on multi-disciplinary teams
- e) an ability to identify and solve applied science problems
- f) an understanding of professional and ethical responsibility
- g) an ability to communicate effectively
- h) the broad education necessary to understand the impact of solutions in a global and societal context
- i) a recognition of the need for, and an ability to engage in life-long learning
- j) a knowledge of contemporary issues
- k) an ability to use the techniques, skills, and modern scientific and technical tools necessary for professional practice.

Section 2 of this report “Program Goals and Educational Objectives” listed the Idaho State University Health Physics Programs Objectives:

The educational objectives of our Health Physics program are to produce Health Physicists with

- 1) broad, fundamental technical knowledge,*
- 2) written and verbal communication skills*
- 3) professional judgement and capability to think critically*
- 4) practical experience in solving applied health-physics problems*
- 5) the ability to work independently*
- 6) a professional ethic*

of magnitude sufficient for them to productively and successfully work in a variety of health physics settings.

These objectives, and our proof of the accomplishment of these objectives in conjunction with the course work required of our graduate students is offered in demonstration that our graduates have the attributes detailed in Criterion 3 of AC 2001. The following table, Table Three, correlates how the ISU Health Physics Program Objectives correlate to the attributes listed in Criterion 3.

Table Three, How the ISU Health Physics Program Objectives correlate to the attributes listed in Criterion 3. **This shows absolute consistency between ISU objectives and Criterion 3.**

Criterion 3 Attributes

- a) an ability to apply knowledge of mathematics, science, and applied sciences
- b) an ability to design and conduct experiments, as well as to analyze and interpret data
- c) an ability to formulate or design a system, process or program to meet desired needs
- e) an ability to identify and solve applied science problems
- k) an ability to use the techniques, skills, and modern scientific and technical tools necessary for professional practice.
- h) the broad education necessary to understand the impact of solutions in a global and societal context
- d) an ability to function on multi-disciplinary teams

Correlating ISU Objectives

- 1) broad, fundamental technical knowledge,*
- 2) written and verbal communication skills*
- 3) professional judgement and capability to think critically*
- 4) practical experience in solving applied health-physics problems*
- 5) the ability to work independently*

Criterion 3 Attributes

- f) an understanding of professional and ethical responsibility

Correlating ISU Objectives

- 6) a professional ethic*

Criterion 3 Attributes

- g) an ability to communicate effectively

Correlating ISU Objectives

- 2) written and verbal communication skills*

Criterion 3 Attributes

- i) a recognition of the need for, and an ability to engage in life-long learning
- j) a knowledge of contemporary issues

Correlating ISU Objectives

- 3) professional judgement and capability to think critically*
 - 4) practical experience in solving applied health-physics problems*
 - 6) a professional ethic*
-

The demonstration that the ISU Health Physics Program is in the continuous process of attaining our objectives was also provided in section 2 within the subsection:

“F. Examples and Documentation that this Process is Working and Producing the Desired Results”.

Further demonstration of Idaho State Universities Compliance with Criterion 3 will be elaborated on in the next section which considers ISU compliance with Criterion 4.

4. Professional Component and Program Criteria

Under AC 2001 Criterion 4 and Criterion 8 programs seeking accreditation must demonstrate that students are prepared for applied science practice through structure of the required curriculum which should include appropriate mathematics, basic and applied sciences, and general education requirements consistent with the objectives of the institution and the program. Programs must also demonstrate that program graduates possess the necessary knowledge, skills, and attitudes to competently and ethically implement and practice applicable scientific, technical, and regulatory aspects of Health Physics. Graduates must produce a culminating senior project and demonstrate competency in the following curricular areas:

HEALTH PROGRAM CRITERIA

- (1) Radiation Physics
- (2) Radiation Biology
- (3) Radiation Detection and Measurements with Laboratory Experience
- (4) Internal and External Radiation Dosimetry
- (5) Principles of Radiation Safety and Health Physics
- (6) Contemporary Issues in Health Physics

Table Four is intended to be a definitive summary of how the ISU Core Curriculum accomplishes the intentions of both criteria 4 and 8 and is consistent with the Idaho State University Health Physics Program Objectives. Attachment Four is the ISU Graduate Catalog course description for all classes included in the ISU Health Physics Graduate Program Core Curriculum and all Health Physics Technical Elective Courses.

The Idaho State University Health Physics Program also offers a set of Health Physics Technical Electives that also add to accomplishing the intentions of criteria 4 and 8 and that are consistent with the Idaho State University Health Physics Program Objectives. A list of these electives and how they relate to the various goals and objectives is provided in Table Five. Although these electives are an integral portion of the educational program that many students experience, they are not required, and therefore are not considered as institutional requirements by which we establish our minimum standards. There are six such elective courses which are continuously offered, one each semester over a three year rotational cycle. The remaining set of electives are offered at various frequencies or on demand.

Table Four. Correlation among ISU Health Physics Program Core Curriculum, the ISU Program Objectives,

Criterion 3 attributes, and Health Physics Program Criteria.

ISU Health Physics M.S. Program Self-Study Report

Class	ISU Objectives	Criterion 3 attributes	Program Criteria
<u>Required Courses</u>			
PHYS 601 Quantitative Methods in Physics _____	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(3),(4),(5)
PHYS 605 Rad. Enviro. Mon. & Surveillance _____	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(3),(4),(5)
PHYS 610 Radiation Regulations _____	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(3),(4),(5)
PHYS 650 Thesis _____	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(3),(4),(5)
<u>Electives- That are required if not taken at the undergraduate level</u>			
PHYS 531 Radiation Physics I	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1)
PHYS 532 Radiation Physics II	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(2),(5)
PHYS 516 Intro Nuc. Measurements	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(3),(5)
PHYS 533 External Dosimetry	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(3),(4),(5)
PHYS 534 Internal Dosimetry	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(4),(5)
BIOS 507 Radiobiology	1,2, 3,4,5	a,b,c,e,k,h,d	(2),(5)

The reader may wish to refer to pages 33, and 34 to refresh themselves on the definitions of all numbered ISU objectives, Lettered Criterion 3 attributes, and numbered Health Physics Program Criteria.

ISU Health Physics M.S. Program Self-Study Report

Table Five. Correlation among ISU Health Physics Program Technical Elective Courses, the ISU Program Objectives, Criterion 3 attributes, and Health Physics Program Criteria.

Class	ISU Objectives	Criterion 3 attributes	Program Criteria
<u>Health Physics Rotating Elective Courses</u>			
PHYS 511 Accelerator Health Physics	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(2),(3),(4),(5),(6)
PHYS 512 Environmental Health Physics	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(2),(3),(4),(5),(6)
PHYS 513 Fundamentals of Industrial Hygiene	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(2),(3),(4),(5),(6)
PHYS 517 Industrial Ventilation and Aerosol Physics	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(2),(3),(4),(5),(6)
PHYS 518 Non-ionizing Radiation Protection	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(2),(3),(4),(5),(6)
PHYS 519 Radiological Emergency Planning	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(2),(3),(4),(5),(6)
PHYS 520 Reactor Health Physics	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(2),(3),(4),(5),(6)
<u>Other Electives</u>			
PHYS 555 Topics in HP I	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(2),(3),(4),(5),(6)
PHYS 556 Topics in HP II	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(2),(3),(4),(5),(6)
PHYS 592 Colloquium in Physics 1 st	1,2, 3,4,5	a,f,g,h,i,j	(6)
PHYS 592 Colloquium in Physics 2 nd	1,2, 3,4,5	a,f,g,h,i,j	(6)
PHYS 599 Medical Applications	1,2, 3,5	a,b,c,e,k,h,d	NA
NS&E 371 Intro. to Nuc. Engineering	1,2, 3,5	a,b,c,e,k,h,d	NA
PHYS 501 Modern Physics	1,2, 3,5	a,b,c,e,k,h,d	NA
PHYS 403 Advanced Mod. Phys.	1,2, 3,5	a,b,c,e,k,h,d	NA
PHYS 404 Advanced Mod. Phys.	1,2, 3,5	a,b,c,e,k,h,d	NA
PHYS 490 ABHP Certification **	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(2),(3),(4),(5),(6)
PHYS648 Advanced Radiation Dosimetry	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(2),(3),(4),(5),(6)

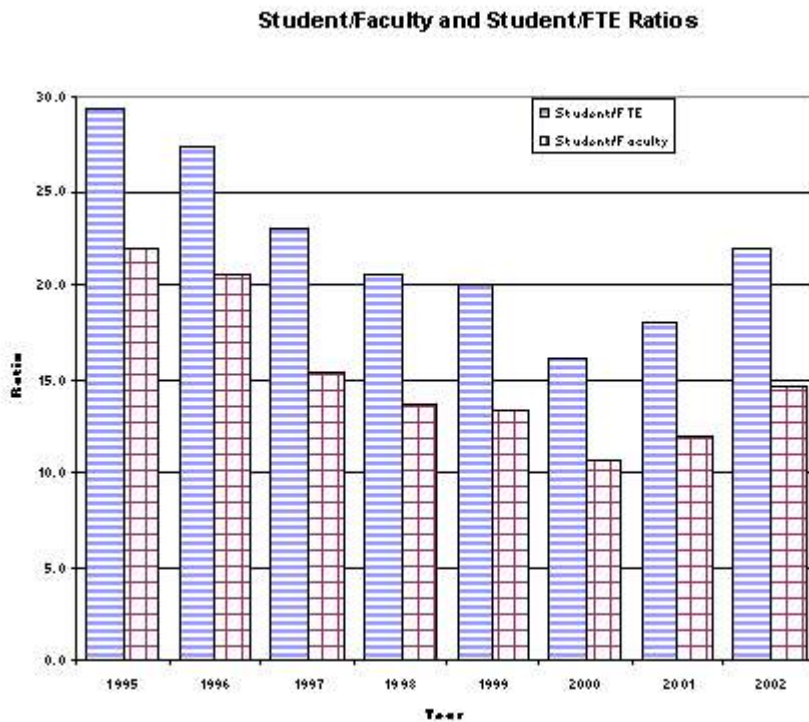
Many other graduate credits may be taken to fulfill the 15 credit elective requirements of the M.S. program. Selection of these is highly dependent on the students research project, advise from the students major advisor, and students previous academic preparation.

** This is a continuing education course which students are encouraged to take, however, credits from this class are not applicable toward the MS degree.

The reader may wish to refer to pages 33, and 34 to refresh themselves on the definitions of all numbered ISU objectives, Lettered Criterion 3 attributes, and numbered Health Physics Program Criteria.

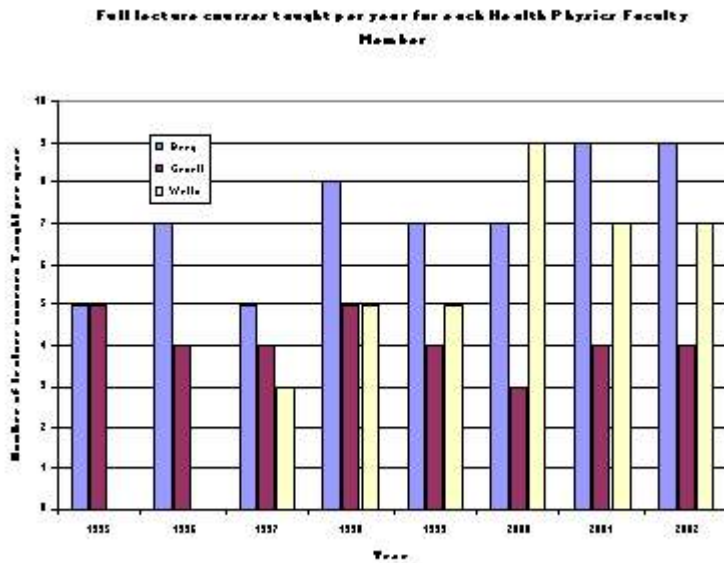
5. Faculty

The Idaho State University Health Physics Program is currently supported by three senior faculty. Two of these three are Certified Health Physicists, the third a current member of the National Council of Radiation Protection (NCRP), represents over 25 years of exceptional professional experience, 10 of these with the Department of Energy, the balance in academia. This individual is a recognized expert on the subject of environmental radioactivity. The university has previously committed to a fourth tenure track junior faculty position. Although this position has been temporarily frozen due to a extenuating state budget crisis, there is every indication that the university will resume its commitment to this new position as state economic conditions improve. The three senior faculty are doctors Brey, Gesell, and Wells. All of the faculty are tenured in the Physics Department of Idaho State University. Table I-3 summarizes Faculty Workload. Table I-4 summarizes information about each faculty member. Additionally, Attachment Eight is a two page short form *curriculum vitae* for each faculty member. Personnel and student information is further provided in Table II-5. Faculty Salary Information is provided in Table-II6. The following figure demonstrates the student/faculty and student/faculty-FTE ratio provided by the Health Physics Program since 1995. The ISU Health Physics Ph.D. program was started in 1995.

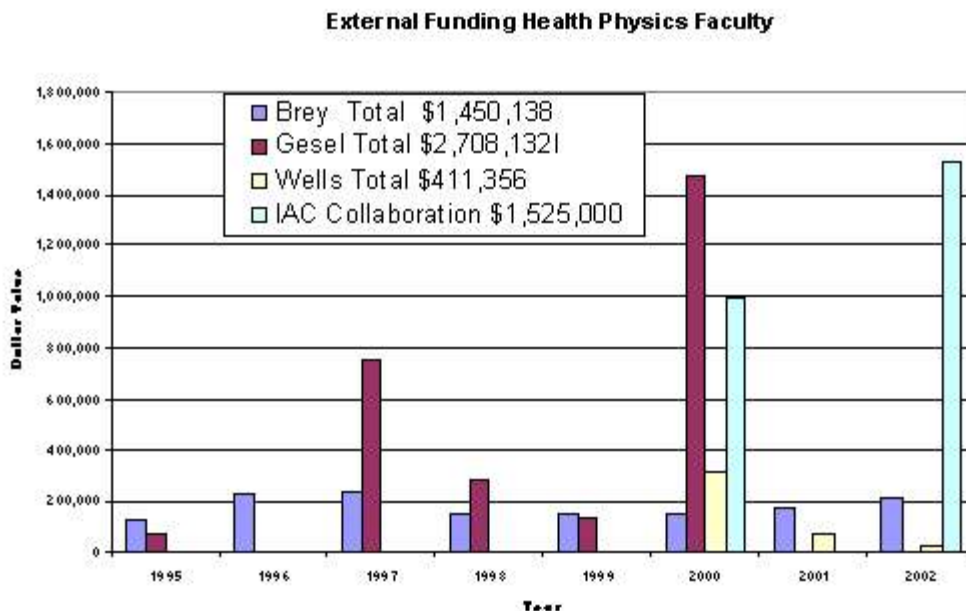


ISU Health Physics M.S. Program Self-Study Report

The following figure demonstrates the number of courses taught per year by each faculty member since 1995.



The following figure demonstrates the total outside grant and contact money brought into the university per year by each Health Physics Program Faculty Member since 1995. This is broken into two categories. This first represents the total amount of grant or contract money per year by individual faculty member, Brey, Gesell, and Wells. The second category is the sum of all other grant or contract money associated with members of this group. A list of grant and contract money by project is provided in Attachment Nine.



ISU Health Physics M.S. Program Self-Study Report

The following table summarizes the number of committee assignments undertaken by Brey, Gesell, and Wells since 1995 on the Departmental, University, and National levels. This table also provides the number of publications of all types produced by these individuals either as first author, or collaborators.

<u>H.P. Faculty</u>	<u>Number of Committee Assignments</u>			<u>Number of Publications</u>
	<u>Department</u>	<u>University</u>	<u>National/International</u>	
Brey	3	6	11	55 ^a
Gesell	4	3	11	15 ^b
Wells	1	3	3	53 ^c

^a Total since 1995

^b This includes only full peer reviewed papers not abstracts and poster papers

^c Total Since 1997

The program is also supported in various ways by adjunct and affiliate faculty. The Health Physics Program has six Adjunct Faculty: Abbott, Graham, Oberg, Otis, and Rood, and six affiliate faculty: Buzzi, Cummings, Davidson, Langley, O’Rear, and Ritter. Occasionally Adjunct or Affiliate faculty provide guest lectures in Health Physics Courses. Approximately one lecture course per year is offered by either Affiliate, Adjunct, or local experts on specialized topics.

When considering the full time faculty alone there is clearly a firm capability among the available talent to completely provide the educational services necessary to accomplish all programmatic objectives. The addition of affiliate and adjunct faculty enhances this considerable pool of talent. Review of this section also serves to demonstrate that the research and service aspects of the Health Physics Program’s mission statement are clearly being fulfilled.

6. Facilities

The Idaho State University Health Physics Program is proud to boast of their newly remodeled facilities in the Physical Sciences Building on the Campus of Idaho State University in Pocatello, Idaho. The physical sciences building houses departmental head quarters, faculty offices, graduate student offices - and offices for many undergraduates employed by research grants or contracts, and laboratories. All of these facilities maintain current micro-computers with internet capabilities that students have access to under various circumstances. There is a state of the art nuclear instrumentation teaching laboratory used for PHYS 516. There are two sister environmental radioanalytical laboratories, the Environmental Monitoring Laboratory (EML) and Environmental Assessment Laboratory (EAL). The EML serves the INEEL State of Idaho

Oversight Program's needs. The EAL currently works with a private contractor group: Stoller Inc., to analysis a large fraction of the regulatory required INEEL Off-Site monitoring requirements. These laboratories employ both graduate and undergraduate students. Both laboratories also employ full time laboratory supervisors and are administered by Health Physics Program faculty.

The Physical Science Building also houses the ISU Technical Safety Office (TSO) which is responsible for both Radiation Safety on Campus and Hazardous Waste Management. The TSO is administered by a Health Physics Faculty member. The organization also employs undergraduate and graduate students. The Physical Science Building also houses one of the three laboratories which comprise the Idaho Accelerator Center (IAC).

The Idaho Accelerator Center (IAC) plays an integral part in the educational experience offered to Idaho State Health Physics Program students. The IAC operates three separate accelerator laboratories on the ISU campus. Although not verified, *the university believes that the IAC perhaps operates more accelerators than any other institution on the planet and clearly represents more available accelerator capital than any other institution of comparable size.* Idaho State University students at all levels have greater opportunity to operate, repair, and in short gain experience with accelerator technology than is commonly encountered within a university setting.

The three IAC laboratories are the IAC central facility (referred to locally as the IAC), the Particle Beam Laboratory, and the Small Accelerator Facility. The IAC's Particle Beam Laboratory located in the ISU Physical Sciences Building operates two Van de Graaff accelerators and two LINACs': an 18-MeV machine and a 6-MeV machine. The facility also houses a Tandatron machine and a 4-MeV LINAC unit that may be made operational but presently are not being used. The IAC central facility houses and operates a 30-MeV fast pulse LINAC and a 22-MeV LINAC. The facility houses a Febatron pulse machine and will soon operate ISIS a 100-amp beam pulsed-machine. IAC also owns a 10-MeV LINAC recently obtained from an industrial contributor. This machine is in storage at a rented storage facility in Pocatello. The eventual goal is to expand the IAC central facility to also house this unit.

The IAC Small Accelerator Facility operates two 4-MeV LINAC one which is portable, several industrial radiography units, and various other devices such as D-T neutron generators (bomb-triggers) employed mainly for imaging work. All of these facilities employ Health Physics and Physics students to the greatest extent possible - currently limited only by the number of students available.

Idaho State University Facilities are thought to be entirely appropriate to achieve all programmatic objectives, provide an atmosphere conducive to learning, and provide an atmosphere that encourages professional development and professional activities. Over the last 8-years of the ISU Health Physics Program's history **all traditional graduate students** have been gainfully employed in one of these facilities performing professional quality work and undertaking professional level responsibilities for some fraction of their tenure year at ISU.

Table Six provides an extensive, although perhaps not exhaustive, list of all nuclear instrumentation and research capital equipment available within the facilities described above.

University Library

The University Library, located in the Eli M. Oboler Library building, contains major collections of books, maps, microfiche, periodicals and government publications and provides a full range of services to students and staff. The book collection of approximately 360,000 volumes is accessed via an on-line catalog which is linked to an automated circulation system. The library subscribes to some 3,400 periodicals and serials including Health Physics, Radiation Protection Dosimetry, Radiological Protection and other journals important to Health Physics. Complete collections of many of these journals have been established. The Library is working to complete its partial collection of NCRP and ICRP reports. The government publications collection comprises over 400,000 items. ISU has been a depository for federal publications since 1908 and for Idaho State publications since 1972. The government publications department contains a collection of more than 1,500,000 items published in microform. Thanks to the efforts of Dr. Wells, a Health Physics Faculty member and past chair of the University Library Committee, the new ISU policy on periodical resources is based upon interlibrary loan request. Since this is dominated by the physical sciences and physics in particular, The Health Physics Program anticipates an equitable share of the periodical budget presently and in future years.

ISU Health Physics M.S. Program Self-Study Report

Table Six: Nuclear Instrumentation and Research Capital Equipment

Equipment/Facility	Location (on/off campus)	Description of Equipment/Facility Utilization
Accelerators	On	2(2 MeV) Van de Graaff/ neutron dosimetry studies recently acquired micro-beam control equipment when brought on line will be used for micro-biological and micro-dosimetry studies. Tandatron Accelerator 3(4-MeV), 10-MeV,18-MeV, and 22-MeV electron LINACs/ materials irradiation, sterilization, biological effect, photon activation, neutron generation, BNCT, waste characterization, and dosimetry studies 30-MeV fast pulse LINAC/ to go online during 1998 - many similar applications. Febatron unit Working on Installation and building construction of ISIS a 100-amp beam pulsed-machine
5 mW AGN-201 reactor	On	Activation studies, instrumentation studies, iodine generation in therapy studies.
Neutron Howitzer and neutron transport cask	On	20 Ci PuBe neutron source in a water filled howitzer, 50 Ci AmBe source calibration and activation investigations.
Solid state detectors: 9 Intrinsic Germanium detectors one of the 8 is a LE(Ge) with Be window 6 Si(Li) Detectors	On	Shielded high resolution gamma spectrometers and x-ray spectrometers The LE(Ge) is currently shielded with a 12" annular NaI(Tl) crystal operated as an active shield for Compton suppression. Most systems are operated via NIM electronics with AIM modules and employing Genie 2000 /Pro-count 2000 software. Also several different portable MCA systems are available
Independent Radiation detectors and NIM electronics	On	The department has a large assortment and great quantity of radiation detectors and supporting NIM electronics including: NaI(Tl), Geiger-Muller, proportional counters detectors (gas flow and sealed), long counters, BF ₃ tubes, a spherical tissue equivalent proportional counter, Phoswich systems, plastic scintillators, light pipes, etc. and amplifiers, pre-amplifiers, scalers & counters, timers, pulsers, cables, bins, and various pulse manipulation NIM. For example ISU has over 3 dozen NaI(Tl) detectors ranging in size from 1-inch to 8-inch.
Workstations (3)	On	Hewlett Packard Apollo and Athena unit
Personal computers, most computers are networked to the Apollo mini-computers. (>30)	On	PC's with MCA data acquisition cards for data acquisition and analysis, gross data analysis, report generation.

ISU Health Physics M.S. Program Self-Study Report

Equipment/Facility	Location (on/off campus)	Description of Equipment/Facility Utilization
Machine Shops: Physics Facility and “High precision” machine shop equipment available with 30-MeV LINAC facility.	On	Fabricate research items
Staffed Electronics Shop	On	Fabricate and repair electric equipment
Frequency Generators and pulse generators	On	Calibrated frequency generators for use in survey meter calibration and pulse generators Used for calibrating portable survey instruments
Misc. laboratory equipment	On	Glassware (volumetric flasks, condensers, distillation flasks, vacuum filtration flasks, burrets, pipettes etc.) balances, micro-balances, oscilloscopes, multi-meters, temperature probes, hot plates, mixers, centrifuges, refrigerators, ovens, vacuum ovens, pH meters, conductivity meters, calibrated standards, calibration standards, etc.
TLD readers and TLDs	On	ALNOR automated TLD reader and Harshaw research grade single chip, powder, and rod reader with a large assortment of TLD 100, 600, and 700 chips, TLD powders, rods, capsules etc.
Portable survey equipment (several)	On	Ion chambers, GM tubes, scintillators, including HP REM 500 neutron survey meter and other neutron survey meters self-reading dosimeters etc. Used for health physics surveys and as investigation tools
Air Pumps; Portable Air samplers and environmental air sampling systems	On	Portable and stationary air samplers for collecting airborne radioactive materials for isotope identification and hazard evaluation
Liquid Scintillation Counters (5)	On	2 Wallac, and 6 Beckman. Both Wallac systems employ an active shield to reduce bkg. One of the two is in the Idaho Falls facility.
Laboratory Proportional Counters (6)	On	3 Canberra 2404 APC systems, and 1 Protean APC system. All have active guard ring shielding capability and significant passive shielding.
Calibration Sources (many) emitting alpha, beta, gamma, and x-ray radiation.	On	All NIST traceable, of various geometries, densities, and radionuclide compositions in dispersable and non-dispersable forms.

ISU Health Physics M.S. Program Self-Study Report

Equipment/Facility	Location (on/off campus)	Description of Equipment/Facility Utilization
Idaho National Engineering Laboratory	Off	This large multi-disciplinary laboratory has numerous facilities which can be accessed on a case basis by ISU students. Included are whole body counters, beta, gamma and neutron calibration sources, and radioanalytical laboratories

7. Institutional Support and Financial Resources

The Health Physics program was first available to students at ISU 11 years ago when the first faculty member was hired. Growth of the program and institutional support allowed a second faculty to be hired in 1993 with a third hired in 1996. (The last person is 0.5 FTE Health Physics and 0.5 FTE Physics.) All of the faculty are tenured in the Physics Department of Idaho State University. Table I-3 summarizes Faculty Workload. Table I-4 summarizes information about each faculty member. Additionally, Attachment Five is a two page short form *curriculum vitae* for each faculty member. Personnel and student information is further provided in Table II-5. Faculty Salary Information is provided in Table-II6.

Since Physics at ISU has focused on Nuclear Physics and its applications, Health Physics was a natural extension of our activities. The budget for Health Physics is not separately determined from the rest of the department's. Departmental budgets are based on the previous year's budget unless there has been a major change in the program or number of faculty. Thus, in Physics, the FY02 budget was determined by applying an inflationary adjustment to the FY01 budget. Unfortunately, the economy of the State of Idaho has not performed up to expectations; this is resulting in at least a 10% reduction in University funding of operating costs for FY03, as shown in Table I-5. The department has been able to institute lab fees which have taken some of the pressure off our capital equipment budget and provided us with some capability to maintain reasonable computational facilities and, when coupled with grant monies, provide well equipped teaching labs.

After initial start-up funding from the Department, College, and Office of Research, research equipment is generally provided and upgraded through individually obtained external funding or, to a lesser extent, through University funding competitions. This means that faculty development is funded through grants that provide travel to conferences, etc. The university provides resources to assist faculty in taking advantage of new technologies as desired by the faculty.

8. Program Criteria

Because of the entwined nature of the Program Criterion and Professional Component Criterion as described in AC-2001 this report address both criteria in section 4 of this report. The reader is requested to review section 4: **"4. Professional Component and Program Criteria"** in detail.

ISU Health Physics M.S. Program Self-Study Report
List of Attachments

- Attachment 1.....Forms used to record student information and on file
Attachment 2.....List of Alumni Employers
Attachment 3.....List of Student Papers and Presentations
Attachment 4.....HP Program Report 1999
Attachment 5.....ISU Health Physics Program (HPP) Outcomes
Assessment
Attachment 6.....Minutes of Advisory Committee Meeting
Attachment 7.....ISU Graduate Catalog course descriptions
Attachment 8.....Faculty *Curriculum Vitae*
Attachment 9.....List of Grant and Contract Awards

ISU Health Physics M.S. Program Self-Study Report
 ATTACHMENT ONE
 Forms from Files

HEALTH PHYSICS - M.S.

The Department of Physics, in addition to the more traditional physics program, also offers the M.S. option in Health Physics. Health Physics, an applied science, is concerned with the protection of humans and their environment from the possible harmful effects of radiation while providing for its beneficial uses. It is a multidisciplined profession that incorporates aspects of both the physical and biological sciences.

Progress Check-off Work-sheet for Requirements of Major

Required Courses

Phys 601	Quantitative Methods in Physics - 3 cr	.....	_____
Phys 605	Radiological Environmental Monitoring & Surveillance - 3 cr	.....	_____
Phys 610	Radiation Regulations - 3 cr	.....	_____
Phys 650	Thesis - 6 cr	.....	_____
			Total _____

Elective Courses (may be required if not taken at the undergraduate level.)

Bios 507	Radio Biology	.....	_____
Phys 509	Introductory Nuclear Physics - 3 cr	.....	_____
Phys 516	Introduction to Nuclear Measurements - 3 cr	.....	_____
Phys 531	Radiation Physics I - 3 cr	.....	_____
Phys 532	Radiation Physics II - 3 cr	.....	_____
Phys 533	External Dosimetry - 3 cr	.....	_____
Phys 534	Internal Dosimetry - 3 cr	.....	_____
Phys 555	Topics in Health Physics I - 3 cr	.....	_____
Phys 556	Topics in Health Physics II - 3 cr	.....	_____
Phys 592	Colloquium in Physics (may be repeated) - 1 cr	.....	_____
Phys 000	Other	.....	_____
Phys 000	Other	.....	_____
Phys 000	Other	.....	_____
			Total _____
			Grand Total _____

Title of Thesis Proposal _____

Proposal is _____
 Thesis is _____

C=completed SRC=still required to be completed W=waived NA=not applicable
 T=transfer credits accepted IP=in progress

Signature _____
 Date _____

ISU Health Physics M.S. Program Self-Study Report

NOTES

date _____

date _____

date _____

April 9, 2002

ISU Health Physics M.S. Program Self-Study Report

Name
15316 S. Hawkins Rd.
Arimo, ID 83214-1547

Dear :

I see that you have had some difficulty with mid-term grades. I would like to encourage you to keep working at your classes. Please stop by the Health Physics office and see me, room 123B, during the week of April 22nd. I can also be reached at 282-2667. If this is not convenient, contact my secretary, Ellen, at 282-4308.

Thank you.

Sincerely,

Rich Brey, Professor
Health Physics

RB/en

ISU Health Physics M.S. Program Self-Study Report

ATTACHMENT TWO

BBWI INEEL
P.O. Box 1625
Idaho Falls, ID 83415

Clayton Group Services OSHA
4636 E. Marginal Way So. Suite 215
Seattle, WA 98134

University of Florida
714 S. W. 16th Ave
Gainesville, FL 32601

INEEL Oversight
900 N. Skyline, Suite C
Idaho Falls, ID 83402

DEQ
1445 N. Orchard
Boise, ID 83706-2239

Cre-Act School
761 Dogwood Ave.
Pocatello, ID 83201

Physics Department
Campus Box 8106
Idaho State University
Pocatello, ID 83201

Bechtel
3350 George Washington Way
Richland, WA 99352

Rocky Flats Site
P.O. Box 464 T-130B
Golden, CO 80402-0464

AMI
2300 Buckskin Rd.
Pocatello, ID 83201

DOE-ID
P.O. Box 1625
Idaho Falls, ID 83415

ANL-W
P.O. Box 1625
Idaho Falls, ID 83415

St. Vincent Hospital
5680 Old Portland Rd.
Warren, OR 97053

Fred Hutchinson Cancer
Research Center
1100 Fairview N.
Seattle, WA 98109

Arc, Inc.
11624 Bowling Green
St. Louis, MO 63146

Afftrex Ltd.
Bechtel/NRF
Scoville, ID 83415

Bechtel Rad. Con
P.O. Box 2068
Idaho Falls, ID 83415-0001

EzCoding
8800 Pembroke Dr.
Boise, ID 83704

Sciencetech
1690 International Way
Idaho Falls, ID 83402

Washington Dept. Health
Division Radiation Protection
2839 W. Kennewick Ave.
Kennewick, WA 99336

Washington University
One Brookings Dr..
Campus Box 8224
St. Louis, MO 63130

Sciencetech Inc. RSO
115 Reactor Rd.
Karthaus, PA 16845

SAIC
545 Shoupe Ave, Suite 200
Idaho Falls, ID 83402

Radiation Health
260 S. Central Campus Dr. #100
Salt Lake City, UT 84112-9159

ISU Health Physics M.S. Program Self-Study Report

UCLA
Radiation Safety Office
Los Angeles, CA 90036

Acculabs, Inc.
4663 Table Mountain Dr.
Golden, CO 80403-1650

James A. Fitzpatrick
Nuclear Power Plant
Oswego, NY

International Isotopes Idaho
4137 Commerce Circle
Idaho Falls, ID 83401

Aftrex Ltd.
1010 W. Bridge St., Suite G
Blackfoot, ID 83221

NRC Region IV
610 Elmhurst Dr.
Papillion, NE 68046

US DOE-ID
850 Energy Dr.
Idaho Falls, ID 83401-4149

Micron Electronics, Inc.
800 Federal Way
Boise, ID 83709

ISU Health Physics M.S. Program Self-Study Report
ATTACHMENT THREE
List of Student Papers and Presentations

PUBLICATIONS

Peer reviewed journal articles

A Monte Carlo Investigation of Electron Backscattering. **Radiation Protection Dosimetry** (2001), C. Frujinoiu and R.R. Brey.

Evaluation and Optimization of a Proportional Counter-based Detector System for Detection of High Energy Beta Particles with Application to Strontium-90 Surface Contamination, K. T. S. Islam, R. Brey, T. Gesell, L. Johnson, C. McIsaac **Radiation Protection Management** May/June 2000 Volume 17, No. 3, p 23.

Radiocolloids in Leachate from the NRC Field Lysimeter Investigations; R.R. Brey, T. Butikofer, J.W. McConnell, and R.D. Rogers, **Waste Management**, Vol. 18 No. 1 pp 39-53, 1998

An Evaluation of ²²²Rn Concentrations in Idaho Ground Water; L.R. Paulus, T.F. Gesell, R.R. Brey, **Health Physics** Vol. 74 No. 2, February 1998.

Review of Lead Decontamination Products Treatability Report - EET TechXtract, Brey and Paulus **Radiation Protection Management**, Vol. 14, No. 3, May/June 1997, p 53.

Estimation of Exposure Rates to Workers from Recycled Radioactively Contaminated Steel Disposal and Storage Containers; R.R. Brey, T.D. Taylor, T.F. Gesell, **Radiation Protection Management**, Volume 12, No. 5 (September/October 1995), pp. 38-50

Average Beta Energy Estimation, R.R. Brey, G. Gibbons, L. Paulus, K. Claver, P. Jenkins, J. Cassidy, **Radiation Protection Management**, July/August 1998

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Iodine Neutron Capture Therapy: A New Generation of Radiotherapy for the Thyroid, K.F. Ahmed, A.G. Stephens, R.D. Spall, R.R. Brey, J.S. Bennion, **American Nuclear Society Transactions**, Paper and Presentation, Volume 77, 1997 p45 Albuquerque, New Mexico November 1997

Abstracts and Poster Papers

Comparison of Desiccant Materials used for Monitoring Atmospheric Tritium Concentrations in a High Tritium Background Environment J. Case, R. Dunker, L. Paulus, R. Brey, Submitted to Health Physics 2002

Study of the I-129 (γ, n) I-128 Photonuclear Reaction, G. Kharashvili, R. Brey, Submitted to Health Physics 2002

Shielding Analysis at Two Radiation Oncology Sites, N. Gee, R. Brey, M. Davidson, Submitted to Health Physics 2002

A Fricke Dosimetric Technique to Calculate G-Values for Accelerator Produced Photons, J. Macklin, R. Brey, Submitted to Health Physics 2002

Examination of HPGe Efficiency for Varying Amounts of Similar Density Material, A. Arndt, R. Brey, Submitted to Health Physics 2002

Homogeneity and Self-Absorption Considerations for Small Cylinder Geometries Used During Soil Gamma Spectrometric Analysis, *Health Physics*, J. Case, R. Dunker, and R. Brey, (Abstract & Poster Paper) Vol. 80, No. 6, June 2001 S98 Supplement

Quality Assurance and Control Procedures for Area Dosimeters Developed for a Shielding Integrity Survey, *Health Physics*, A. Arndt, R. Brey, (Abstract & Poster Paper) Vol. 80, No. 6, June 2001 S101 Supplement

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An MCNP Examination of Electron Backscattering, *Health Physics*, C. Frujinoiu, R. Brey and T. Gesell, (Abstract & Poster Paper) Vol. 80, No. 6, June 2001 S101 Supplement

Calibration of High-Dose LiF Crystal Optical Dosimeters, *Health Physics*, N. Gee and R. Brey, (Abstract & Poster Paper) Vol. 80, No. 6, June 2001 S102 Supplement

Neutron Spectroscopy by Phantom Flux Depth Measurements for Boron Neutron Capture Therapy, C.J. Watchman, R.R. Brey, T.F. Gesell, and Y. Harker (Abstract & Poster Paper) submitted to *Health Physics* 1-2000

A Review of Cavity Theory and a Proposal for a Microdosimetric Interpretation of TLD's Cavities for the Case of Electronic Fields, C. Frujinoiu, T.F. Gesell, and R.R. Brey (Abstract & Poster Paper) submitted to *Health Physics* 1-2000

Investigation of a Prototype Radiocolloid System, D.K. Garretson, R.R. Brey and T.F. Gesell (Abstract & Poster Paper) submitted to *Health Physics* 1-2000

Use of the ICRP-66 Lung Model to Study the Potential Health Risks Associated with ^{210}Po Effluent at a Southeastern Idaho Elemental Phosphorous Facility, J.J. Helms, T.F. Gesell and R.R. Brey (Abstract & Poster Paper) submitted to *Health Physics* 1-2000

Photon Activation Analysis of ^{129}I Iodine, J.C. Seeber, R.R. Brey, J.F. Harmon, and T.F. Gesell (Abstract & Poster Paper) submitted to *Health Physics* 1-2000

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Application of Anti-Coincidence Shielding Using a Low Energy Germanium Detector, J. B. Walker, J.F. Harmon, and R. R. Brey, **Health Physics** 76(6) June 1999 supplement

Photon Activation Analysis of Iodine-129, J.C. Seeber, R.R. Brey, J.F. Harmon, and T.F. Gesell, **Health Physics** 76(6) June 1999 supplement

Developing a Methodology for Analysis of Sr-90 in Milk Using 3M Empore Rad Discs, K.T. Claver, R.R. Brey, and T.F. Gesell, **Health Physics** 76(6) June 1999 supplement

Improving Sampling and Counting Methodologies to Decrease The MDC of Environmental Radiological Air Samples, P.A. Jenkins, T.F. Gesell, R.R. Brey, D.P. Wells, and A..J. Schilk, **Health Physics** 76(6) June 1999 supplement

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Cavity Effects in the Case of Measurements of Personal Absorbed Dose from Beta Particles using TLDs, C. Frujinoiu, R. Cummings, T.F. Gesell, and R.R. Brey, **Health Physics** 76(6) June 1999 supplement

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Polyvinyl Alcohol film dyed with congo red as a simple dose indicator for use in industrial irradiation facilities, L. G. Backstrom, R. R. Brey, F. J. Harmon, **Health Physics** Vol. 74 sup. No. 6, June 1998. P-s30 (Abstract & Poster Paper)

ISU Health Physics M.S. Program Self-Study Report

Developing a Methodology for Strontium-90 Analysis in Milk Using 3M Empore Rad Discs; K.T. Claver, R.R. Brey, T.F. Gesell, R. Rodriguez, **Health Physics** Vol. 74 sup. No. 6, June 1998. P-s27 (Abstract & Poster Paper)

Investigation of Radiation Doses Lethal to Virsus; K.R. Marlow, R.R. Brey, L.D. Farrell, J.F. Harmon, R.D. Spall **Health Physics** Vol. 74 sup. No. 6, June 1998. P-s30 (Abstract & Poster Paper)

Average Beta Energy Estimation; G. Gibbons, R.R. Brey, L. Paulus, K. Claver, P. Jenkins, Department of Physics - Health Physics Program, **Health Physics** Vol. 74 sup. No. 6, June 1998. P-s341 (Abstract & Poster Paper)

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Photon Activation Analysis of Iodine-129; T.D. Henderson, F.J. Harmon, R.R. Brey **Health Physics** Vol. 74 sup. No. 6, June 1998. P-s41 (Abstract & Poster Paper)

Kinetics of the Distribution of I-125 in Bovine Milk during Aging; Nasreen Parvin, R. R. Brey, R. W. McCune and Thomas F. Gesell, **Health Physics**, Supplement to Vol. 72, No.6, June 1997 pp s29. (Abstract & Poster Paper)

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ISU Health Physics M.S. Program Self-Study Report

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Spring, Co,
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published in
X-ray Analysis
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- F. A. Selim, D.P. Wells, F. J. Harmon, J. Kwofie, W. Scates, R. Spaulding, G. Erickson, S.A. Parke,
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Subsurface
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Boise, October
2002.
- J. Kwofie, D.P. Wells, F. A. Selim, F. J. Harmon, S.P. Duttagupta, J.L. Jones, T. White and T. Roney,
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CAARI 2002:
Seventeenth
International
Conference on
the Application
of
Accelerators in
Research and
Industry,
Denton,
Texas, 2002.
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Proceedings of

ISU Health Physics M.S. Program Self-Study Report

- J. Kwofie, D.P. Wells, F. A. Selim, F. J. Harmon, S.P. Dutttagupta, J.L. Jones, T. White and T. Roney, *Bremstrahlung -Based Assays of Process and Waste Streams*, To be published in Proceedings of CAARI 2002.
- Wade Scates, D.P. Wells, J.F. Harmon, *A Test of Non-Exponential Decay in Quantum Systems*, To be published in Proceedings of CAARI 2002.
- M. Reda, J.F. Harmon, W. Scates and D.P. Wells, *Accelerator-Based photo-neutron sources for Sub-Critical Nuclear Reactors*, To be published in Proceedings of CAARI 2002.
- J.F. Harmon, D.P. Wells, R. Brey, *Pure and Applied Research Opportunities at the Idaho Accelerator Center*, To be published in Proceedings of CAARI 2002.
- D.P. Wells, J.F. Harmon and M. Reda, *Cabinet-Safe, Portable Electron Linac Systems*, To be published in Proceedings of CAARI 2002.
- K. Chouffani, D.P. Wells, J.F. Harmon, J.L. Jones and G. Lancaster, *Laser-Compton experiments at the Idaho Accelerator Center*, Workshop on Novel Photon Sources From Relativistic Electron Beams, November 29 –30, 2001. Idaho Accelerator Center, Pocatello Idaho (2001).
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- Selim, F.A., D.P. Wells, F. J. Harmon, J. Kwofie, W. Scates, R. Spaulding, G.Erickson, S.A. Parke, S.P. Dutttagupta, J.L. Jones, T. White and T. Roney, *Development of Bremsstrahlung-based Positron Probe for Assay and Defect*

ISU Health Physics M.S. Program Self-Study Report

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ISU Health Physics M.S. Program Self-Study Report
ATTACHMENT FOUR

Health Physics Program Report of 1999 for reference.

ATTACHMENT FIVE

*Data related to the ISU Health Physics Program (HPP) Period of July 1, 2001 to July 1, 2002,
T. F. Gesell, March 15, 2002*

Introduction

The HPP has recorded grades of all students in all HPP courses since the inception of the program in 1989. Faculty evaluations by the students for 17 attributes have also been collected. In late 2001, the HPP alumni and their supervisors were surveyed, using 21 questions for alumni and 12 questions for their employers. The instruments used for the faculty evaluations and for the alumni and employer surveys will be available for review of the ABET Review Team. The raw survey data and summary data for grades and faculty evaluations are located in binders in Room 120 B of the Physical Science Building. Grade and faculty evaluation data for 1977 through 2001 and the survey data have also been entered into an Excel spreadsheet. The paper and electronic copies of the data are available to authorized users for official purposes.

The electronic format of the data allows analysis in various ways. This report provides an overview of the data and offers a few observations. We have resisted the temptation to provide numerous, detailed tables and charts with the understanding that specific questions that arise can usually be addressed quickly by accessing the spreadsheet. Thus it is not necessary to attempt to anticipate all possible questions and provide the answers in this paper.

Grades

Most grades are on an A to F system (A= 4, F= 0) with withdrawal (w) and incomplete (I) as options. A few courses such as thesis are graded as satisfactory (s) or unsatisfactory (u). The average grades by year for undergraduate and graduate courses in the HPP are given in Figure Two. The results are unremarkable with an average undergraduate grade in the major of 3.42 and an average graduate grade in the major of 3.66. By comparison, the average ISU Fall 2001 upper division GPA is 3.3 and the average graduate GPA is 3.78. Figure Three includes a Table and Scatter Plot of the Idaho State University grade distribution comparison from Fall 1997 through Fall 2001. As indicated in Figure Two, there is no indication of grade inflation in the HPP program over the five year period. About 6.5 percent of students withdraw from HPP courses for various reasons and 2% receive an incomplete.

Student Evaluations

Faculty evaluations by students are also on an A to F system but we have chosen to use a 1 to 5 scale (A= 5, F= 1) to be consistent with the scale of the alumni and employer surveys. The overall average scores over the 5 year period 1997 through 2001 is 4.64. With one exception, the various attributes are fairly tightly grouped. The attribute "*examinations were graded and returned promptly,*" was scored noticeably below the mean for all 5 years studied. Detailed results of the individual faculty evaluations by students are available to faculty members who are expected to use them as an aid to improving their teaching.

Survey of alumni

The first alumni survey was developed in board and revised several times before use. Upon trying to

analyze the data, several flaws were discovered. There was not a one to one correspondence between knowledge and skills to be scored for importance and those to be scored for how well the student was prepared by the HPP. We failed to ask them how well the HPP prepared them regarding regulations. We also failed to ask the alumni whether they were responding for the undergraduate program or the graduate program. We sent out 80 questionnaires and received 40 responses for a return rate of 50 percent. Summaries of the results are given in Figure Four for all alumni who responded, in Figure Five for alumni who responded and who graduated prior to 1996, and in Figure Six for alumni who responded and who graduated in 1996 or later. These dates was chosen in order to allow comparison of program performance in the early and later periods. A few generalizations can be drawn. Alumni felt that their level of preparation was lowest in computer programming and software application. The alumni felt that they were well prepared in health physics theory and in laboratory and instrumentation skills, although these were not highly rated in importance. Both groups cited communication skills as most important.

Survey of employers

The first employer survey was also developed in board and revised several times before use. The major flaw in this survey was an almost complete lack of correspondence between attributes to be scored for importance and those to be scored for how well the employee had been prepared by the HPP. Thus we could not extract this potentially important correlation from the data. We were able to make comparisons between the alumni and their employers regarding their perceptions of the importance of the various attributes (Figure Seven) and the degree to which the alumni had been prepared in those same topics (Figure Eight). There is a remarkable agreement between the employers and alumni in the relative importance of the five knowledge and skill areas that could be compared (Figure Seven). There is less agreement between employers and alumni on how well the alumni had been prepared by the HPP (Figure Eight). It is comforting; however, that for all six knowledge and skills categories, the employers believed that the alumni were better prepared than did the alumni themselves. Perhaps the alumni are too modest and unassuming.

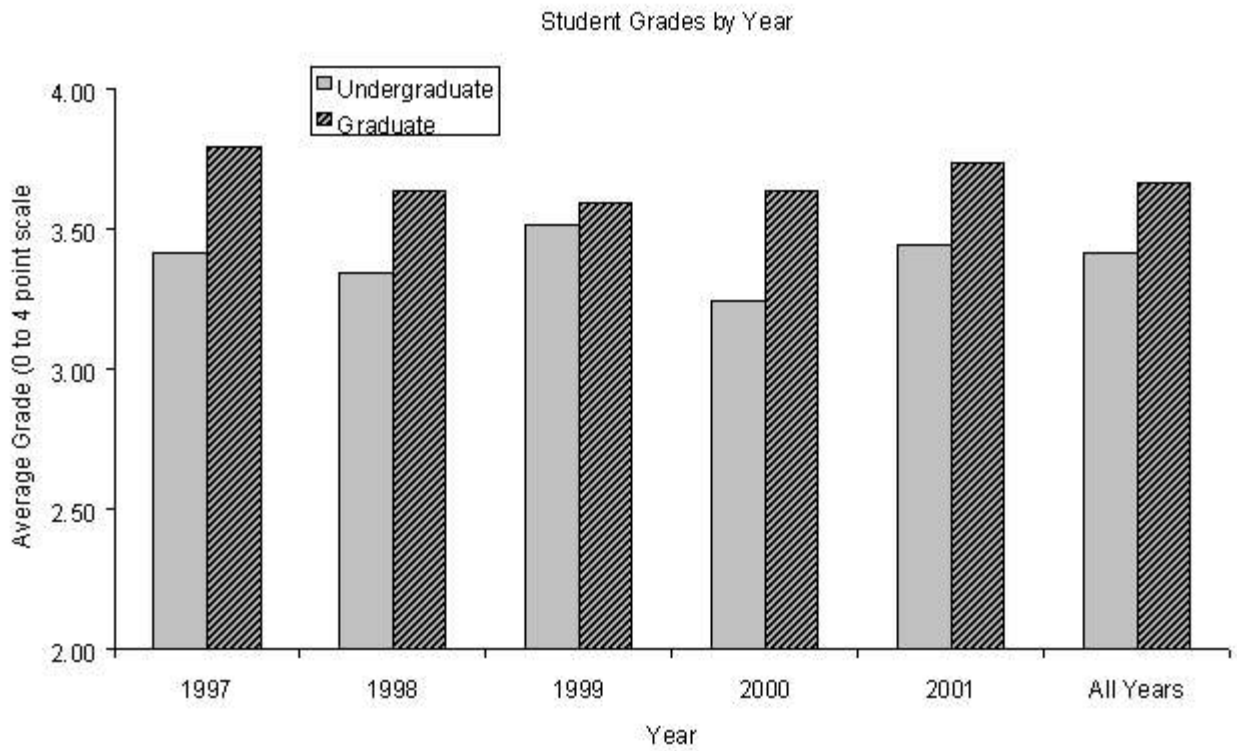


Figure Two: Average grades by year for undergraduate and graduate courses in the HPP

ISU Health Physics M.S. Program Self-Study Report

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IDAHO STATE UNIVERSITY GRADE DISTRIBUTION COMPARISON FALL 1997 THROUGH FALL 2001

COLLEGE BY LEVEL	AVERAGE OF GRADES GIVEN					PERCENT CHANGE 1997 - 2001
	FALL 1997	FALL 1998	FALL 1999	FALL 2000	FALL 2001	
ARTS AND SCIENCES						
LOWER DIVISION	2.71	2.74	2.73	2.73	2.67	-1.48%
UPPER DIVISION	3.06	3.07	3.06	3.18	3.16	3.27%
GRADUATE LEVEL	3.69	3.66	3.72	3.78	3.80	2.98%
BUSINESS						
LOWER DIVISION	2.61	2.50	2.63	2.52	2.57	-1.53%
UPPER DIVISION	2.91	2.88	2.84	2.97	2.85	-2.06%
GRADUATE LEVEL	3.22	3.41	3.45	3.39	3.45	7.14%
EDUCATION						
LOWER DIVISION	3.44	3.49	3.54	3.56	3.70	7.56%
UPPER DIVISION	3.51	3.59	3.56	3.63	3.74	6.55%
GRADUATE LEVEL	3.88	3.85	3.81	3.84	3.88	0.00%
ENGINEERING						
LOWER DIVISION	2.81	3.06	2.53	2.94	2.77	-1.42%
UPPER DIVISION	2.98	3.00	3.05	2.98	3.08	3.36%
GRADUATE LEVEL	3.72	3.76	3.75	3.54	3.63	-2.42%
HEALTH PROFESSIONS						
LOWER DIVISION	3.28	3.44	3.36	3.57	3.51	7.01%
UPPER DIVISION	3.58	3.56	3.60	3.60	3.58	0.00%
GRADUATE LEVEL	3.71	3.78	3.77	3.83	3.88	4.58%
INTERDISCIPLINARY						
LOWER DIVISION	--	--	--	--	3.19	N.A.
PHARMACY						
LOWER DIVISION	3.93	3.97	4.00	4.00	3.98	1.27%
UPPER DIVISION	3.47	3.13	3.12	3.38	3.27	-5.76%
GRADUATE LEVEL	3.49	3.42	3.41	3.33	3.43	-1.72%
TECHNOLOGY / ACAD.						
UPPER DIVISION	--	--	--	3.94	3.89	N.A.
GRADUATE LEVEL	--	--	--	3.98	3.97	N.A.
UNIVERSITY OF IDAHO						
LOWER DIVISION	3.33	3.53	3.34	3.41	3.45	N.A.
UPPER DIVISION	3.42	3.37	3.45	3.49	3.43	N.A.
GRADUATE LEVEL	3.72	3.79	3.83	3.87	3.82	N.A.
TOTAL ACADEMIC						
LOWER DIVISION	2.85	2.88	2.90	2.93	2.90	1.75%
UPPER DIVISION	3.25	3.22	3.22	3.32	3.30	1.54%
GRADUATE LEVEL	3.68	3.71	3.72	3.76	3.78	2.72%
TECHNOLOGY / PTE						
LOWER DIVISION	3.05	3.06	3.03	3.01	3.08	0.98%
UPPER DIVISION	2.12	2.03	2.11	1.85	2.29	8.02%

SOURCE: Grade Distribution Reports -- Office of Registration and Records -- Prepared by Cathy Blair
EXCEL:GradeFall

(UPDATED: 01/10/2002)

Figure Three: Table and Scatter plot of Idaho State University grade distributions from Fall 1997 through Fall 2001.

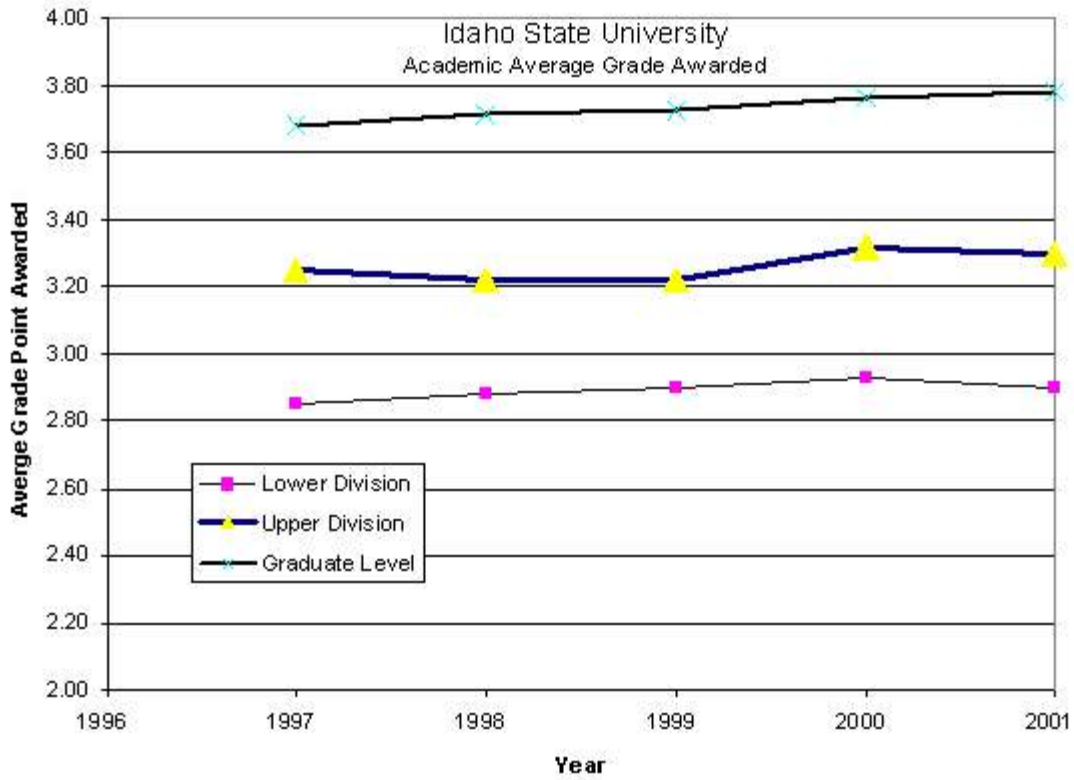


Figure Three “continued”: Table and Scatter plot of Idaho State University grade distributions from Fall 1997 through Fall 2001.

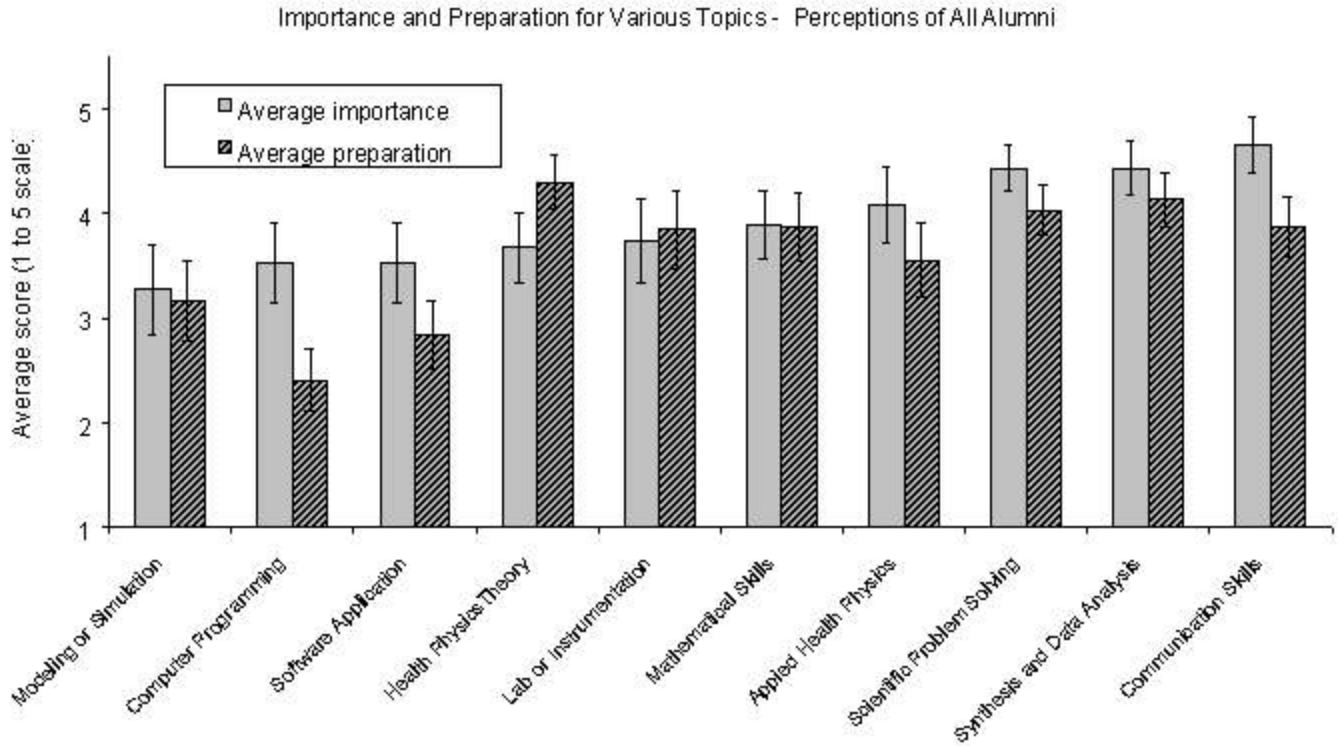


Figure Four: Comparison of all alumni perceptions of the importance of various topics and their preparation for the by the HPP. Topics are ordered along the abscissa with increasing perceived importance.

Importance and Preparation for Various Topics - Perceptions of 1989-1995 Alumni

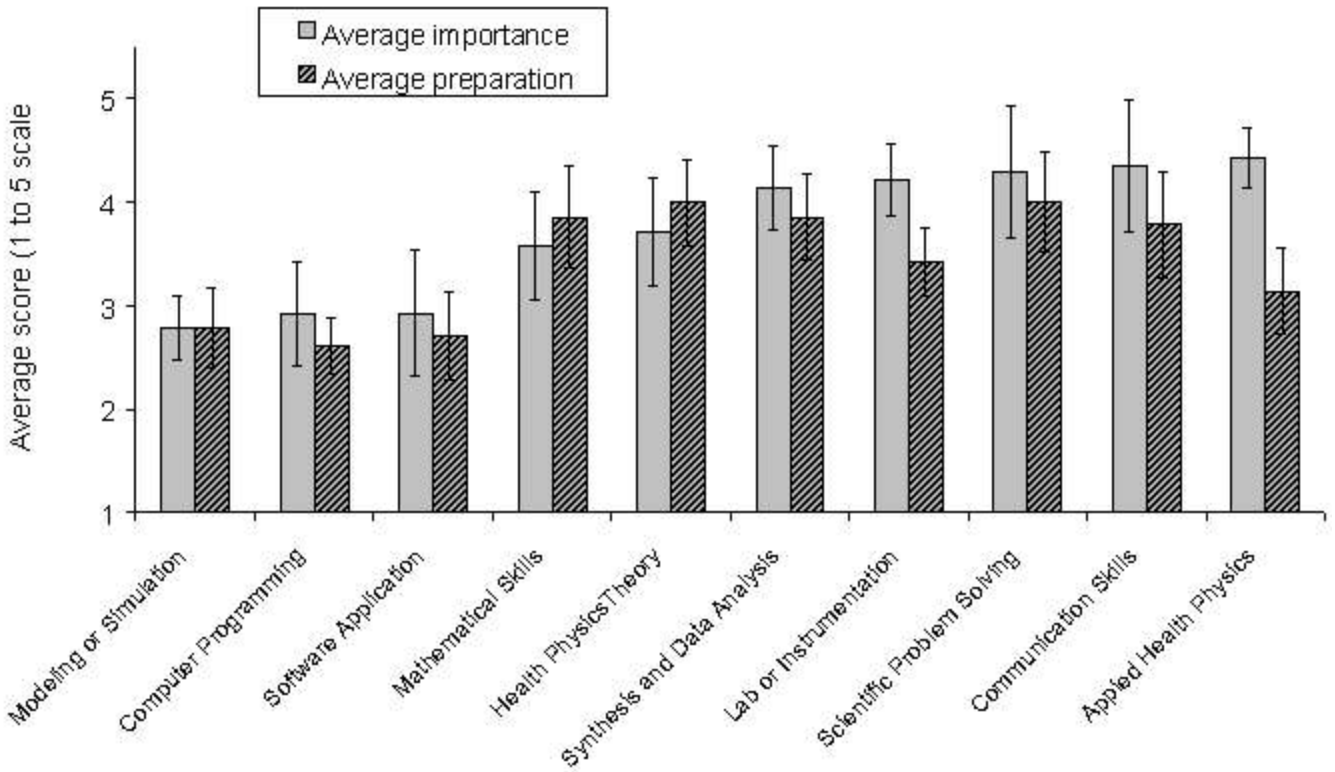


Figure Five: Comparison of 1989-1995 alumni perceptions of the importance of various topics and their preparation for the by the HPP. Topics are ordered along the abscissa with increasing perceived importance.

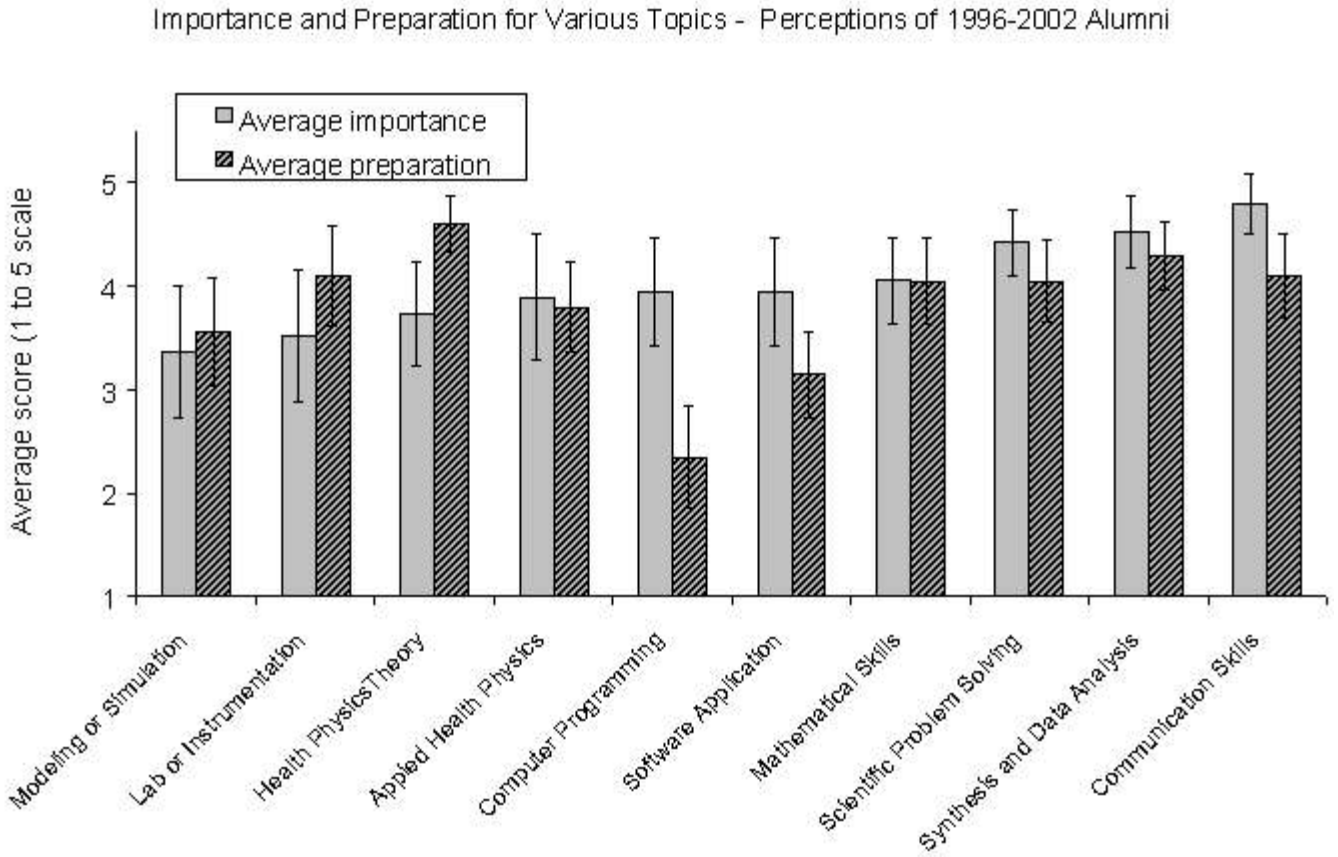


Figure Six: Comparison of 1996-2002 alumni perceptions of the importance of various topics and their preparation for the by the HPP. Topics are ordered along the abscissa with increasing perceived importance.

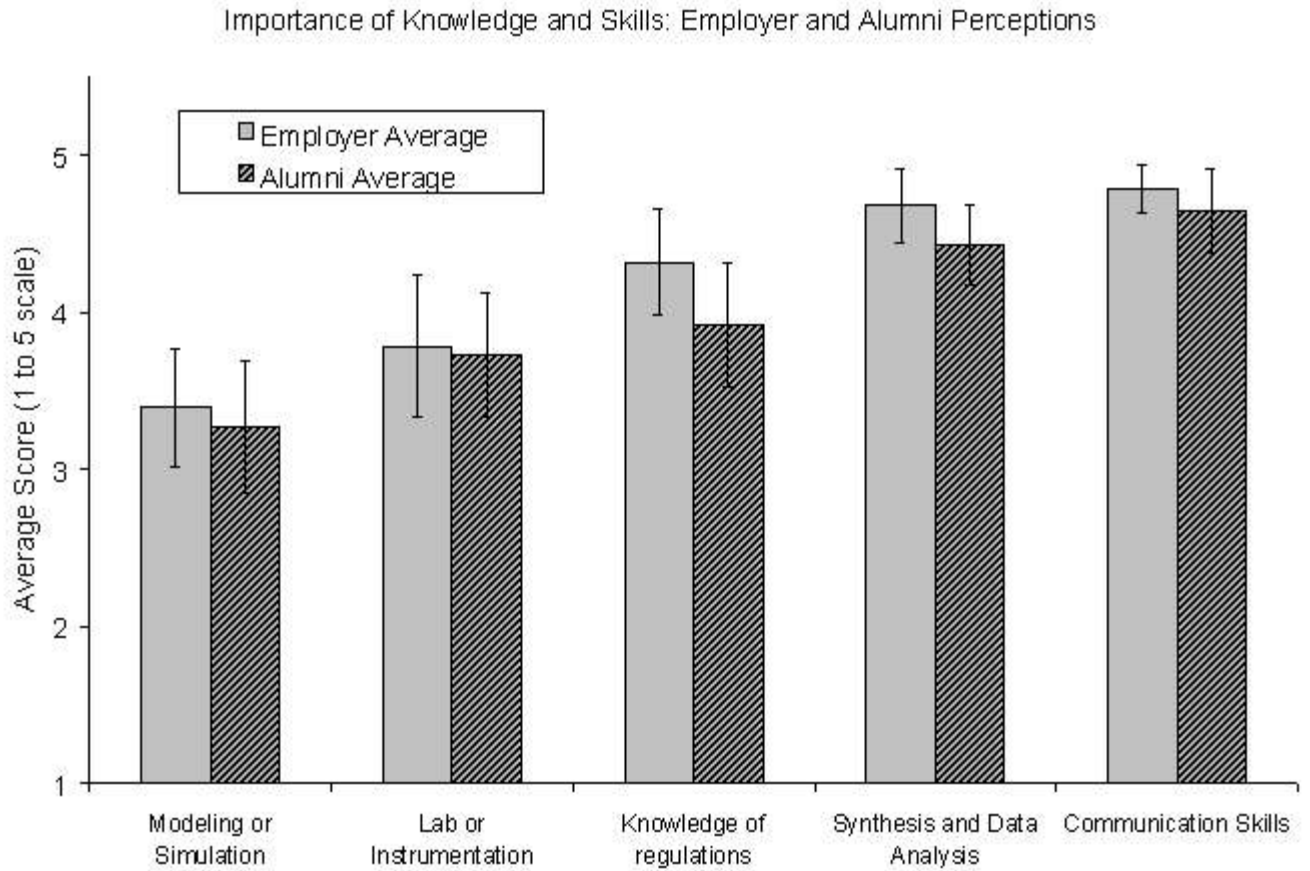


Figure Seven: Comparisons between the alumni and their employers regarding their perceptions of the importance of the various knowledge and skills .

Possession of Knowledge and Skills: Employer and Alumni Perceptions

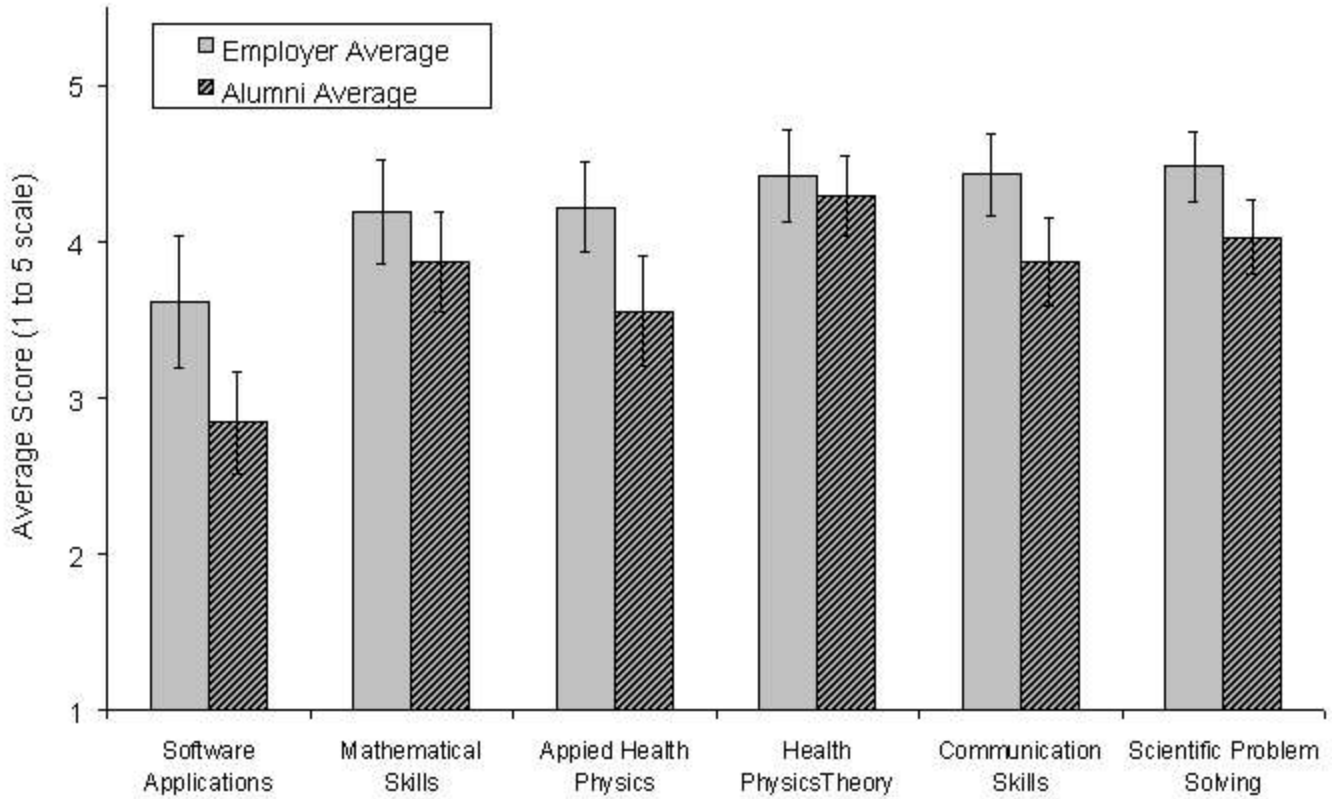


Figure Eight: Comparisons between the alumni and their employers regarding their perceptions of the to which the alumni possessed knowledge and skills in those same topics

ISU Health Physics M.S. Program Self-Study Report

Outcome Assessment Examination

Another Outcome Assessment Tool that was used during this assessment cycle was a test given to all students enrolled in the course Topics in Health Physics II PHYS-g456. Ideally these are seniors in their spring semester. However, this is not always the case. Following is a mini-report and conclusions from this exercise:

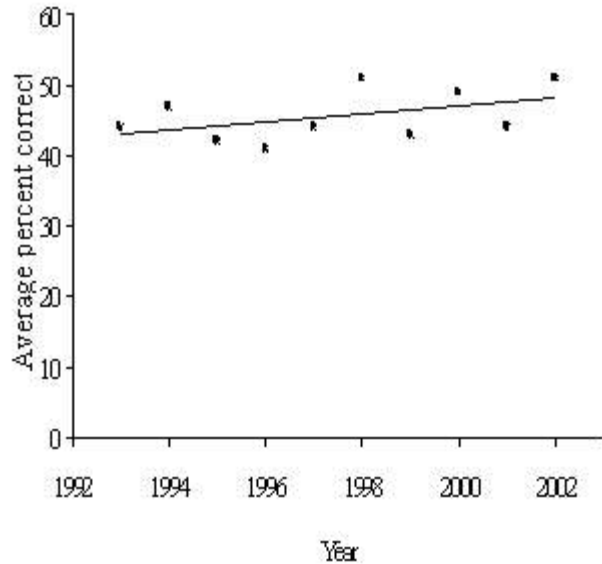
Results

All graduating seniors in the Health Physics Emphasis of the Physics B.S. program have been given a simulated American Board of Health Physics certification examination for the past 10 years. No class average reached the passing grade of 70% that would be required for certification had this been an actual exam. However, of 230 persons taking part 1 of the ABHP exam in 1992, fewer than half (105) scored a passing grade of 70% or higher on their first attempt. The instructor of the ISU certification review course, a certified, practicing Health Physicist, took the ISU outcome assessment exam in 1994 and achieved only 85%. The test instrument is difficult, but does provide for consistent evaluations over the years.

Average Class Performance

Topic	Number of questions	Average scores (%)									
		1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Nuclear reactor operations and principles	5	56	55	43	48	53	50	40	40	40	40
Neutron physics and neutron activation	7	45	47	41	31	52	40	57	57	43	57
Dosimetry of external radiation sources	8	44	44	41	53	46	44	38	31	33	56
Radiation shielding physics and design	7	38	35	37	20	43	31	36	29	38	43
Radiation biology	9	48	54	52	38	56	50	72	78	44	50
Radiation physics, sources, detectors, and counting	27	44	50	41	46	33	59	37	54	49	54
Environmental releases of radioactive material	2	41	23	36	20	50	50	25	25	33	50
Dosimetry of internally deposited radioactive material	5	25	53	49	44	53	73	60	60	53	70
Regulations and standards	5	47	35	37	40	40	47	20	30	47	30
Overall	75	44	47	42	41	44	51	43	49	44	51
Number of Seniors		11	11	7	5	3	6	2	2	3	2

Overall performance, given in the next to last line of the table as percent correct answers, has varied from a low of 41% in 1995 to a high of 51% in 1998 and 2002. It is not known if the differences among the 10 years are statistically significant but there is an observable upward trend in the scores (see figure).



Many of these students are weak in their science and mathematics backgrounds to an extent that makes academic success in the field of health physics challenging. Although we markedly increased the rigor of both the classroom and laboratory portions of our academic program in 1997 and 1998, scores are still not consistent with the passing requirements for the national examination.

The characteristics of the class have changed over the period. In the earlier classes we had a majority of students with prior experience at national laboratories or the Naval Nuclear Propulsion Program. Graduating class sizes were larger because we were meeting a pent up demand for higher education among employees of the Idaho National Engineering and Environmental Laboratory. Later undergraduate classes contained primarily younger, traditional students with little prior experience in the field, and graduate education became a larger component of the ISU health physics program. The fact that examination scores for seniors improved at the same time that the experience level of the incoming students decreased suggests that the undergraduate program has become stronger over the years.

In addition to Dr. Gesell’s data report and the Outcome Assessment Examination, both of which were provided above, faculty were asked to comment on student work performance, class room performance, and laboratory performance during a monthly outcomes assessment meeting conducted during the late spring of 2002.

To summarize this faculty discussion, student performance had been on par with previous years with the exception of a number of incomplete grades initially awarded for the Spring 2002 Nuclear Instrumentation Class. This was thought to be related to several different items including several interdepartmental research activities and projects, and perhaps an overzealous emphasis on report quality. There were no observation of dishonest or unethical behavior within the group of health physics majors. Over various and sundry interactions on grants, contacts, and in class activities students were observed to conduct themselves in a professional manner, and with the exception of a few late laboratory reports, students appeared to be consistently performing in a manner consistent with a professional work ethic. Generally, the observation of student problem solving capability were consistent with past experiences if not slightly better in several instances in particular several current students displayed good ability to sort through unnecessary data in an appropriate way to solve specific

questions. There were no reports of upper division health physics students failing any classes.

With the exception of one lower division undergraduate student, the work performance of all students, with respect to practical problem solving skills were considered to be good or consistent with past experience. Idaho State University Health Physics students were reported to have published the papers, posters, or presentations listed in Attachment Three during the last academic year from July 1, 2001 to July 1, 2002. Faculty agreed that this record seemed reasonable.

The Following List indicates which Outcome Assessment tools were employed during this year (July 1, 2001 to July 1, 2002) program review. Those tools employed are designated using a check mark (✓).

Objective 1: broad, fundamental technical knowledge

Outcome Assessment Tools:

- ✓* Students pass core courses
- ✓* Students perform well on outcome assessment examination
 - * Graduates pass ABHP certification examination
- ✓* Surveys of Program Constituency indicate appropriate knowledge base
 - * Advisory Board Curriculum review

Objective 2: Written and verbal communication skills

Outcome Assessment Tools:

- ✓* Students pass applicable communication courses
- ✓* Students laboratory reports
 - * Capstone course student reports
- ✓* Professional papers, presentations and posters

Objective 3: Professional judgement and capability to think critically

Outcome Assessment Tools:

- ✓* Performance in classes, problem solving and approaches to “defective problems”, laboratory performance
 - * Assessment of Capstone Project Administrator
 - * Performance in work/internship experience as reported by supervisor
- ✓* Surveys of students and alumni, alumni employers

Objective 4: Practical Experience in Solving Applied Health physics Problems

Outcome Assessment Tools:

- * Performance in classes, problem solving, laboratory performance
- * Assessment of Capstone Project Administrator
- ✓* Performance in work experience
- ✓* Surveys of students and alumni, alumni employers

Objective 5: The Ability to Work Independently

Outcome Assessment Tools:

- * Performance in class problem solving exercises and laboratory performance
- * Assessment of Capstone Project Administrator
- * Performance in work experience
- ✓* Surveys of students, alumni, and alumni employers
- ✓* Professional papers, presentations and posters

Objective 6: A Professional Work Ethic

Outcome Assessment Tools:

- ✓* Performance in classes

ISU Health Physics M.S. Program Self-Study Report

- ✓* Performance in work experience
 - * Surveys of alumni employers
- ✓* Assessment of students as observed in letters of recommendation

ISU Health Physics M.S. Program Self-Study Report

Interpretations and Recommendations

Summary of the 2001-2002 Outcomes Assessment Report; Objectives Evaluated, the Outcomes Assessment Tools Employed, interpretation of the outcomes assessment data relative to meeting objectives, and specific action items taken with respect to the outcomes and objectives evaluated.

Objectives and Outcome Assessment Tools	Results/Interpretation	Actions
<u>Objective 1: broad, fundamental technical knowledge</u>		
Outcome Assessment Tools:		
* Students pass core courses	Satisfactory	No New Action
* Students perform well on outcome assessment examination	Satisfactory	No New Action
* Surveys of Program Constituency indicate appropriate knowledge base	Satisfactory	Further evaluation of “computer confidence” Required (See report Attachment Five)
<u>Objective 2: Written and verbal communication skills</u>		
Outcome Assessment Tools:		
* Students pass applicable communication courses	Satisfactory	No New Action
* Students laboratory reports	Satisfactory	No New Action
* Professional papers, presentations and posters	Satisfactory	No New Action
<u>Objective 3: Professional judgement and capability to think critically</u>		
Outcome Assessment Tools:		
* Performance in classes, problem solving and approaches to “defective problems”, laboratory performance	Satisfactory	No New Action
* Surveys of students and alumni, alumni employers	Satisfactory	No New Action
<u>Objective 4: Practical Experience in Solving Applied Health physics Problems</u>		
Outcome Assessment Tools:		
* Performance in work experience	Satisfactory	No New Action
* Surveys of students and alumni, alumni employers	Satisfactory	No New Action
<u>Objective 5: The Ability to Work Independently</u>		
Outcome Assessment Tools:		
* Surveys of students, alumni, and alumni employers	Satisfactory	No New Action
* Professional papers, presentations and posters	Satisfactory	No New Action
<u>Objective 6: A Professional Work Ethic</u>		
Outcome Assessment Tools: (Outcome assessment tool is weak - require improvement see report -Attachment Five)		
* Performance in classes	Satisfactory	No New Action
* Performance in work experience	Satisfactory	No New Action
* Assessment of students as observed in letters of recommendation	Satisfactory	No New Action

Interpretations and Recommendations

The university interprets this first formal-documented set of outcomes assessment data to indicate that, in general, the programmatic objectives are being achieved based upon the reports of the constituency; including Class Grades, Course Evaluations, Alumni Survey, Alumni Employer Surveys, Faculty Assessments, Advisory Board Reviews and Comments, and an Outcome Assessment Examination. All metrics considered this year indicate that the programmatic objectives are being accomplished in a positive fashion.

Response to Surveys

Alumni and their employers in particular indicate strength in knowledge of Health Physics Theory and Laboratory skills. Based upon constituency survey and discussion with the advisory board there is no indication that programmatic objectives should be modified at this time. Specifically this is one of at least two metrics that indicates that ISU HPP Programmatic Objectives 1, 3, 4 and 5 regarding:

- Broad, fundamental technical knowledge
- Professional judgement and capability to think critically
- Practical experience in solving applied health physics problems
- The ability to work independently

are currently being accomplished to a satisfactory level.

There is an indication by program alumni that students could benefit from more computer confidence, although this indication is not reflected in the comments of student employers. The survey question from which this issue arose was unfortunately not worded well enough to define the exact weakness which motivated the alumni response. It has been agreed that this issue will be considered in much greater detail during the next portion of the review process so that specific solutions to this possible weakness might be developed.

An important aspect of the survey is the satisfaction with the level of preparation in science and mathematics relative to job requirements and professional aspirations. Based upon this result, it can be concluded that differences in the calculus requirements between the APT and BST options has no apparent impact on job performance.

Response to Grades

The metric of student grades carried no surprises. All aspects of this metric seemed appropriate and consistent with programmatic goals. Specifically this is one of at least two metrics that indicates that ISU HPP Programmatic Objectives 1, 2, 3 and 6 regarding:

- Broad, fundamental technical knowledge
- Written and Verbal Communication Skills
- A professional work ethic

are currently being accomplished to a satisfactory level.

Response to Outcomes Assessment Examination

The general trend in the ISU HPP Outcome Assessment Examination has been positive, demonstrating continuous improvement. This trend is defined by too small a data set to define it as statistically significant. Nevertheless the trend is positive and it is counted as a satisfactory accomplishment of Programmatic Objective 1 regarding broad, fundamental technical knowledge. This metric supports a

conclusion that objective 1 is currently being accomplished to a satisfactory level. The positive trend is expected to continue. The absolute grade is felt to be related to the rigor of the examination which perhaps is actually greater than that of Part I of the ABHP examination. It can be demonstrated with a more detailed review of the data then presented here that this examination clearly favors students with more experience. The relative scores are focused on to assess this data rather than absolute scores.

Response to Student-Course Evaluations

Student course evaluations generally reflected that ISU faculty and facilities were providing a good educational experience to which students appeared satisfied. This information is consistent with trends of data developed over several years. Unfortunately, one negative aspect, which also is consistent with a trend over the last several years was identified. Apparently, faculty are not consistently returning graded homework, test, and projects back to students in a timely fashion. Although faculty discussed this issue, and agreed that the timely return of graded documents is extremely important to the didactic process, no recommendations to alleviate this trend were identified. It was speculated that perhaps this reflects a spectacularly large work-load among program faculty. Faculty agreed to try harder to improve this particular situation. Student evaluations are interpreted as an indication that Programmatic Objectives 3, 4, and 5 regarding:

- Professional judgement and capability to think critically
- Practical experience in solving applied health physics problems
- The ability to work independently

are currently being accomplished to a satisfactory level.

Faculty Reports and Reflections

Individual faculty, a constituency group of the ISU HPP, conduct on essentially a continuous basis an assessment of student performance. This is a job responsibility. As part of the educational process faculty interact, encourage, motivate, and sometimes admonish their students. Considering the extensive faculty/student contact time and the frequent quantitative assessment encountered during simple laborious grading, it can be surmised that faculty can provide perhaps one of the most thorough assessments of objective-achievement. Summary comments made by faculty regarding student performance have been documented during periodic outcome assessment meetings. Extensive personalized student evaluations are formally conducted when letters of reference are written for individual students. Faculty informal assessments assert that Programmatic Objectives 2, 3, 4, and 6 regarding

- Written and verbal communication skills
- Professional judgement and capability to think critically
- Practical experience in solving applied health physics problems
- A professional work ethic

are currently being accomplished to a satisfactory level.

Student Papers and Presentations

A final metric can be mentioned at this point. The historical record of student publications and presentations. Attachment Three of this report is a list of student papers and presentations. Student Papers and Presentations are interpreted as an indication that Programmatic Objectives 2, and 5 regarding:

- Written and Verbal Communication Skills
- The Ability to Work Independently

are currently being accomplished to a satisfactory level.

ISU Health Physics M.S. Program Self-Study Report

Based on this evaluation, an understanding of faculty research and service (*as described in Section 5: Faculty in the main body of this report*). It is concluded that the ISU Health Physics Program is achieving all of its programmatic objectives and its mission:

“Our mission is educating students so they can achieve the highest standards of the health physics profession, and solving important problems for the people and industries of Idaho and the Nation through teaching, research, and service.”

ACTION ITEMS FOR THE NEXT ASSESSMENT CYCLE

The responsibility for accomplishing action items is ultimately that of the HPP Director. These are ultimately collaborative agreements among faculty to be accomplished as a team effort.

- 1) A consideration of the outcome assessment tools indicates that some tools need further refinement.
 - A) One glaring item was the inability of survey information to be easily correlated among the different groups surveyed. This information will be used during the design of the next set of surveys to be conducted.
 - B) A second item which seemed to require a better process with respect to defining a quantified outcome assessment tool was the objective of developing within students - a professional work ethic.
 1. This will become a specific item to ask employers about in the next survey.
 2. Specific report requirements, quizzes, and questionnaires by which students can specifically be assessed with regard to this objective will be developed.
 3. Further course development with respect to this area is expected.
 - C) A third item to be revised includes the alumni and alumni employer surveys with respect to questions involving computer confidence. The program's goal is to further evaluate this initial indication observed in the latest survey results to determine the root cause of this issue. Once identified, aggressive steps to remedy this item will be conducted.
- 2) Student Course Evaluations indicate a reoccurring trend with respect to the belated return of classroom assignments. Faculty agreed to work harder at reducing this valid criticism.
- 3) There was an indication from the ISU Health Physics Advisory Board that prerequisite-performance standards perhaps should be set higher primarily for cosmetic purposes. Some advisory Board members expressed that the HPP should consider raising this from a D grade minimum to a C grade minimum. Faculty indicated that experience with the normal self-selection process generally excludes D students from continuing in physics. However, the impact of this proposal will be considered as time permits. After assessment, if this proposal can be justified, it will be forwarded to the ISU Curriculum Council for review and approval. If this proposal is ultimately appropriate the HPP will adopt the idea judiciously.

ISU Health Physics M.S. Program Self-Study Report
ATTACHMENT SIX - MINUTES
Advisory Board Meeting
June 25, 2002
5:00 p.m. PS 126
I.S.U.

Present: John Knox, Doug Wells, Morris Hall, Mark Davidson, Tom Gesell, Richard Dickson, Bryce Rich, Kathleen Trever, Rich Brey, Ellen Nelson.

Agenda: Corrections, additions, changes made to Self-Study Report, BS Program.

Bryce Rich: Concern over 4th faculty member on hold, is it a problem? Are Adjunct faculty counted in total? How many classes do they teach? (p. 2) How do Affiliate fit in? **Report needs to hint at the need for a 4th faculty member.**

Morris Hall: Mission of HP program is educating and ?motivating. How do you assess motivation? Objectives and mission statement need to line up.

Kathleen Trever: Need clarification on the 50-50 class transmission. Add qualifier of "Mode II. Internet II broad band live interaction capability is coming.

Bryce Rich: Program designed for full-time, four-year diligent pursuit. **Rework paragraph, p. 4 "Full-time undergraduates**

Is acceptance in program universally the same? Ans. No. ISU is open enrollment
Can pre-requisites be controlled? eg. maintain "C" level.

- The Advisory Board thinks that performance levels should be set and maintained as part of acceptance criteria. Do we need higher standards? eg. requirement of "C" or higher? Permission of instructor? "D" or better? Rich removed phrase p7

Decision was made to leave in references to Phys 251 and 459 for this accreditation application. What is the process for challenging a course? What happens when we waive?

1. Note in file
2. Must use an elective or get other credits.

General Education requirements are looked at closely, but individual programs and colleges monitor themselves. Health Physics does not have any control over General Education goals. HP can suggest using a course in Gen. Ed. that better fits the HP major, but ultimately, the student determines his track.

John Knox: Gen. Ed. goals will go under the microscope in the Fall 2002. Any changes will be a huge political/Turf battle

Do search on the word "tract". Should be track. Math 352 should be all higher case MATH 352, p. 9. No "300" level physics courses anymore.

ISU Health Physics M.S. Program Self-Study Report

Bryce Rich: BST & APT track have different numbers of credits for completion. APT has more calculus. Rich explained that the BST was used to attract Biology majors; therefore, more math should not be added. The Advisory Board thinks that _____(long winded discussion no consensus)_? Discussion was halted, and noted to come back to it later.

Should Faculty be included as a Constituency? Faculty was added to the list.

A paragraph concerning the NW Accreditation Group's base requirements should be added.

A paragraph about beefing up/or summarizing findings from survey are needed. Possibly saying: "this is how we will improve."

Doug Wells: The MS program is not credited with enough praise for its instrumentation and practical hands-on experience.

Bryce Rich: **Suggested to put all tables of Dr. Gesell's together at the end of the report**, to show outcomes, assessment, and recap of how it came out, are we happy? How to present it? A scorecard. A summary table. Three columns:
Goals Methods Results
with reference to "See Appendix B."

Richard Dickson: Have not mentioned Curriculum Council.

Bryce Rich: **Need to show ratio of faculty to students over the years, General workload, and FTE's did not jump out, no insight.** 100 graduates since the program's inception is a healthy number. It was pointed out that Dr. Brey made a presentation in this area at one of the Advisory Board Meetings. It was suggested that he use it in the body of the SSR's.

Ethics? How do we measure? Is an element of accreditation. How do we incorporate it? Recommendations were as follows:

- Show we taught Ethics.
- Include it in survey.
- Show how we have taken "these steps" to teach it.
- Or say, "Haven't any idea how to do this"
- Tools: grades, reports, quizzes, questionnaire.
- Is a weakness!

Update Adjunct, Affiliate, p. 41. Give sentence about where they are.

Doug Wells: Where are the Research Grants which show our funding. Need this information. **Show IAC facilities. Show Contracts/amounts.** ISU functions at a high level on this criteria. Have more accelerators than any other place on planet.

Table concerning the HP budget was discussed. Does not look representative of

ISU Health Physics M.S. Program Self-Study Report

program. Is there a reason to make us look poor? It was suggested that the paragraph concerning travel be eliminated, p. 46 under #7.

Richard Dickson: Said we need a new logo. What are we trying to market? What do we want others to know? Is it applied HP, radioecology, medical HP, hands-on, or some other area?

Improvement Process was obscure, and how we came to those conclusions. We have a successful program already, it is working.

Adjourned: 8:15 p.m.

ISU Health Physics M.S. Program Self-Study Report

Attachment Seven is the ISU Graduate Catalog course descriptions for all classes included in the ISU Health Physics Graduate Program Core Curriculum and all Health Physics Technical Elective Courses.

Required Courses

Phys 601 Quantitative Methods in Physics 3 credits. A review of the principles of physics and quantitative methods used: calculus, elementary differential equations and statistics. Designed for graduate students in the biosciences, chemistry, geology, and interdisciplinary sciences.

Phys 605 Radiological Environmental Monitoring and Surveillance 3 credits. Advanced considerations in the design of monitoring programs. Sampling and analytical measurement programs for specific radionuclides and sources with emphasis in quality assurance.

Phys 610 Radiation Regulations 3 credits. Covers regulation of ionizing and non-ionizing radiation. Historical, biological, and legal foundations; federal regulations; state regulations; nuclear fuel cycle; emergency response; academic and medical facilities; transportation; accelerators; NORM/NARM; non-ionizing radiation. Prereq: permission of instructor.

Phys 650 Thesis 1-10 credits.

Electives required if not taken at the undergraduate level

Phys 516 Intro Nuclear Measurements - 3 credits. A lecture and laboratory course emphasizing practical measurement techniques in Nuclear Physics. Prereq: Chem 111,112. Phys 111,113 or 211,213

Phys 531-532 Radiation Physics I & II - 3 cr each. A lecture course detailing atomic and nuclear structure, series and differential-equation descriptions of radioactive decay, physical theory of the interactions of radiation with matter suitable for the discipline of Health Physics. Prereq: Phys 112 or Phys 211
532 - dosimetric quantities/units, theory and technology of radiation detection and measurement, and radiobiology important to an advanced understanding of radiation protection. Prereq: Junior standing in HP or permission of instructor. Prereq: Phys 531 or permission of instructor.

Phys 533-534 External/Internal Dosimetry - 3 cr. ea. A lecture course emphasizing external radiation protection including the study of point kernel techniques, monte carlo modeling, NCRP-49 methods, external dosimetry measurement techniques, internal radiation protection including studies of ICRP-2,26,30,60,66, and MIRD methods of internal dosimetry. Prereq: Phys 532 or permission of instructor.

Bios 507 Radiation Biology -3 cr. Ea Survey of the effects of ionizing radiation on living matter at the subcellular, cellular, and organismal levels.

Other Electives

Phys 511 Accelerator Health Physics 3 credits. Fundamentals of particle accelerator design and operation. Examination of the potential radiation environment associated with accelerators and the health and safety issues of their operation. Prereq: Senior standing in HP or permission of instructor.

Phys 512 Environmental Health Physics - 3 credits. State-of-the-art applied mathematical techniques for estimating the release, transport, and fate of contaminants in multi-media environmental pathways (air, ground water, terrestrial). Both radiological and non-radiological contaminants will be addressed, with emphasis on radiological contaminants.

Phys 513 Fundamentals of Industrial Hygiene - 3 credits. Overview on the recognition, evaluation, and control of hazards arising from physical agents in the occupational environment. The exposure consequences associated with agents of major occupational health concerns are considered.

Phys 517 Industrial Ventilation & Aerosol Phys - 3 credits. This course focuses on two distinct subject areas: an elaboration on the details of the ACGIH method of local exhaust-system design, and a study of applied aerosol physics based upon trajectory analysis.

Phys 518 Nonionizing Radiation Protection - 3 credits. Occupational safety and health issues of human exposure to nonionizing radiation. Topics include health concerns and safety strategies developed for extremely low frequency, microwave, radio-frequency, ultraviolet, infrared, laser radiation, and sound waves.

Phys 519 Radiological Emergency Planning - 3 credits. Radiological emergency planning for facilities ranging from reactors and other major nuclear facilities to transportation accidents and smaller-scale nuclear accidents. Topics include planning, co-ordination, "exercises", exposure pathways, modeling, measurement, control, decontamination, and recovery.

Phys 520 Reactor Health Physics - 3 credits. Introduction to reactor physics; nuances peculiar to reactor health physics; reactor designs. Critiques of exposure pathways, accidents, decommissioning, contamination control, and emergency planning examine radiation safety approaches within the nuclear fuel cycle.

Attachment Eight: Faculty *curriculum vitae*

ISU Health Physics M.S. Program Self-Study Report
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Idaho State University
Pocatello, ID 83209
D.O.B: 7/10/63

Telephone: (208) 282-2667
FAX:(208)-288-4649
Brey@PHYSICS.ISU.EDU

POSITIONS

July 1994-Present	Idaho State University, Associate Professor of Physics <i>Director, Health Physics Program</i> <i>Director, Environmental Assessment Laboratory</i>
Jan. 1994 - June 1994	Purdue University School of Health Sciences <i>Teaching Assistant</i>
Aug. 1990 - Dec. 1993	Purdue University <i>DOE Graduate Fellow</i>
May 1991 - Aug. 1991	INEL, EG&G Idaho, Environmental Technology Unit <i>Intern</i>
Aug. 1989 - Aug. 1990	Purdue University School of Health Sciences <i>Teaching Assistant</i>
May 1987 - Aug. 1987	American Electric Power Service Corp., Nuclear Operations, Radiological Support Section, Columbus, OH <i>Intern</i>
July 1983 - July 1986	Indiana & Michigan Electric Company, D.C. Cook Nuclear Power Station, Bridgman, MI <i>Chemistry Radiation Protection Technician</i>

EDUCATION

Ph.D. 1994, Health Physics, Purdue University
M.S. 1990, Health Physics, Purdue University
B.S. 1988, Health Physics/Industrial Hygiene, Purdue University
A.A.S. 1983, Nuclear Power Technology, Terra Technical College

PROFESSIONAL CERTIFICATION

American Board of Health Physics

HONORS AND AWARDS

2002 Health Physics Society Elda E. Anderson Award Recipient

Honor Societies:

Phi Kapa Phi National Honor Society
Eta Sigma Gamma Honor Society
Golden Key National Honor Society

Fellowships and Scholarships:

DOE Environmental Restoration and Waste Management Fellowship
I.N.P.O. Graduate Fellowship & I.N.P.O. Undergraduate Scholarship
Health Physics Society Fellowship
D.C. Cook Scholarship/Internship Award

PUBLICATIONS (Peer reviewed journal articles) Total of 55 Publications Since 1995

A Monte Carlo Investigation of Electron Backscattering. **Radiation Protection Dosimetry** (2001), C. Frujinoiu and R.R. Brey.

Investigation of Irradiated Soil Byproducts, **Waste Management**, R.R. Brey, R. Rodriguez, J.F. Harmon, P. Winston, 21 (2001) 581-588

ISU Health Physics M.S. Program Self-Study Report

Increasing PCB Radiolysis Rates in Transformer Oil, **Radiation Physics and Chemistry**, Bruce J. Mincher, Richard R. Brey, Rene G. Rodriguez, Scott Pristupa, Aaron Ruhter, *in press*

Methods to Simultaneously Improve PCB Radiolysis Rates in Transformer Oil and to Close the Chlorine Mass Balance, **Environmental Science and Technology**, Vol. 34, No 16, pp. 3452-3455 (2000). B.J. Mincher, R.C. Curry and R.R. Brey.

Methods to Simultaneously Improve PCB Radiolysis Rates in Transformer Oil and to Close the Chlorine Mass Balance, Bruce J Mincher, Randy C. Curry, R. R. Brey **Environmental Science and Technology** Vol. 34, No. 16, 2000 pp 3452-3455

Evaluation and Optimization of a Proportional Counter-based Detector System for Detection of High Energy Beta Particles with Application to Strontium-90 Surface Contamination, K. T. S. Islam, R. Brey, T. Gesell, L. Johnson, C. McIsaac **Radiation Protection Management** May/June 2000 Volume 17, No. 3 , p 23.

Radiocolloids in Leachate from the NRC Field Lysimeter Investigations; R.R. Brey, T. Butikofer, J.W. McConnell, and R.D. Rogers, **Waste Management**, Vol. 18 No. 1 pp 39-53, 1998

An Evaluation of ²²²Rn Concentrations in Idaho Ground Water; L.R. Paulus, T.F. Gesell, R.R. Brey, **Health Physics** Vol. 74 No. 2, February 1998.

Review of Lead Decontamination Products Treatability Report - EET TechXtract, Brey and Paulus **Radiation Protection Management**, Vol. 14, No. 3, May/June 1997, p 53.

Estimation of Exposure Rates to Workers from Recycled Radioactively Contaminated Steel Disposal and Storage Containers; R.R. Brey, T.D. Taylor, T.F. Gesell, **Radiation Protection Management**, Volume 12, No. 5 (September/October 1995), pp. 38-50

A Preliminary Investigation of the Existence of Radiocolloids in Leachate from the Epicor-II Resin/Linear Lysimeter Project; R.R. Brey, J.W. McConnell, R.D. Rogers, T.M. Sullivan. **Waste Management**, Vol. 14 No. 7 pp 581-588, 1994.

Average Beta Energy Estimation, R.R. Brey, G. Gibbons, L. Paulus, K. Claver, P. Jenkins, J. Cassidy, **Radiation Protection Management**, July/August 1998

Analysis of Ore Samples Employing Photon Activation of the Metastable States of Gold and Silver; A.P. Tonchev, J.F. Harmon, R. Brey, **Nuclear Instrumentation & Methods in Physics Research -Section A** 422 (1999) 926-928

Characterization of Radioactive Waste N13.50 Standard, J.M. Hylko, B. Bowman, R. R. Brey, R. Landolt, C.D. Massey, J.E. Riley, M.H. Shanks, M.A. Smith, D.P. Taggart, R. Thacker, S. Voris, J.R. Wachter, Draft **ANSI Standard** currently under ANSI Review

Most recent Proceedings

Radiation Shielding Considerations for Drinking Water Facilities Using an Irradiation Treatment Process **12 Annual Biennial RPSD Topical Meeting**. Sante Fe, New Mexico, April 2002

The Possibility of Photon Activation Analysis of Radionuclides at Environmental-Levels; R. Brey, F. Harmon, D. Wells, A. Tonchev. *Replicate Publication* **ICONE6 Proceedings June 1998**

The Possibility of Photon Activation Analysis of Radionuclides at Environmental-Levels; R. Brey, F. Harmon, D. Wells, A. Tonchev. *Replicate Publication* **Seventh International Conference on Low Level Measurements of Actinides and Long-Lived Radionuclides in Biological and Environmental Samples** September, 1998

ISU Health Physics M.S. Program Self-Study Report

Douglas P. Wells

Idaho State University

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Phone: 208-236-3986, E-mail: WELLS@PHYSICS.ISU.EDU

Education and Professional Certifications:

CHP, American Board of Health Physics, 1997

Ph.D., Experimental Nuclear Physics, University of Illinois, 1990

M.S., Physics, University of Illinois, 1985

M.S., Mathematics, University of Virginia, 1984

B.A., Physics, Rutgers University, 1982

Professional Positions:

2002-present: Associate Professor of Physics, (tenured), Department of Physics, Idaho State University, ID.

1997 - 2002: Assistant Professor of Physics, (tenure-track), Department of Physics, Idaho State University, ID.

1996 - 1997: Associate Professor of Health Physics, (non-tenure-track) Department of Physics, ISU, ID.

1993 - 1996: Radiation Health Physicist, Washington State Department of Health, Olympia, WA.

1990 - 1992: Post-Doctoral Research Associate, Department of Physics, University of Washington, Seattle, WA.

Experience and Interests:

Current research spans several areas of health physics and applied physics. These include nuclear waste assay and imaging using accelerator-based XRF and Positron Annihilation Analysis, environmental health physics, production of Compton-backscattered X-ray beams, and isomeric photo-nuclear physics, particularly in the areas of metal assays and non-exponential decay. I am currently funded for three projects. These are (as one of 5 Co-PIs) Applications of Radiation Science and Accelerator Technology, \$996,000, **Funded** July of 2001, Co-PI with Dr. Frank Harmon for a two-year \$150,000 grant for Compton Back-Scattered Photons: Development of an Intense Source of Polarized X-rays, **Funded** from August, 2000 to August 2002, and PI for a three-year \$180,000 grant to study Non-Destructive Assay and Imaging with Accelerator-based X-ray Fluorescence for Sub-Surface Science, **Funded** from September, 2000 to September 2003.

Selected Recent Publications:

 (There are a total of 53 publications since my arrival as a non-tenure-track faculty in 1996.)

J. L. Alvarez, R. Geddes, J. E. Rice, T. F. Gesell, and D. Wells, *Elemental Phosphorous Slag Exposure Study in Southeastern Idaho, USA*, 5th International Conference on High Levels of Natural Radiation and Radon, 2002.

D.P. Wells, D.P., F. A. Selim, J. F. Harmon, W. Scates, J. Kwofie, R. Spaulding, S.P. Duttagupta, J.L. Jones, T. White and T. Roney, *Development of Accelerator-Based X-ray Fluorescence for Large Sample Assay*, Advances in X-Ray Analysis, Volume 45 (2002).

F. A. Selim, D.P. Wells, J. F. Harmon, W. Scates, J. Kwofie, R. Spaulding, S.P. Duttagupta, J.L. Jones, T. White, and T.

Roney, *Doppler Broadening Measurements of Positron Annihilation Using Bremsstrahlung Radiation.*, Nuclear Instruments & Methods B, Vol. 192, p. 197, May 2002.

F. A. Selim, D.P. Wells, F. J. Harmon, J. Kwofie, R. Spaulding, G. Erickson, and T. Roney, *Bremsstrahlung -induced non destructive probes for chemical assays and defect analysis*, Accepted for publication in Nuclear Instruments & Methods A,

ISU Health Physics M.S. Program Self-Study Report

June 2002.

D.P. Wells, J.F. Harmon and R. Brey, *Radiation Research Opportunities and the Idaho Accelerator Center*, 2002 American Radiation Safety Conference and Exposition, HPS 47th Annual Meeting, Tampa, June 2002.

F. A. Selim, D.P. Wells, F. J. Harmon, J. Kwofie, R. Spaulding, G.Erickson, and T. Roney, *New positron annihilation spectroscopy techniques for thick samples*, Invited talk at the 7th international positron and positronium chemistry conference, July 2002, Knoxville, TN (Paper to be published in Radiation Physics & Chemistry, 2002).

F. A. Selim, D.P. Wells, F. J. Harmon, J. Kwofie, R. Spaulding, G.Erickson, and T. Roney, *Stress analysis using bremsstrahlung radiation*, Talk at the 51 Denver X-ray conference, July 2002, Co Spring, Co, Paper to be published in X-ray Analysis proceedings, July 2002.

F. A. Selim, D.P. Wells, F. J. Harmon, J. Kwofie, W. Scates, R. Spaulding, G.Erickson, S.A. Parke, S.P. Duttagupta, J.L.Jones, T. White and T. Roney, *Applications of nuclear isomers in subsurface research*, Paper to be published at Inland Northwest Research Alliance Subsurface Science Symposium,

ISU Health Physics M.S. Program Self-Study Report

- J. Kwofie, D.P. Wells, F. A. Selim, F. J. Harmon, S.P. Duttagupta, J.L. Jones, T. White and T. Roney , Sept. 2002. *Accelerator-based Waste Assays*, 2002 American Radiation Safety Conference and Exposition, HPS 47th Annual Meeting, Tampa, June 2002
- J. Kwofie, D.P. Wells, F. A. Selim, F. J. Harmon, S.P. Duttagupta, J.L. Jones, T. White and T. Roney, *Accelerator Based Subsurface Science Probes*, To be published in proceedings of the INRA Subsurface Science Symposium Boise, October 2002.J.
- Kwofie, D.P. Wells, F. A. Selim, F. J. Harmon, S.P. Duttagupta, J.L. Jones, T. White and T. Roney, *Bremstrahlung-Based Assays of Process and Waste Streams*, CAARI 2002: Seventeenth International Conference on the Application of Accelerators in Research and Industry, Denton, Texas, 2002.
- K. Chouffani, D.P. Wells, J.F. Harmon, J.L. Jones and G. Lancaster, *Laser-compton scattering from a 20 MeV electron beam*, Submitted to Nuclear instruments and methods in physics research A (2002).
- K. Chouffani, D.P. Wells, J.F. Harmon, J.L. Jones and G. Lancaster, *Laser-compton scattering as a potential electron beam monitor*, Presented at the International Beam Instrumentation Workshop, Brookhaven, NY (2002).
- D.P. Wells, K. Chouffani, J.F. Harmon, J.L. Jones and G. Lancaster, Development of a New, Tunable and Monochromatic X-ray Source, Talk at the 51

ISU Health Physics M.S. Program Self-Study Report

Denver X-ray
conference,
July 2002, Co
Spring, Co,
(Paper to be
published in
X-ray Analysis
proceedings),
July 2002.

- K. Chouffani, D.P. Wells, J.F. Harmon, J.L. Jones and G. Lancaster, *Laser-compton scattering from a 20-22 MeV electron beam*, Presented at the European Particle Accelerator Conference, June 3-7, 2002, Paris, France (2002).
- K. Chouffani, D.P. Wells, J.F. Harmon, J.L. Jones and G. Lancaster, *Laser-Compton scattering as a potential x-ray source and electron beam monitor*, Submitted to NIM A, 2002.
- K. Chouffani, D.P. Wells, J.F. Harmon, J.L. Jones and G. Lancaster, *Exotic X-ray Sources from Low-Energy Relativistic Electron Beams*, To be published in Proceedings of CAARI 2002.
- F. A. Selim, D.P. Wells, J. F. Harmon, J. Kwofie, G. Erickson, J.L. Jones, T. White, and T. Roney, *Bremsstrahlung-based Positron Annihilation Spectroscopy for Material Defect Analysis*, To be published in Proceedings of CAARI 2002.
- J. Kwofie, D.P. Wells, F. A. Selim, F. J. Harmon, S.P. Duttgupta, J.L. Jones, T. White and T. Roney, *Bremstrahlung-Based Assays of Process and Waste Streams*, To be published in Proceedings of CAARI 2002.
- Wade Scates, D.P. Wells, J.F. Harmon, *A Test of Non-Exponential Decay in Quantum Systems*, To be published in Proceedings of CAARI 2002.

ISU Health Physics M.S. Program Self-Study Report

	edings of CAA RI 2002.
M. Reda, J.F. Harmon, W. Scates and D.P. Wells, <i>Accelerator-Based photo-neutron sources for Sub-Critical Nuclear</i>	React ors, To be publis hed in Proce edings of CAA RI 2002.
J.F. Harmon, D.P. Wells, R. Brey, <i>Pure and Applied Research Opportunities at the Idaho Accelerator Center,</i>	To be publis hed in Proce edings of CAA RI 2002.
D.P. Wells, J.F. Harmon and M. Reda, <i>Cabinet-Safe, Portable Electron Linac Systems,</i>	To be published in Proceedings of CAARI 2002.
K. Chouffani, D.P. Wells, J.F. Harmon, J.L. Jones and G. Lancaster, <i>Laser-Compton experiments at the Idaho Accelerator</i>	Center, Worksh op on Novel Photon Sources From Relativistic Electron Beams, November 29 –30, 2001. Idaho Accelerator Center, Pocatello Idaho (2001).
F. A. Selim, D.P. Wells, F. J. Harmon, J. Kwofie, W. Scates, R. Spaulding, G. Erickson, S.A. Parke, S.P.	Duttgupta, J.L. Jones, T. White and T. Roney, <i>Development of Bremsstrahlung- based Positron Probe for Assay and Defect Analysis,</i> Published in Inland Northwest

ISU Health Physics M.S. Program Self-Study Report

Research
Alliance
Subsurface
Science
Proceedings,
Nov. 2001.

D.P. Wells, J.L. Jones, W.Y. Yoon and F. Harmon, " Cabinet-Safe" Study of 1-8 MeV Electron Accelerators, Nuclear Instruments and Methods in Physics Research **A 463**, 118 (2001).

D.P. Wells, J.F. Harmon, W.W. Scates and R. Spaulding, *A Test of the Exponential Decay Law by Photo-Production of Nuclear Accelerators*, 16th International Conference on the Application of Accelerators in Research and Industry CAA RI 2000, AIP Press, Denton, Texas (2001).

Chouffani, K., Wells, D.P., Harmon, J.F., *Optical Transition Radiation from Copper, Aluminum and Silicon Crystals*, Proceedings of the 21st ICFA Beam Dynamics International Conference on Colliding Beams, Brookhaven, NY, (2001).

Curriculum Vitae

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Professor of Health Physics and
Director, Technical Safety Office
Idaho State University
Campus Box 8106
785 South Eighth Avenue
Pocatello, Idaho 83209

(208) 236-3669 or 2350
FAX (208) 236-4649
gesell@physics.isu.edu

DUTIES

Teaching, research, and service in radiation protection and environmental science; Director of the ISU Environmental Monitoring Program; Radiation Safety Officer; responsible for management of campus radioactive and hazardous waste.

COURSES TAUGHT

Radiological Environmental Monitoring and Surveillance; Topics in Health Physics I & II; Accelerator Health Physics; Quantitative Methods in Physics; Non-ionizing Radiation Protection.

PREVIOUS EXPERIENCE

5/88-10/91 -- Director of the DOE Radiological and Environmental Sciences Laboratory (RESL) located on the Idaho National Engineering Laboratory (INEL) Site. Directed several programs related to protection of health and environment. These included: environmental sampling and analysis (surveillance) for the INEL and its environs (air, water, soil, vegetation, animals); analytical and radiochemistry; environmental, ecological and radio-ecological research; DOE laboratory accreditation programs in personnel dosimetry, bioassay and whole body counting; support of the Nuclear Regulatory Commission with radiochemical standards and

ISU Health Physics M.S. Program Self-Study Report

analyses; measurements in support of emergency response; oversight of programs in personnel radiation dosimetry, bioassay, and meteorology.

5/87-5/88 -- Deputy Assistant Manager for Nuclear Programs, DOE Idaho Operations Office. Served as Acting Assistant Manager for Nuclear Programs, supervised the Environmental Support Office, and managed the INEL environmental restoration program with its associated sampling and analysis. Nuclear Programs had responsibility for test reactors, nuclear fuel reprocessing, radioactive and hazardous waste management and technology development at the Idaho National Engineering Laboratory. The Environmental Support Office activity required close coordination with EPA and State regulatory programs.

5/81-6/87 -- Chief of the Dosimetry Branch, DOE Idaho Operations Office.

Developed and implemented operational and applied research and development programs in personnel and environmental radiation dosimetry as well as a DOE-wide accreditation program in personnel radiation dosimetry. Supervised the INEL personnel dosimetry program. Managed the development and implementation of a new dosimetry system and a new, computerized data acquisition, record-keeping and reporting system.

5/71-5/81 -- Assistant, then Associate Professor of Health Physics, University of Texas School of Public Health; Convener of the Environmental Sciences Discipline. Responsibilities included teaching, conducting research and consulting in radiation protection and environmental science.

EDUCATION

B.S. in physics from San Diego State University (6/65). M.S. (6/68) and Ph.D. (6/71) in physics (with specialization in radiation protection) from the University of Tennessee.

PROFESSIONAL ACTIVITIES

Associate Editor, Health Physics (1985-1990); chair, National Council on Radiation Protection and Measurements Hot Particle Committee (1988-present); member, International Commission on Radiological Protection Task Group on Skin (1989-1992); member, National Council on Radiation Protection and Measurements (1990-present); member, EPA/Industry Technical Work Group pertaining to the use of radioactive phosphorus slag in construction (1992-present); member, International Atomic Energy Agency Panel on Radon in the Workplace (1994-present); member, DOE Environmental Management Board "FUSRAP" Advisory Committee (1995-present); member, Environment, Safety & Health Panel of the University of California President's Council on National Laboratories (1995-present); member EPA Science Advisory Board, Radiation Advisory Committee (1996-present); member, Health Physics Society "NORM" committee (1996-present).

SPECIAL ASSIGNMENTS

Special assignments have included: consultant to EPA Office of Radiation Programs (1974-1980); consultant, President's Commission on the Accident at Three Mile Island (1979); DOE Idaho's Liaison to the Idaho State Government (1/89-6/89); member, Secretary of Energy's Special Team assessing environmental conditions at the Rocky Flats Plant (6/89-8/89); chair, DOE fatal accident investigation committee (5/91-6/91); administrative lead, INEL Historical Dose Evaluation (12/88-9/91); member, Monitoring Activities Review Panel for the Idaho National Engineering Laboratory Waste Management Program (1992).

REPRESENTATIVE PUBLICATIONS

Book

Merril Eisenbud and Thomas Gesell, *Environmental Radioactivity (from Natural, Industrial and Military Sources)*, Edition IV, Academic Press (1997).

Book Chapters

H. M. Prichard and T. F. Gesell. Radon in the environment, *in* *Advances in Radiation Biology*, Volume 11, Academic Press, New York, pp. 391-428 (1984).

T. F. Gesell, *Environmental Radioactivity*, *in* the *Encyclopedia of Environmental Biology*, Academic Press, pp 653-673 (1995).

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Attachment 9.....List of Grant and Contract Awards

ISU Health Physics M.S. Program Self-Study Report

List of AC2001 Requested Tables

Note: Not all Tables provided in this section of the report are specifically discussed in the body of the report. Instead this information is provided as appropriate.

Table I-1A	Undergraduate Level Curriculum (BS)
Table I-1B	Graduate Level Curriculum (MS)
Table I-2	Course and Section Size Summary
Table I-3	Faculty Workload Summary
Table I-4	Faculty Analysis
Table I-5	Support Expenditures
Table II-1	Faculty and Student Count for Institution
Table II-4	Supporting Academic Departments
Table II-5	Personnel and Students
Table II-6	Faculty Salary Data

ISU Health Physics M.S. Program Self-Study Report

Table I-1A. Undergraduate (Associate or Baccalaureate)
Bachelor of Science in Physics (Emphasis: Health Physics)

Year; Semester or Quarter	Course (Department, Number, Title)	Category (Credit Hours)			
		Math & Basic Sciences	Professional Program Topics	General Education	Other
s	Biol 202/202L Gen Zoology & Lab	x		x	
s	Bios 209 (BST) Gen Ecology	x			
y	Bios 301, 302 Anatomy & Physiology	x			
s	Bios 307 Radiobiology		x		
y	Chem 111, 112 Gen Chemistry	x		x	
s	Chem 102 Essentials Chemistry II	x		x	
s	CS 181 or CIS 220 Computer	x			
s	Engl 307 Professional Writing				x
s	Math 147 Precalculus	x			
s	Math 160 (BST) Brief Calculus	x		x	
s	Math 170 (APT) Calculus I	x		x	
s	Math 175 (APT) Calculus II	x			
s	Math 275 (APT) Calculus III	x			
s	Math 352 (APT) or Bios 315 (BST)	x			
y	Phys 111,112,113,114 (BST) Gen Ph	x		x	
y	Phys 211,212,213,214 (APT) Engr	x		x	
s	Phys 416 Intro Nuclear Measurement		x		
y	Phys 431, 432 Radiation Physics		x		
y	Phys 433, 434 External/Internal Dosimetry		x		
y	Phys 455, 456 Topics in H.P. I, II		x		
s	Phys 480 Health Physics Capstone		x		
s	Phys 492 Colloquium in Physics		x		

Note that instructional material and student work verifying course compliance with ABET criteria for the categories indicated above will be required during the campus visit.

ISU Health Physics M.S. Program Self-Study Report

Table I-2. Course and Section Size Summary
Bachelor's and Master's Degree in Physics (Health Physics Emphasis) 2001-2002

Course No.	Title	No. of Sections offered in Current Year	Avg. Section Enrollment	Type of Class1			
				Lecture	Laboratory	Recitation	Other
Phys 251	Introduction to Health Physics	1	4	90%		10%	
P h y s 411/511	Accelerator Health Physics	4	2	90%		10%	
P h y s 413/513	Fundamentals of Industrial Hygiene	4	2	90%		10%	
P h y s 416/516	Introduction to Nuclear Measurements	4	3	50%	50%		
P h y s 431/531	Radiation Physics I	2	3	80%		20%	
P h y s 432/532	Radiation Physics II	2	3	80%		20%	
P h y s 433/533	External Dosimetry	4	2	80%		20%	
P h y s 434/534	Internal Dosimetry	4	2	80%		20%	
P h y s 455/555	Topics in Health Physics I	2	2	60%		40%	
P h y s 456/556	Topics in Health Physics II	2	2	60%		40%	
P h y s 490/590	ABHP Certification	4	2	100%			
Phys 601	Quantitative Methods	1	10	80%	10%	10%	
Phys 605	Rad Enviro Monitoring & Surveillance	2	3	90%		10%	
Phys 610	Radiation Regulations	2	3	100%			

ISU Health Physics M.S. Program Self-Study Report

Table I-3. Faculty Workload Summary
Bachelor's and Master's Degree in Physics (Health Physics Emphasis)

Faculty Member	FT or PT ⁴	Classes Taught (Course No./Credit Hrs.) Term and Year ¹	Total Activity Distribution ²		
			Teaching	Research	Other ³
Richard R. Brey	FT	Spring Semester 2000	89%	10%	1%
		Phys 321 (2)			
		Phys 332/532 (3)			
		Phys 416/516 (3)			
		Phys 434/534 (3)			
		Phys 459 (3)			
		Fall Semester 2000	55.6%	40%	4.4%
		Phys 251 (1)			
		Phys 331/531 (3)			
		Phys 433/533 (3)			
		Phys 459 (3)			
		Spring Semester 2001	95%	4%	1%
		Phys 300/321 (4)			
		Phys 332/532 (3)			
		Phys 416/516 (3)			
		Phys 434/534 (3)			
		Phys 459 (3)			
		Phys 499/599 (3)			
		Fall Semester 2001	3.8%	91.2%	5%
Phys 251 (1)					

ISU Health Physics M.S. Program Self-Study Report

Table I-3. Faculty Workload Summary

Bachelor's and Master's Degree in Physics (Health Physics Emphasis)

Faculty Member	FT or PT ⁴	Classes Taught (Course No./Credit Hrs.) Term and Year ¹	Total Activity Distribution ²		
			Teaching	Research	Other ³
Brey (cont.)		Phys 331/531 (3)			
		Phys 434/534 (3)			
		Spring Semester 2002	89%	10%	1%
		Phys 300/321 (4)			
		Phys 332/532 (3)			
		Phys 416/516 (3)			
		Phys 434/534 (3)			
		Phys 499/599 (3)			
Thomas F. Gesell	FT	Spring Semester 2000	30%	10%	60%
		Phys 456/556 (2)			
		Phys 459 (3)			
		Phys 605 (3)			
		Fall Semester 2000	30%	10%	60%
		Phys 455/555 (2)			
		Phys 601 (3)			
		Spring Semester 2001	30%	10%	60%
		Phys 456/556 (2)			
		Phys 459 (3)			
		Phys 605 (3)			

ISU Health Physics M.S. Program Self-Study Report

Table I-3. Faculty Workload Summary

Bachelor's and Master's Degree in Physics (Health Physics Emphasis)

Faculty Member (Name)	FT or PT ⁴	Classes Taught (Course No./Credit Hrs.) Term and Year ¹	Total Activity Distribution ²		
			Teaching	Research	Other ³
Gesell (cont.)		Fall Semester 2001	30%	10%	60%
		Phys 455/555 (2)			
		Phys 601 (3)			
		Spring Semester 2002	30%	10%	60%
		Phys 456/556 (2)			
		Phys 605 (3)			
Douglas Wells	FT	Spring Semester 2000	70%	25%	5%
		Phys 416/516 (3)			
		Fall Semester 2000	70%	25%	5%
		Phys 499/599 (3)			
		Phys 610 (3)			
		Spring Semester 2001	70%	25%	5%
		Phys 416/516 (3)			
		Fall Semester 2001	65%	25%	10%
		Phys 610			
		Spring Semester 2002	65%	25%	10%
		Phys 490/590 (3)			

ISU Health Physics M.S. Program Self-Study Report

Table I-4. Faculty Analysis

Department of Physics (Health Physics Program)

Name	Rank	Type of Academic Appointment TT, T, NTT	F T o r P T	Highest Degree	Institution from which Highest Degree Earned & Year	Years of Experience			Professional Registration	Level of Activity (high, med, low, none) in:		
						Govt./Industry Practice	Total Faculty	This Institution		Professional Society	Research	Consulting/Summer Work in Industry
Richard Brey	P	T	F T	Ph.D.	Purdue University Ph.D. 1994	4 years	8 years	8 years	C.H.P.	High	High	Medium
Thomas Gesell	P	T	F T	Ph.D.	University of Tennessee Ph.D. 1971	11 years	21 years	11 years		High	Medium	Medium
Douglas Well	P	T	F T	Ph.D.	University of Illinois Ph.D. 1990	6 years	6 years	6 years	C.H.P.	Medium	High	None

ISU Health Physics M.S. Program Self-Study Report

Table I-5. Support Expenditures Department of Physics (Health Physics Program)%

	1	2	3
Fiscal Year	2000 - 2001	2001 - 2002	2002 - 2003
Expenditure Category			(10% decrease)
Operations (1) * (not including staff)	\$8,815.80	\$8,948.10	\$8,858.62
Travel (2) **	\$707.40	\$717.90	\$646.11
Equipment (3)	\$16,171.50	\$28,923.40	\$6,433.56
(a) Institutional Funds	\$7,045.50	\$7,148.40	\$6,433.56
(b) Grants and Gifts (4)	\$9,126.00	\$21,775.00	Unknown (TBD)
Graduate Teaching Assistants	\$15,244.40	\$16,231.97	\$14,608.78
Part-time Assistance (5) (other than teaching)	\$1,107.30	\$1,157.10	\$1,041.39
Faculty Salaries	\$200,907.20	\$211,432.00	\$193,901.76

% Figures reflect 30-33% of total Departmental budget for BS & MS Programs.

* Average balance based on Health Physics faculty representation in the department.

** All travel for Health Physics faculty is facilitated through grants and contracts.

Notes:

1. Categories of general operating expenses
2. Institutionally sponsored, excluding special program grants.
3. Major equipment, excluding equipment primarily used for research. Note that the expenditures (a) and (b) under "Equipment" should total the expenditures for Equipment. If they don't, please explain.
4. Including special (not part of institution's annual appropriation) non-recurring equipment purchase programs.
5. Do not include graduate teaching and research assistant or permanent part-time personnel.

ISU Health Physics M.S. Program Self-Study Report

Table II-1 Faculty and Student Count for Institution
School Year: 2001[^]

	HEAD COUNT		FTE	Total Student Credit Hours
	FT	PT		
Tenure Track Faculty	380			
Other Teaching Faculty (excluding student assistants)	118	140*		
Student Teaching Assistants	0	260	88.4**	
Undergraduate Students	7535	3632	8866	117,727***
Graduate Students	663	1603	972.2	11,651
Professional Degree Students	207	23	129.7	1,556

[^]Data provided by Institutional Research: Dr. John Jones, ext.4431 and Lori Chatfield, ext. 3762

*May have tenured and tenure track faculty included

**Based on .34 assumed FTE

***Academic only

ISU Health Physics M.S. Program Self-Study Report

Table II-4 Supporting Academic Departments
For Academic Year: 2002

Department or Unit	Full-time Faculty Head Count	Part-time Faculty Head Count	FTE Faculty	Teaching Assistants	
				Head Count	FTE
Chemistry	11	3	12.5	10	5
Biology	42	7	45.5	21	10.5
Math	17	25	54.5	6	3
English	29	42	50	11	5.5
Engineering (CS)	18	13	24.5	7	3.5
Business (CIS)	8	1	8.5	5	2.5

ISU Health Physics M.S. Program Self-Study Report

Table II-5 Personnel and Students
 Bachelor and Master Degree in Physics (Health Physics Emphasis)
 Year F 2001

	HEAD COUNT		FTE (see Note 1)	RATIO TO FACULTY (See Note 2)
	FT	PT		
Administrative	0			
Faculty (tenure track)	3		3	
Other Faculty (excluding student assistants)		1	0.5	
Student Teaching Assistants	3		3	.857
Student Research Assistants	4		4	1.142
Technical/Specialists	2		2	.571
Office/Clerical Employees		1	.75	.214
Others (Post Docs)	1		1	.285
Undergraduate Student enrollment includes Freshman & Sophomores	5	5	7.5	2.142
Graduate Student enrollment	12	21	22.5	6.428

Notes:

ISU Health Physics M.S. Program Self-Study Report

1. For student teaching and research assistants, 1 FTE equals 20 hours per week of work (or service).
2. Equals FTE in each category divided by total FTE faculty.

Table II-6 Faculty Salary Data
 Idaho State University
 Academic Year Fall 2001

For the Institution as a Whole
 Based on Nine-Month Contract

	Professor	Associate Professor	Assistant Professor	Instructor
Number				
High	\$98,405	\$83,115	\$91,367	\$62,358
Mean	\$63,086	\$52,388	\$45,047	\$38,381
Low	\$29,225	\$32,032	\$36,005	\$26,270