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 Baccalaureate 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 - BS

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 37^{th} 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.

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 scientists 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 an 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 the 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 B.S. Program at Idaho State University that awards baccalaureate 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
B.S. in Physics
Indication on Transcript
B.S. in Physics
Emphasis: Health Physics

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 Undergraduate Health Physics Program at Idaho State are offered exclusively during the fall and spring semester. Undergraduate 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 normal program practice when in mode II is for instructors to broadcast the class 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 immediately following a closed-circuit two-way broadcast in which the 50-minute plus transit 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 undergraduate students have completed their B.S. degree within four years. This is highly dependent on a student's individual initiative relative to completion of a degree. All required upper division course work, by design, may be completed within two years for those students who have adequate lower division undergraduate preparation. There are a few instances where completion of a B.S. degree requires substantially longer than the four year expected time. The primary reasons for longer times to graduation are:

> Inadequate academic preparation of incoming freshmen in mathematics, English, and the physical sciences; this requires the students to take preparatory course work at the university prior to completing calculus, English composition, chemistry, physics or biology.
>
> The rigor of the health physics curriculum within the department of physics requires a substantial amount of scholarship, therefore, even students with appropriate academic preparation choose to tailor their course load in such a way that class completion stretches beyond four 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 four years.
>
> The academic retooling of students who transfer into ISU's program from other disciplines or from other institutions often subjects students to longer completion times for a B.S. degree associated with curriculum mis-match. These students often end up with extra, non-applicable credits that cannot be used toward their B.S. degree.

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 <u>considers acceptance of both traditional and transfer students</u>, <u>validates courses taken for credit elsewhere</u>, and <u>assures that all students meet all program requirements.</u> The ISU specific approach to each of these sub-requirements are considered in this section as subtitled.

Criterion 1 also requires that <u>the institution evaluates, advises, and monitors students</u> 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 <u>Program Goals and Educational Objectives</u> as student and alumni evaluation processes are central to understanding and assessing the accomplishment of programmatic outcomes and consequently programmatic goals.

A. <u>Student Trends</u>

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

> A) First time freshmen who enter the university with the intention of entering health physics directly from high school, the military, or post-high-school employment. These individuals, according to university administrative procedure, must first obtain 24 credits, and not be on probation, before declaring a major.
>
> 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) Transfer students admitted from other colleges or universities. Frequently this includes students entering from two year junior colleges and technical programs where they may have obtained certificates or associate degrees in some applied science. This occasionally includes those with baccalaureate degrees from technical, engineering, or non-physical science programs such as those students who have studied radiographic sciences.

B. Acceptance and Placement of Traditional Students

Entering freshmen are allowed to register for courses in mathematics, English writing, and chemistry in accordance with general university policies on academic placement. This is the initial evaluation and advising that the students receive that is generally carried out by the Supplemental Academic Advising Center (S.A.A.C.) within Enrollment Planning. The placement guidelines are summarized below.

Placement in English writing classes is based on each student's SAT, COMPASS, or ACT scores:

SAT	ACT	COMPASS	Recommended Course
≤440	≤ 17	≤67	English 090 Developmental Writing
450-560	18-24	68-94	English 101 Intro. To College Writing
570-690	25-30	95-99	English 102 College Writing & Rhetoric
≥700	≥31	-	Exempt (credit awarded for ENGL 102)

If SAT or ACT testing scores are not available, the student is placed in the appropriate English Writing class according to testing results from the "COMPASS" writing examination administered by the University Testing Center. Students scoring greater than 3 on the Language & Composition Advanced Placement Test receive 3 credits for ENGL-101. Those scoring a 5 receive 3 credits for ENGL-101 and 3 credits for ENGL-102. Students scoring a 3 on the Literature & Composition Advanced Placement Test receive 3 credits for ENGL-101. Those scoring a 4 receive 3 credits for ENGL-101 and 3 credits for ENGL-110. Those scoring a 5 receive 3 credits for ENGL-101, 3 credits for ENGL-110 and 3 credits for ENGL-102.

Placement in mathematics classes is also based on each student's SAT, COMPASS, or ACT scores:

SAT	ACT	Completion of	COMPASS			Recommended Course
			A	B	C	
No Prerequisites.......						Math 015
250	12	Math 015	53	30	25	Math 025
420	17	Math 025	-	40	33	Math 108
460	19	Math 025	-	45	37	Math 123, 127
540	23	Math 108	-	61	49	Math 130, 143, 147, 253
620	27	Math 143	-	84	63	Math 144, 157, 160, 230
650	29	Math 144 or 147			71	Math 170

COMPASS: A = Pre-algebra, B = Algebra, C = College Score

Placement in chemistry classes is based upon the following performance criteria:
Eligibility to enroll in Chem 111 (General Chemistry I) requires that the student either

1) Earn a 3 or better on the Chemistry Advanced Placement Test or
2) Have completed Math 143 or Math 147.

C. Acceptance and Placement of Transfer Students

The placement of transfer students into the Health Physics Program follows university guidelines in regard to acceptance of transfer credits from other higher-education institutions. To be admitted into the university, transfer students must present a cumulative grade point average (GPA) of at least 2.0 for all college level study attempted in all accredited colleges attended. Applicants with fewer than 14 semester hours of transfer credit must meet both freshman and transfer admission requirements, including submission of the required test scores.

Upon admission of a transfer student, all credits earned or attempted and all grades received in college-level courses at accredited institutions are evaluated, then core-curriculum equivalence decisions are made by the Registrar's Office. The applicability of these transfer credits to the student's program of study is determined within the physics department. No grade points for this work are included in the computation of the student's GPA at Idaho State University. Transfer credit from non-U.S. institutions is recorded with grades of pass-fail only. All transfer credits are recorded on the student's permanent record after the student is officially registered. The Registrar's Office provides the department with a listing of the accepted transfer credits. When questions arise over whether a certain transfer course will substitute for a required course in the undergraduate health physics curriculum, the health physics program director makes a decision after evaluating the content of the external course based upon an interview with the student or examination of pertinent information about that course such as class notes, published college catalog information, or discussion with the course instructor. This decision evaluates if the material learned in the class being considered is consistent with the goals and objectives of the required course. Should ambiguities exist with regard to the class after the evaluation conducted by the Health Physics Program Director, then the student is asked to sit for the final examination last offered in the required class. The student must pass this examination by a score greater than 70 percent in order for the transfer course to be substituted for a required course in the Health Physics curriculum. Under this circumstance the required course is waived. This happens infrequently, and generally only with the first course in the core sequence. If the student is successful in this pursuit, a memo describing the decision is placed in the student's departmental file.

When a course has a prerequisite, students must earn a passing grade in the prerequisite class, or obtain permission of the instructor before being allowed to participate. Course instructors are provided with computer generated reports listing the students enrolled in each course and their status regarding prerequisites. It is the responsibility of the instructor to assess students with respect to prerequisite requirements. Prerequisites are assigned to classes to prevent students from enrolling in classes in which they are unlikely to succeed without pre-developed skills or understanding of particular topics. Course instructors are in the best position to assess a student's likelihood of success and hence the ultimate decisions about prerequisite satisfaction is left to the instructor.

There were two courses previously required in the undergraduate curriculum, Phys-251 Introduction to Health Physics and Phys-459 Practicum in Health Physics, which could have been waived based on the students discipline-specific life experience. As examples, students who had been employed as health physics technicians, research assistants, or had been discharged from military service where they had performed health physics technician responsibilities such as United States Navy ELTs were routinely waived through these two courses at the discretion of the program director. However, these two classes have recently been removed from the list of core courses. The Phys-251 class was intended to serve as a 1 credit recruitment class to bring students into the major by describing the various responsibilities, challenges, and issues facing the health physics professional. This class suffered from low enrollments and apparently was not achieving its intended goal. Phys-459, Practicum in Health Physics has been modified. It is now the Health Physics Capstone course and serves as an opportunity for students to integrate their didactic experiences. The individual project that each student is expected to complete may include a practicum experience and must be focused upon a specific professional experience, at least one of the ISU Health Physics faculty must collaborate on the project to assure an appropriate experience is achieved.

D. Program Requirements

The ISU Health Physics Program has two possible curriculum tracks: an Applied Physics Track (APT), and a Bioscience Track (BST). A student may follow either track depending upon their interest. The curriculum requirements for the two tracks are listed below.

A student may substitute the APT requirements, or even more rigorous courses, for mathematics, physics, or statistics into the BST track. All students who expect to graduate with baccalaureate degrees in physics with an emphasis in health physics must meet the following criteria:

1. Earn a cumulative GPA of 2.0 or higher;
2. Earn a minimum of 80 core credits as prescribed by the health physics BST curriculum, or earn a minimum of 87 core credits as prescribed by the health physics APT curriculum.
3. After completing 88 semester credits, transfer students must earn at least 32 credits in ISU courses;
4. Meet the following general education requirements:
    - Goals 1, 2, and 3
    - Twelve credit hours in the physical or biological sciences
    - Two of the Goals numbered 6, 7, and 8
    - Three of the Goals numbered 9, 10A or 10B, 11, and 12

Idaho State University Undergraduate Health Physics Program APT and BST Tracks Core Curriculum

BST

FIRST YEAR
CHEM 111 General Chem I
CHEM 112 General Chem II
BIOL 202 General Zoology
BIOL 202L General Zoology Lab
MATH 147 Precalculus
MATH 160 Brief Calculus

SECOND YEAR
PHYS 111 Gen Phys
PHYS 113 Gen Phys Lab
PHYS 112 Gen Phys
PHYS 114 Gen Phys Lab
BIOS 209 General Ecology
CHEM 102 Essentials Chem II

THIRD YEAR
PHYS g431 Radiation Physics I
PHYS g432 Radiation Physics II
PHYS 416 Intro Nuc. Measurements
BIOS 301 Anatomy & Physiology
BIOS g302 Anatomy & Physiology
BIOS 307 Radiobiology
BIOS 315 or MATH 352 Statistics
CS 181 or CIS 220 Computer Prog.

FOURTH YEAR
PHYS g433 External Dosimetry
PHYS g434 Internal Dosimetry
PHYS g455 Topics in HP
PHYS g456 Topics in HP II
PHYS g492 Colloquium in Physics 1st
PHYS g492 Colloquium in Physics 2nd
ENGL 307 Professional Writing
PHYS 480 Health Physics Capstone 1st or 2nd

APT

FIRST YEAR
CHEM 111 General Chem I
CHEM 112 General Chem II
BIOL 202 General Zoology
BIOL 202L General Zoology Lab
MATH 147 Precalculus
MATH 170 Calculus I

SECOND YEAR
PHYS 211 Engr Phys I
PHYS 213 Engr Phys Lab
PHYS 212 Engr Phys II
PHYS 214 Engr Phys Lab
MATH 175 Calculus II
MATH 275 Calculus III
CHEM 102 Essentials Chem II

THIRD YEAR
PHYS g431 Radiation Physics I
PHYS g432 Radiation Physics II
PHYS 416 Intro Nuc. Measurements
BIOS 301 Anatomy & Physiology
BIOS 307 Radiobiology
BIOS 315 or MATH 352 Statistics
CS 181 or CIS 220 Computer Prog.

FOURTH YEAR
PHYS g433 External Dosimetry
PHYS g434 Internal Dosimetry
PHYS g455 Topics in HP
PHYS g456 Topics in HP II
PHYS g492 Colloquium in Physics 1st
PHYS g492 Colloquium in Physics 2nd
ENGL 307 Professional Writing
PHYS 480 Health Physics Capstone 1st or 2nd

A “g” indication proceeding a course number indicates that the course is offered as a dual level upper division and graduate course. Graduate students in these courses typically are asked to complete longer examinations with different problem point-weights or some such similar strategy to enhance the rigor and performance expectations in the class. The “goal system” used by Idaho State University is a means to provide each ISU bachelor degree recipient with a foundation for advanced college work. Some goals are met through specific courses while other goals may be met by accomplishing one of several prescribed course options.

The 12-ISU goals and their course requirements are summarized in Table One:

Table One

Goal	Required credit hours	Courses
#1 To express ideas in clear, logical, grammatically correct written English.	6	ENGL101, 102
#2 To express ideas clearly, correctly, and persuasively in spoken English.	2	COMM 101*
#3 To gain understanding of mathematics as a language in which to express, define, and answer questions about the world.	3- 4	MATH123, 127, 130, 160, 170, 253
#4 To understand how the biological sciences explain the natural world.	4	BIO 100&100L, 202&202L, 203&203L, 205
#5 To understand how the physical sciences explain the natural world.	4	** CHEM 100, GEOL 100&100L, 115 & 115L, PHYS 100, 152&153
#6 To understand the creative process, the aesthetic principles, and the historic traditions of one or more of the fine arts.	3	AMST/MUSC 106, AMST/ART/MC 210, ART 100, 101, 102, ENGL/THEA 126, MUSC 100, 108, DANC 201 THEA 10, HUM 101 &102
#7 To understand how major works of literature explore the human condition and examine human values.	3	***ENGL 110, 115, 257, 258 HUM 101&102
#8 To understand how major philosophies influence human thought and behavior.	3	PHIL 101 or two of either: PHIL 220, 230, 305, 315, 325, 400, 410, 420, 430, 450, 460 ENG/PHIL 440

Con't

Goal	Required credit hours	Courses
#9 To understand the history and culture		

of the United States.	3	one of: AMST 200, AMST/HIST 111, 112or two of: HIST 311, 315, 317, 319 HIST/AMST 225, HIST/AMST/ANTH 258
#10A To understand culture other than that of the United States.	3	one of: ANTH 237, AMST/ANTH 238, HIST 101, 102, 251, 252, 254, 255 LANG 207, or two of: HIST 221, 223, 323, 326, 352, 360, 375, 382, 443, 444, 446, 448, ANTH/AMST 220, SOC 450
#10B To develop communication skills in a foreign language and an understanding of its cultural context.	8	FREN 101&102, 201&202 GERM 101&102, 201&202 LATN 101&102, 201&202 RUSS 101&102,201&202 ANTH/SHOS 101&102, 201&202 SPAN 101&102, 201&202 LANG 101&102, 201&202
#11 To understand how political and/or economic organizations, structures, and institutions function and influence human thought and behavior.	3	one of: ECON 100, 201, 202 AMST/POLS 101, Or two of: POLS 301, 403, 404
#12 To understand how people function within a society.	3	ANTH 101, PSYC 101, SOC 101, SOC 102

*Students may also pass a proficiency examination administered by the Department of Communication and Theater to accomplish this goal.

** Alternate sequences for this goal include: (Choice of one sequence)
CHEM 101 & 102, or CHEM 111 & 112, or CHEM 101 & 112, or CHEM 102 & 111
PHYS 111, 112, 113, 114, or PHYS 211, 212, 213, 214, or PHYS 111, 112, 213, 214, or PHYS 211, 212, 113, 114

*** Alternate sequences for this goal include: (Choice of two courses within sub group)
ENGL 211, 267, 268, 321, or
ENGL/AMST 227, 278

The Health Physics Program views the accomplishment of the specified combination of the general education requirement curriculum to be entirely appropriate to the university general education goals. Students are given the freedom to compose their own curriculum path from within these options and by so doing accomplishing the umbrella goals in a way that best fits their own aspirations and interests.

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 General Education goals required by Idaho State University are reviewed periodically. The next review is scheduled to begin during the fall semester of 2002.

The ISU approach to general education goals is entirely consistent with several accreditation systems and is influenced by a university-wide outcomes assessment system. As taken directly from the Idaho State 2002-2003 Undergraduate Catalog, page 7:

> *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

The university holds membership in numerous organizations which have specific academic requirements. Among these are the American Association of University Women, the Council of Graduate Schools in the United States, the Western Association of Graduate Schools, the National Commission on Accrediting, and the American Association of State Colleges and Universities.

All undergraduate academic programs at four year public institutions in Idaho are required to assess student learning in the major and general education programs. Similar requirements for assessment also appear in the new guidelines issued by the Northwest Association of Schools and Colleges which provides ISU's institution-wide accreditation.

Idaho State University's goal is to encourage students to develop abilities and acquire knowledge that will be of lasting benefit in their personal and professional lives. To ensure that this goal is met, a program of student outcomes assessment has been implemented to improve the teaching and learning process.

Comprehensive information that includes student performance and student opinion is vital to the success of the assessment program. To provide this information, undergraduate students in the academic division may be asked to participate in a variety of assessment activities which may include formal and informal examinations, interviews, surveys and follow-up studies after graduation.

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

The university assures that all students meet all program requirements in the following *ways:*

(1) The Registrar's Office audits the accomplishments of each student toward meeting these general education requirements. Students can request at any time that the Registrar's Office audit their progress in accomplishing the general education requirements. Students are informed that they are responsible for coordinating the accomplishment of their general education requirements with the Registrar's Office. Through this mechanism, students are monitored to assure they have accomplished all of the university's General Education Goals.

(2) 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. Attachment One provides example copies of the type of forms maintained in the 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.

The primary tool used to evaluate student progress in the 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 their 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 Undergraduate Catalog.

Midterm grades are available at a date posted within the published university time schedule of classes (printed each semester) for all undergraduate students receiving a D or less in any particular class. Faculty academic advisors are notified of these situations shortly after the grade postings. Undergraduate 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, undergraduate students who do not achieve the cumulative GPA required for their rank (see below) 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 is 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 Undergraduate Catalog.

Students on academic probation who achieve a GPA of 2.0 or better during the next semester after being placed on academic probation, but whose cumulative GPA is still below the minimum required for that academic rank, remain on academic probation.

Disqualification cutoff by rank:

Rank by Credits Earned	Minimum ISU Cumulative GPA
0 - 25	1.75
26 and above	2.00

At the beginning of a student's final semester of the senior year, an application for graduation is filed with the Registrar's Office. This application prompts an audit of the student's transcript by the staff of the Registrar's Office to verify completion of the general education requirements and elective credits. An audit to verify the degree of a student's completion of the ISU Health Physics Program curriculum requirements is undertaken by either the department head or the program director. This audit considers the record of each class taken by the student and any approved documented deviations from specific curricular requirements placed in the student's departmental file. The result of this audit, if the student has successfully completed all required course work, is that the department head recommends to the Dean of the College of Arts and Sciences that the degree be awarded. Should the student's effort be remiss in completion of all the requirements, a formal letter is generated by the program director describing the situation to the student. A copy of this letter is maintained in the student's file. The degree is not awarded.

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

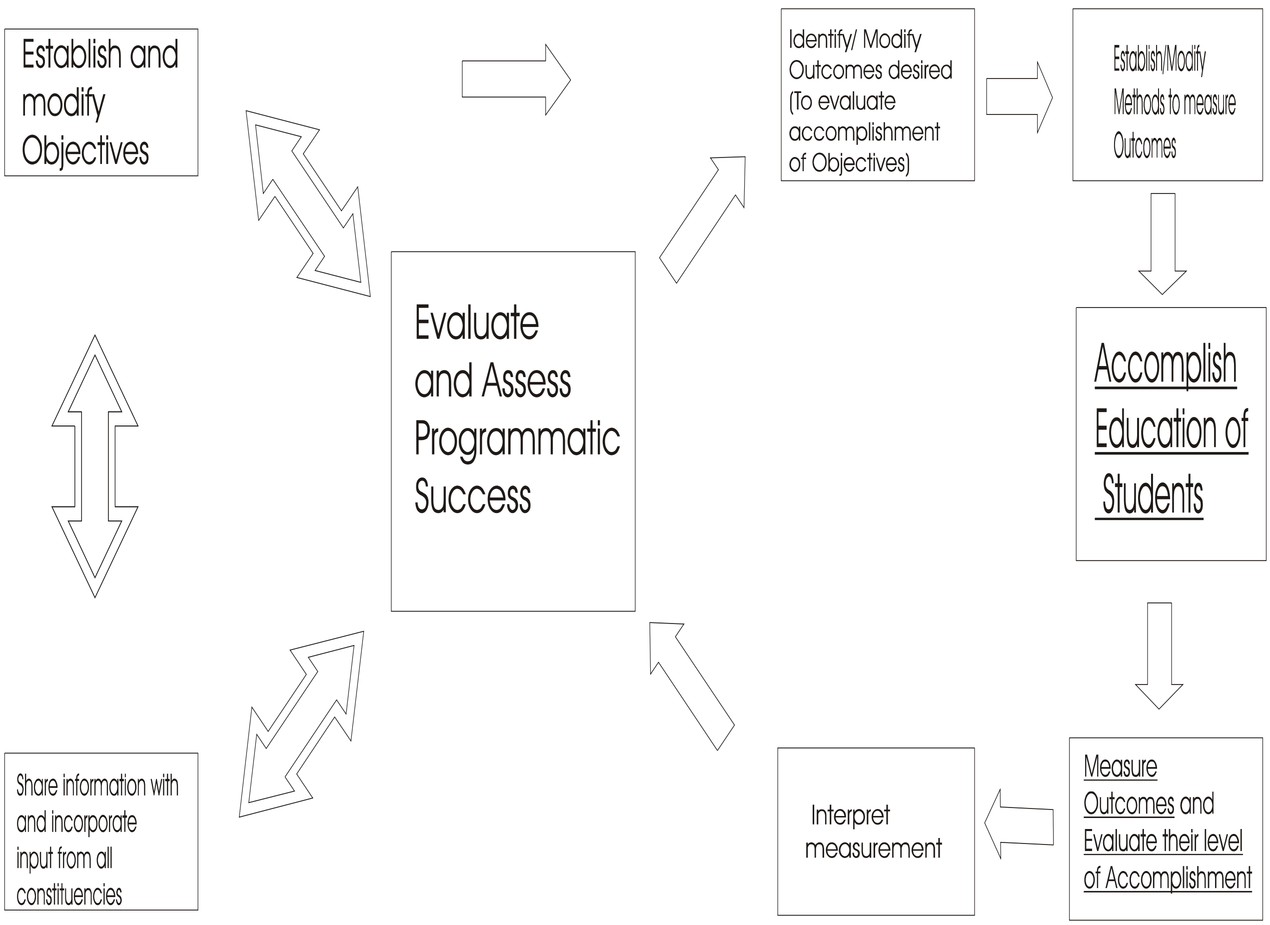
A. Overview

As part of the programmatic commitment to the Outcomes 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 the programmatic objectives. At these meetings, information is documented about how well the educational objectives of the program are serving the 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, student class evaluations, and cumulative outcome assessment examinations given annually to program seniors. All of these assessment tools are under constant review and revision in order to answer the questions arising from this review and continuous improvement/modification process. At least annually, a meeting with the program's advisory board is conducted where the activities of the monthly faculty assessment meetings are summarized with the intention of soliciting feedback from the board 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 board, objectives are developed, modified, or deleted with the goal of improving the program and enhancing the efficacy with 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.

Figure One, The Idaho State University Health Physics Program's Outcomes 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 consideration at 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. (Idaho State University Undergraduate Catalog 2001-2002 page 7)*

D. The Establishment and Continuous Development of Program Objectives

The educational objectives of the 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, i.e., alumni, alumni employer and student surveys, grades, etc., the supposition is that there is extensive constituency involvement in this process by which program objectives are determined and assessed.

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 outcomes 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 outcomes 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.

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

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
* Student 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
* Performance in work 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, Outcomes 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 was nevertheless based on what are currently referred to as "outcomes 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 and enhanced emphasis on student publications (See Attachment Three for a list of recent student papers and presentations)

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 ISU Health Physics Program is that it is a strong program with substantial depth meeting all of its programmatic objectives and fulfilling its mission .Items for improvement are detailed below and also in Attachment Five.

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
Objective 1: Broad, fundamental technical knowledge		
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)
Objective 2: Written and verbal communication skills		
Outcome Assessment Tools:		
* Students pass applicable communication courses	Satisfactory	No New Action
* Student laboratory reports	Satisfactory	No New Action
* Professional papers, presentations and posters	Satisfactory	No New Action
Objective 3: Professional judgement and capability to think critically		
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
Objective 4: Practical Experience in Solving Applied Health Physics Problems		
Outcome Assessment Tools:		
* Performance in work experience	Satisfactory	No New Action
* Surveys of students and alumni, alumni employers	Satisfactory	No New Action
Objective 5: The Ability to Work Independently		
Outcome Assessment Tools:		
* Surveys of students, alumni, and alumni employers	Satisfactory	No New Action
* Professional papers, presentations and posters	Satisfactory	No New Action
Objective 6: A Professional Work Ethic		
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

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 recurring trend that Faculty take too long to return 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 standard 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.

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 the 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 proof of the accomplishment of these objectives in conjunction with the course work required of the undergraduate students is offered in demonstration that ISU 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 Attribute

f) an understanding of professional and ethical responsibility

Correlating ISU Objective

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 the objectives was also provided in section 2 within the subsection:

> "F. Examples and Documentation that this Process is Working and Producing the Desired Results" and in **Attachment Five**

Further demonstration of Idaho State University's 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 Seven is the ISU Undergraduate Catalog course description for all classes included in the ISU Health Physics Undergraduate Program Core Curriculum and all Health Physics Technical Elective Courses.

The Idaho State University Health Physics Program 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 minimum standards are established. There are seven such elective courses which are continuously offered, one each semester in a 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.

Class	ISU Objectives	Criterion 3 attributes	Program Criteria
FIRST YEAR			
CHEM 111 General Chem I	1,2,5	a,b,c,e,k,h,d	NA
CHEM 112 General Chem II	1,2,5	a,b,c,e,k,h,d	NA
BIOL 202 General Zoology	1,2,5	a,b,c,e,k,h,d	NA
BIOL 202L General Zoology Lab	1,2,5	a,b,c,e,k,h,d	NA
MATH 147 Precalculus	1,2, 3,5	a,b,c,e,k,h,d	
MATH 160 (BST) Brief Calculus	1,2, 3,5	a,b,c,e,k,h,d	NA
MATH 170 (APT) Calculus I	1,2, 3,5	a,b,c,e,k,h,d	NA
SECOND YEAR			
PHYS 111 (BST) Gen Phys	1,2, 3,5	a,b,c,e,k,h,d	NA
PHYS 113 (BST) Gen Phys Lab	1,2, 3,5	a,b,c,e,k,h,d	NA
PHYS 112 (BST) Gen Phys	1,2, 3,5	a,b,c,e,k,h,d	NA
PHYS 114 (BST) Gen Phys Lab	1,2, 3,5	a,b,c,e,k,h,d	NA
BIOS 209 (BST) General Ecology	1,2, 3,5	a,b,c,e,k,h,d	NA
PHYS 211 (APT) Engr Phys I	1,2, 3,5	a,b,c,e,k,h,d	NA
PHYS 213 (APT) Engr Phys Lab	1,2, 3,5	a,b,c,e,k,h,d	NA
PHYS 212 (APT) Engr Phys II	1,2, 3,5	a,b,c,e,k,h,d	NA
PHYS 214 (APT) Engr Phys Lab	1,2, 3,5	a,b,c,e,k,h,d	NA
MATH 175 (APT) Calculus II	1,2, 3,5	a,b,c,e,k,h,d	NA
MATH 275, (APT) Calculus III	1,2, 3,5	a,b,c,e,k,h,d	NA
CHEM 102 Essentials Chem II	1,2, 3,5	a,b,c,e,k,h,d	NA

The reader may wish to refer to pages 22 and 23 to refresh themselves on the definitions of all numbered ISU objectives, Lettered Criterion 3 attributes, and numbered Health Physics Program Criteria.

Table Four (Cont.): Correlation among ISU Health Physics Program Core Curriculum, the ISU Program Objectives, Criterion 3 attributes, and Health Physics Program Criteria.

Class	ISU Objectives	Criterion 3 attributes	Program Criteria
THIRD YEAR			
PHYS g431 Radiation Physics I	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1)
PHYS g432 Radiation Physics II	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(2),(5)
PHYS g416 Intro Nuc. Measurements	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(3),(5)
BIOS 301 Anatomy & Physiology	1,2, 3,5	a,b,c,e,k,h,d	NA
BIOS g302 Anatomy & Physiology	1,2, 3,5	a,b,c,e,k,h,d	NA
BIOS 307 Radiobiology	1,2, 3,4,5	a,b,c,e,k,h,d	(2),(5)
Math 352 (APT) Statistics Or BIOS 315 (BST)	1,2, 3,5	a,b,c,e,k,h,d	NA
CS 181 or CIS 220 Computer Prog.	1,2, 3,5	a,b,c,e,k,h,d	NA
FOURTH YEAR			
PHYS g433 External Dosimetry	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(3),(4),(5)
PHYS g434 Internal Dosimetry	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(4),(5)
PHYS g455 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 g456 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 g492 Colloquium in Physics 1st	1,2, 3,4,5	a,f,g,h,i,j	(6)
PHYS g492 Colloquium in Physics 2nd	1,2, 3,4,5	a,f,g,h,i,j	(6)
ENGL 307 Professional Writing	1,2, 3,5	g,k	NA
PHYS 480 Health Physics Capstone 1st or 2nd	1,2, 3,4,5,6	a,b,c,d,e,f,g,h,i,j,k	(1),(2),(3),(4),(5),(6)

The reader may wish to refer to pages 23, and 23 to refresh themselves on the definitions of all numbered ISU objectives, Lettered Criterion 3 attributes, and numbered Health Physics Program Criteria.

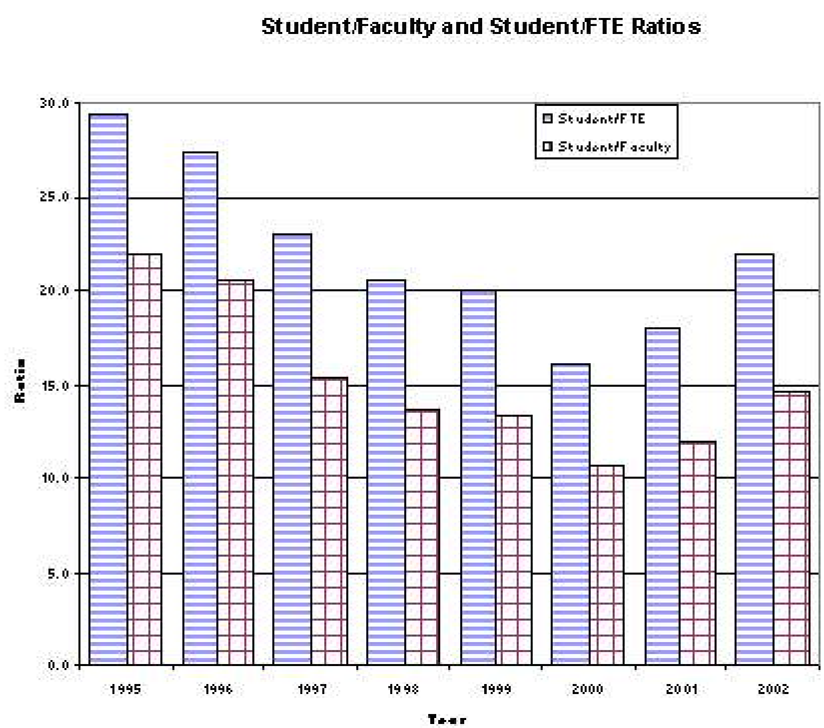
Table Five: Correlation among ISU Health Physics Program Technical Elective Courses, the ISU Program Objectives Criterion 3 attributes, and Health Physics Program Criteria.

Class	ISU Objectives	Criterion 3 attributes	Program Criteria
Health Physics Rotating Elective Courses			
PHYS g411 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 g412 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 g413 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 g417 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 g418 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 g419 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 g420 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)
Other Electives			
PHYS g499 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 g409 Intro. to Nuc. Phys.	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)

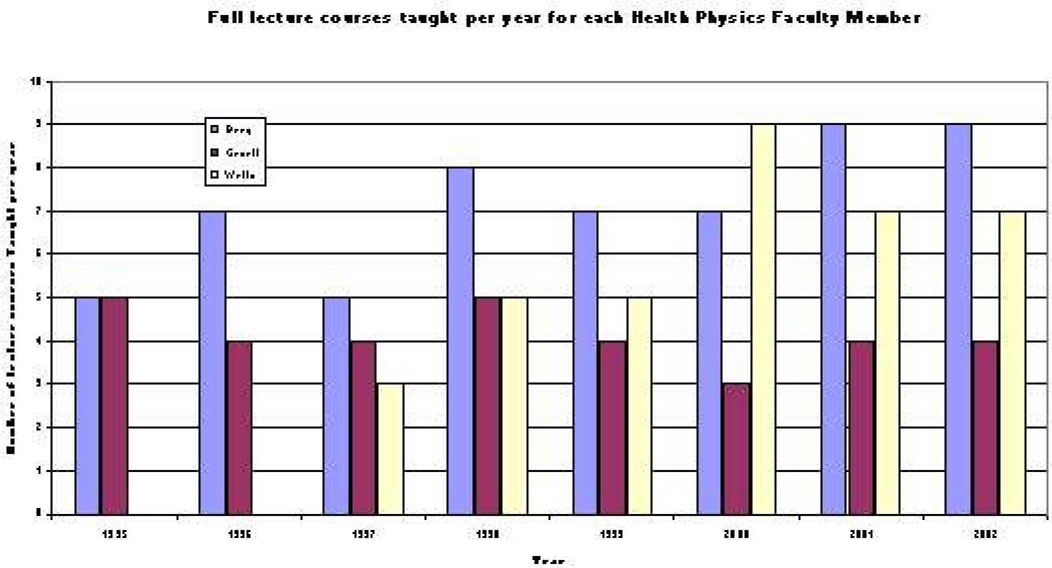
The reader may wish to refer to pages 33, and 34 to refresh themselves on the definitions of all numbered ISU objectives, Lettered Criterion 3 attributes, and numbered Health Physics Program Criteria.

5. Faculty

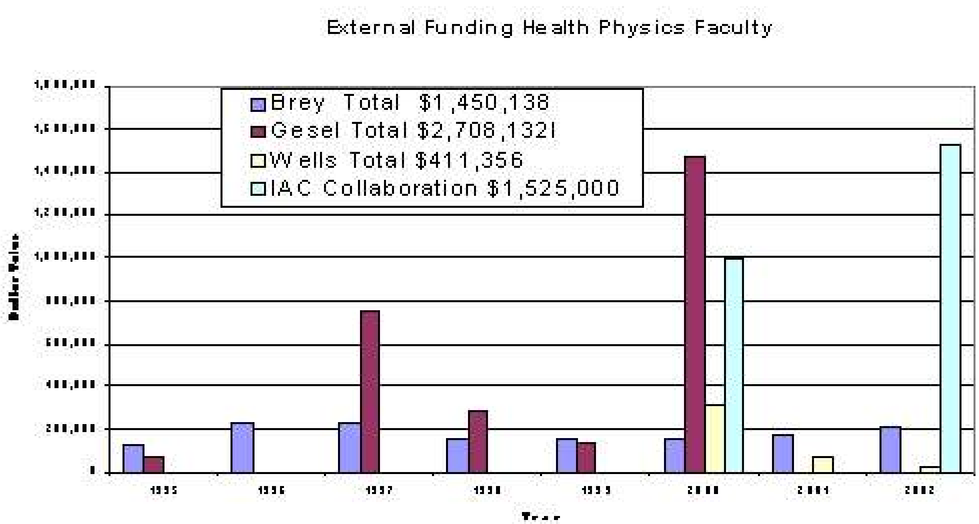
The Idaho State University Health Physics Program is currently supported by three faculty. Two of these three are Certified Health Physicists, the third a current member of the National Council of Radiation Protection (NCRP), represents over 25 years of exceptional professional experience, 10 of these 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 TableII-6. 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.



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 contract money brought into the university per year by each Health Physics Program Faculty Member since 1995and the sum of collaborative money awarded to these faculty members in connection with the Idaho Accelerator Center. A list of grant and contract money by project is provided in Attachment Nine.



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.

	Number of Committee Assignments			Number of
H.P. Faculty	Department	University	National/International	Publications
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 headquarters, faculty offices, graduate student offices, 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 g416. 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 analyze 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 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 pulsed-beam machine. IAC also owns a 10–MeV LINAC recently obtained from an industrial contributor. This machine is in storage at a rented 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 LINACs, one, of 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 undergraduate 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.

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.

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.

Equipment/Facility	**Location (on/off campus)**	**Description of Equipment/Facility Utilization**
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.
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 1994 with a third hired in 1997. (The third 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 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.

Since Physics at ISU has focused on Nuclear Physics and its applications, Health Physics was a natural extension of 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 the capital equipment budget and provided the department 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. 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.

List of Attachments

ATTACHMENT ONE - Forms from Files

HEALTH PHYSICS

The Bachelor of Science in Health Physics is an applied science with emphasis on biology, chemistry, mathematics and physics. Health Physicists are professionals whose concerns are the protection of people and the environment from harmful effects of radiation at medical and nuclear facilities. The ISU program has two tracks: a Bioscience Track (BST), and an Applied Physics Track (APT). C = Completed, SRC = Still Required to be Completed, W = Waived requirement, NA = Not Applicable, * = course number change has occurred, T = Transfer credits accepted, IP = in progress.

Graduation Check-Off Work-Sheet for Requirements of Major

FIRST YEAR

CHEM 111 General Chem I . . . . ______
CHEM 112 General Chem II . . . . ______
BIOL 202 General Zoology . . . . ______
BIOL 202L General Zoology Lab . . . . ______
MATH 147 Precalculus . . . . ______

MATH 160 (BST) Brief Calculus . . . . ______

MATH 170 (APT) Calculus I . . . . ______

SECOND YEAR

PHYS 111 (BST) Gen Phys . . . . ______
PHYS 113 (BST) Gen Phys Lab . . . . ______
PHYS 112 (BST) Gen Phys . . . . ______
PHYS 114 (BST) Gen Phys Lab . . . . ______
BIOS 209 (BST) General Ecology . . . . ______

PHYS 211 (APT) Engr Phys I . . . . ______
PHYS 213 (APT) Engr Phys Lab . . . . ______
PHYS 212 (APT) Engr Phys II . . . . ______
PHYS 214 (APT) Engr Phys Lab . . . . ______
MATH 175 (APT) Calculus II . . . . ______
MATH 275, (APT) Calculus III . . . . ______
CHEM 102 Essentials Chem II . . . . ______

THIRD YEAR

PHYS g431 Radiation Physics I . . . . ______
PHYS g432 Radiation Physics II . . . . ______
PHYS 416 Intro Nuc. Measurements . . . . ______

BIOS 301 Anatomy & Physiology . . . . ______
BIOS g302 Anatomy & Physiology . . . . ______
BIOS 307 Radiobiology . . . . ______
Math 352 (APT) Statistics Or BIOS 315 (BST) . . . . ______
CS 181 or CIS 220 Computer Prog. . . . . ______

FOURTH YEAR

PHYS g433 External Dosimetry . . . . ______
PHYS g434 Internal Dosimetry . . . . ______
PHYS g455 Topics in HP I . . . . ______
PHYS g456 Topics in HP II . . . . ______
PHYS g492 Colloquium in Physics 1st . . . . ______
PHYS g492 Colloquium in Physics 2nd . . . . ______
ENGL 307 Professional Writing . . . . ______

PHYS 480 Health Physics Capstone 1st or 2nd . . . . ______
Signature

ATTACHMENT ONE - Forms from Files (Con't)

NOTES

date ____________

date ____________

date ____________

ATTACHMENT ONE - Forms from Files (Con't)

April 9, 2002

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

ATTACHMENT TWO (Alumni Employers Constituency)

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 Pembrook Dr.
Boise, ID 83704

Scientech
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

Scientech 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

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

Afftrex 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

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 ^{222}Rn 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

Proceedings

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

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} Iodine. J.C. Seeber, R.R. Brey, J.F. Harmon, and T.F. Gesell (Abstract & Poster Paper) submitted to Health Physics 1-2000

Investigation of Possible Correlations Between ^{222}Rn Concentrations and Gas Proportional Counter Background. K. Christensen, S. Thiemann, R.E. Dunker, R.R. Brey, and T.F. Gesell (Abstract & Poster Paper) submitted to Health Physics 1-2000

Dose Response for a Model Virus to Accelerator Produced Radiation, K. Marlowe, F.J. Harmon, R.R. Brey, International Conference on Future Nuclear Systems, Global 99, August 29 - September 3, 1999, Snow King Resort, Jackson Hole WY.

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

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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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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)

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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, 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).

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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 One. 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 Two includes a Table and Scatter Plot of the Idaho State University grade distribution comparison from Fall 1997 through Fall 2001. As indicated in Figure One, 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 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 Three for all alumni who responded, in Figure Four for alumni who responded and who graduated prior to 1996, and in Figure Five 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 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 Six) and the degree to which the alumni had been prepared in those same topics (Figure Seven). 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 Six). There is less agreement between employers and alumni on how well the alumni had been prepared by the HPP (Figure Seven). 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.

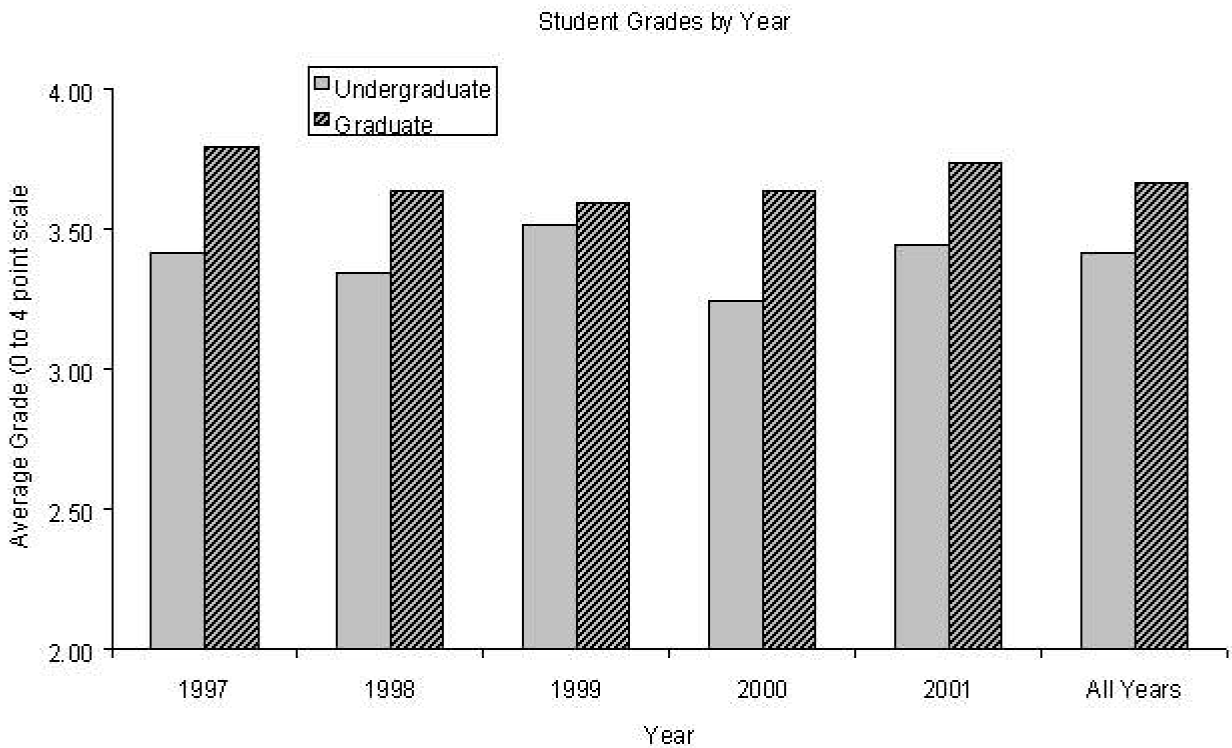


Figure One: Average grades by year for undergraduate and graduate courses in the HPP

ISU R&R

IDAHO STATE UNIVERSITY
GRADE DISTRIBUTION COMPARISON
FALL 1997 THROUGH FALL 2001

COLLEGE BY LEVEL	AVERAGE OF GRADES GIVEN FALL 1997	FALL 1998	FALL 1999	FALL 2000	FALL 2001	PERCENT CHANGE 1997 - 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 Two: Table and Scatter plot of Idaho State University grade distributions from Fall 1997 through Fall 2001.

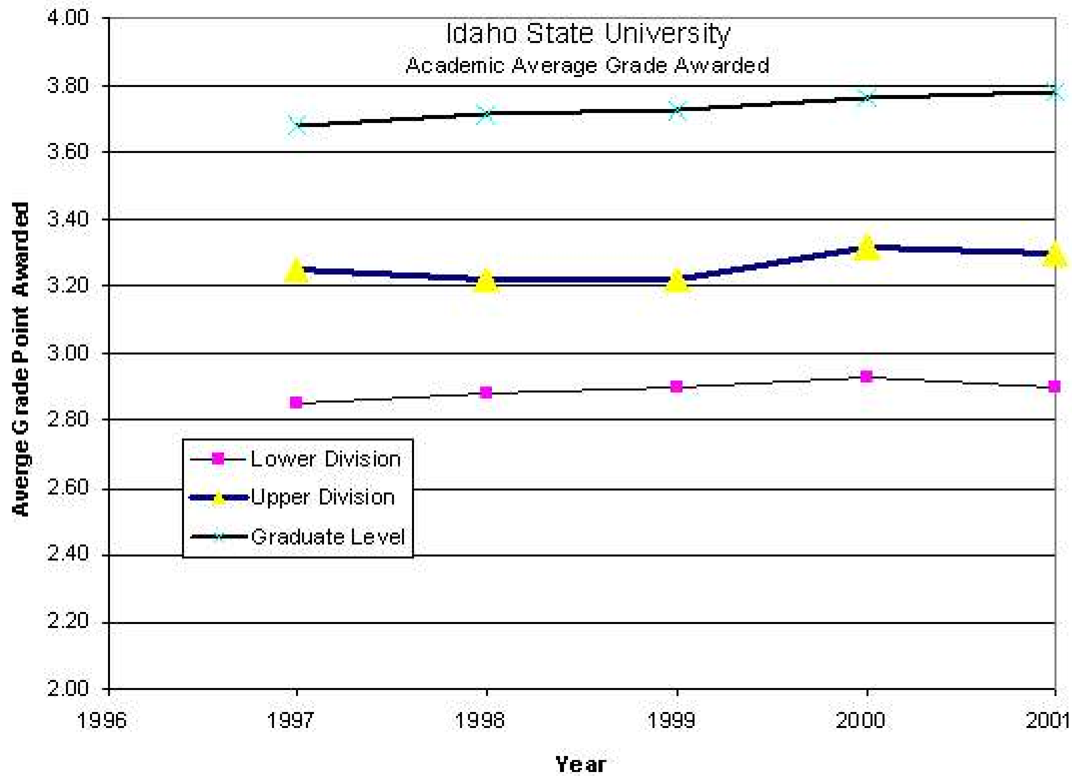


Figure Two “continued”: Table and Scatter plot of Idaho State University grade distributions from Fall 1997 through Fall 2001.

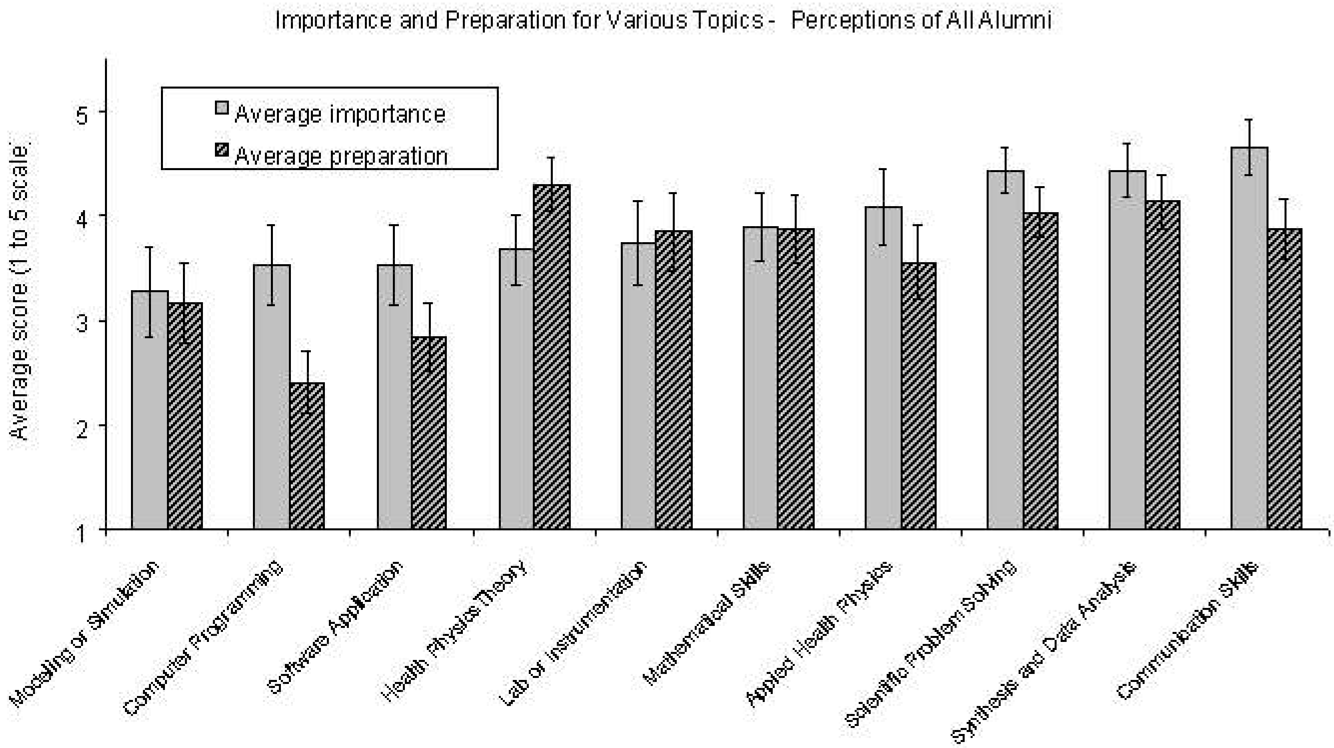


Figure Three: Comparison of all alumni perceptions of the importance of various topics and their preparation by the HPP. Topics are ordered along the abscissa with increasing perceived importance.

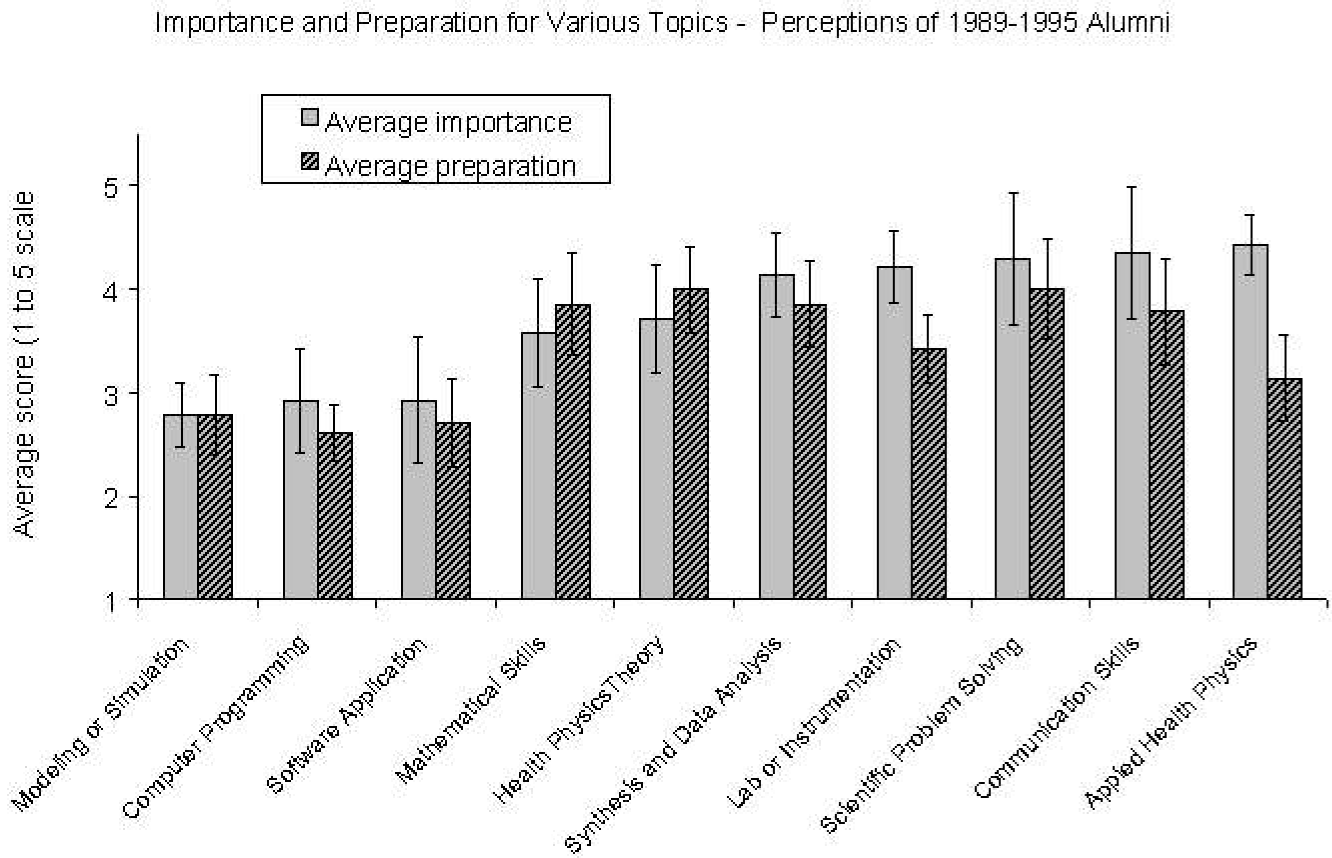


Figure Four: Comparison of 1989-1995 alumni perceptions of the importance of various topics and their preparation by the HPP. Topics are ordered along the abscissa with increasing perceived importance.

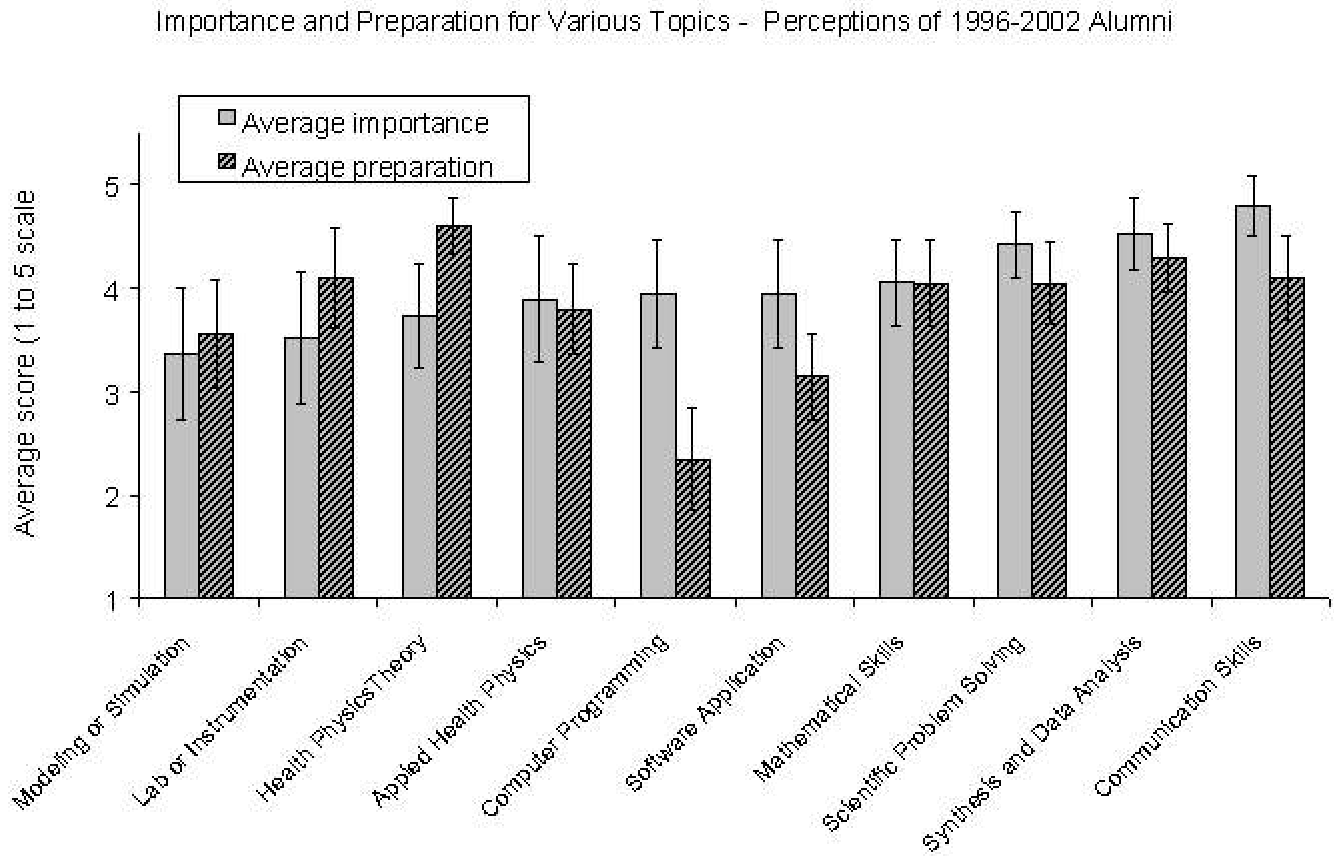


Figure Five: Comparison of 1996-2002 alumni perceptions of the importance of various topics and their preparation by the HPP. Topics are ordered along the abscissa with increasing perceived importance.

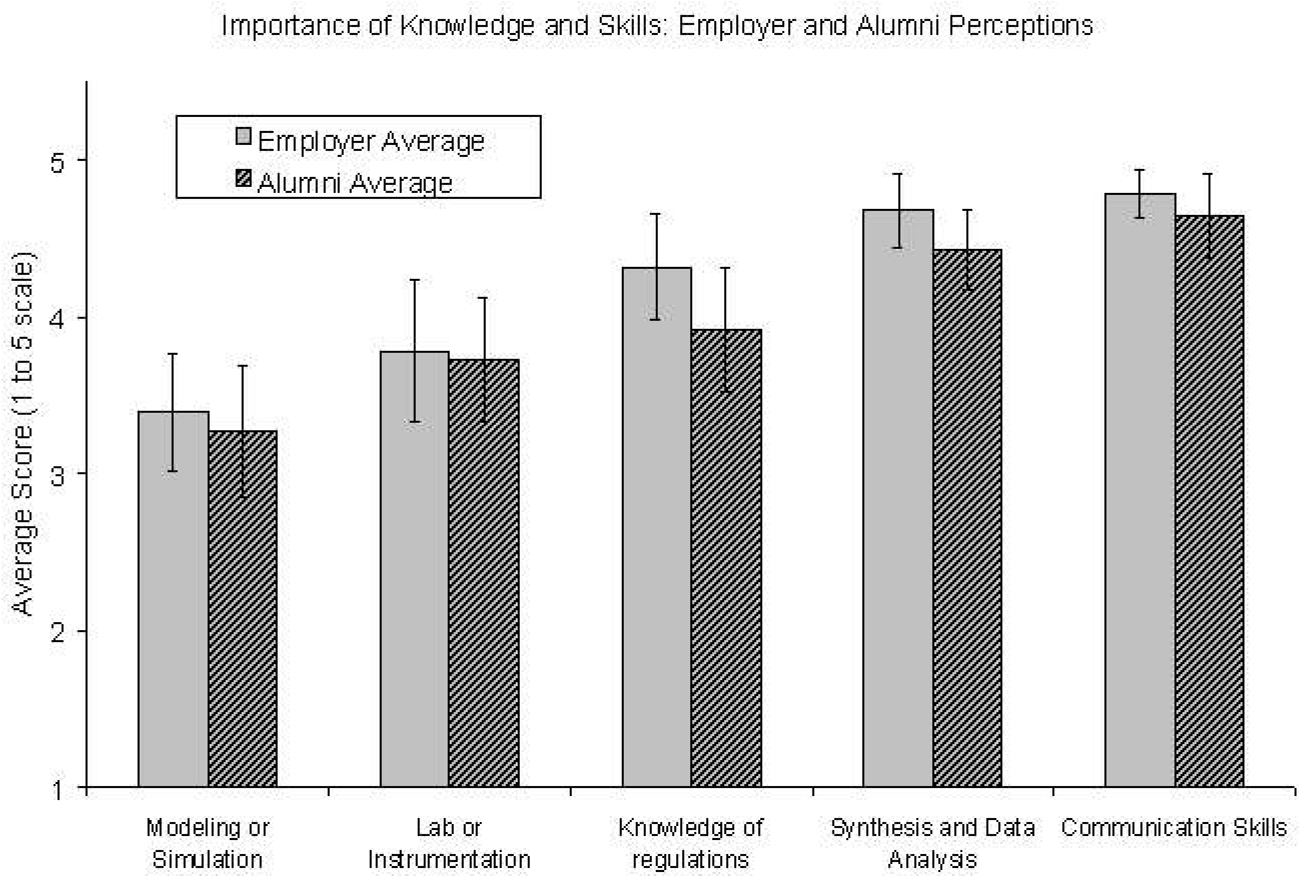


Figure Six: Comparisons between the alumni and their employers regarding their perceptions of the importance of the various knowledge and skills .

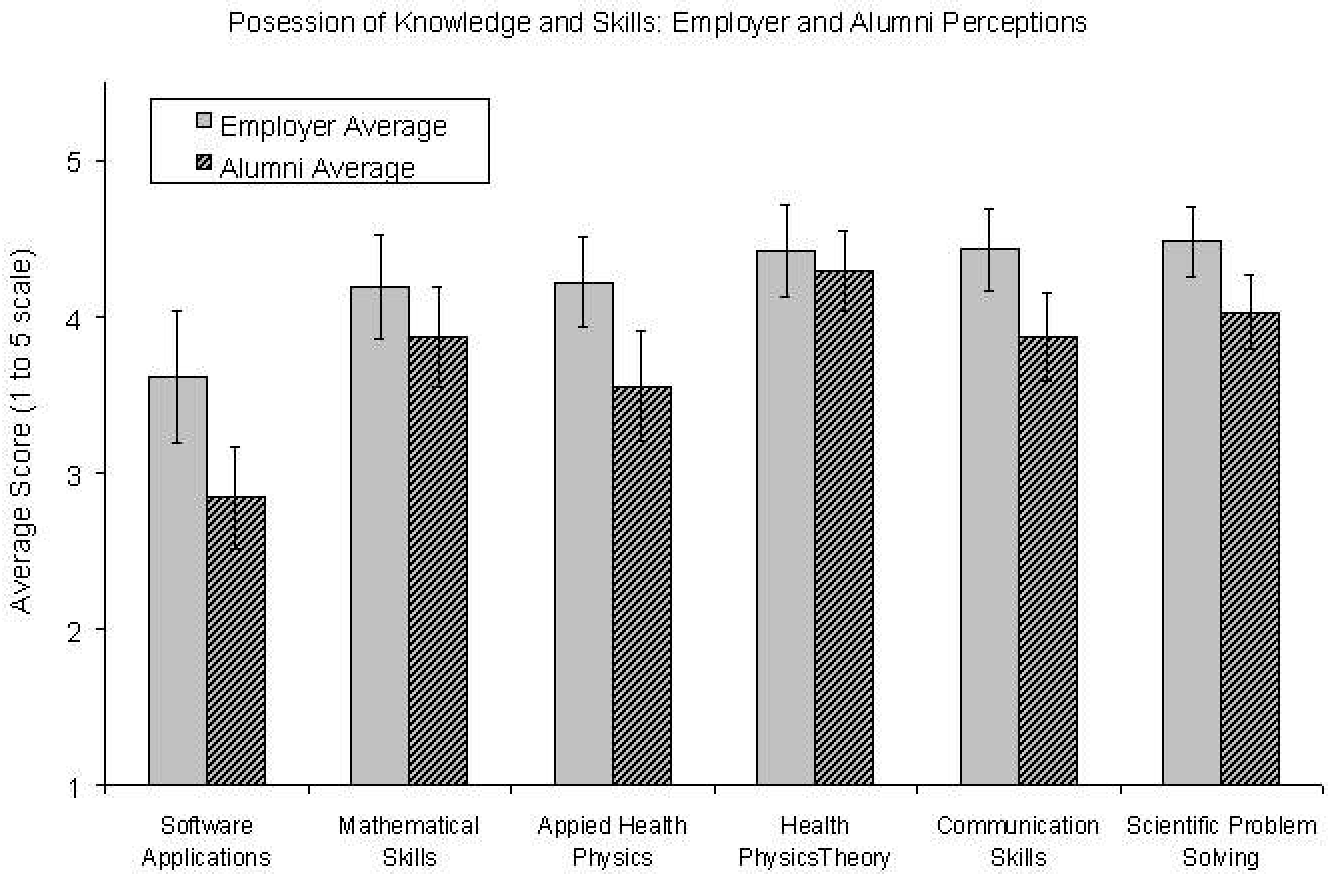


Figure Seven: Comparisons between the alumni and their employers regarding their perceptions of the alumni possessed knowledge and skills in those same topics

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:

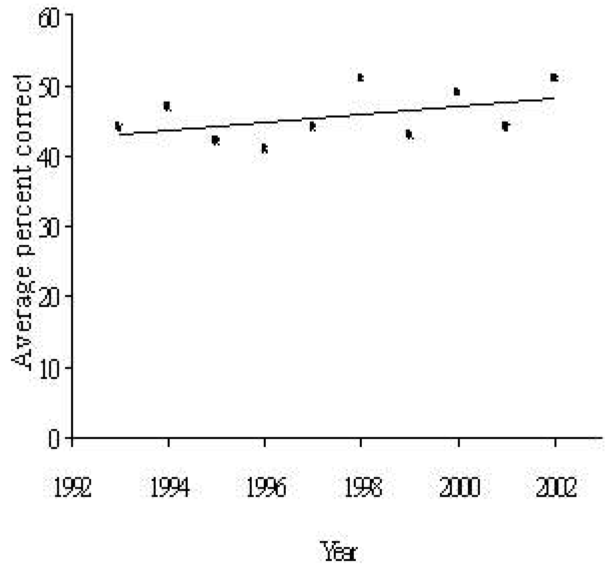
Results

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.

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

<u>Objective 1: broad, fundamental technical knowledge</u>

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

<u>Objective 2: Written and verbal communication skills</u>

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

✓* Performance in work experience

* Surveys of alumni employers

✓* Assessment of students as observed in letters of recommendation

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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, was 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.

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**
Objective 1: broad, fundamental technical knowledge		
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)
Objective 2: Written and verbal communication skills		
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
Objective 3: Professional judgement and capability to think critically		
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
Objective 4: Practical Experience in Solving Applied Health physics Problems		
Outcome Assessment Tools:		
* Performance in work experience	Satisfactory	No New Action
* Surveys of students and alumni, alumni employers	Satisfactory	No New Action
Objective 5: The Ability to Work Independently		
Outcome Assessment Tools:		
* Surveys of students, alumni, and alumni employers	Satisfactory	No New Action
* Professional papers, presentations and posters	Satisfactory	No New Action
Objective 6: A Professional Work Ethic		
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 HPP 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 Outcomes 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, tests, 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.

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."**

We have also concluded that several action items are to be taken to enhance the HPP program. This are described in the next section.

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 by 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.

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.

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 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.

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

HEALTH PHYSICS UNDERGRADUATE PROGRAM CORE CURRICULUM

g411 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.

g416 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

g431-432 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

g432 - 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 g431 or permission of instructor.

g433-434 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 g332 or permission of instructor.

g455-456 Topics in Health Physics I, II - 2 cr ea
A lecture/seminar course covering special topics in HP such as state and federal regulations, waste disposal methodology, and emergency procedures. Prereq: Phys g332 or permission of instructor.

480-Health Physics Capstone - 3 cr. Senior project involving development of an abstract, report, poster and oral presentation with synthesis of the many aspects of the undergraduate Health Physics education into a unified focused endpoint. F or S. Co-ordinate with Health Physics professors.

g490 ABHP Review – 3 cr. A course for practicing professionals aimed at the development and improvement of skills. May be graded S/U.

HEALTH PHYSICS TECHNICAL ELECTIVE COURSES

Phys 412 Environmental Health Physics - 3 cr.
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 413 Fundamentals of Industrial Hygiene - 3 cr.
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 occupation health concerns are considered.

Phys 417 Industrial Ventilation & Aerosol Phys - 3 cr.
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 418 Nonionizing Radiation Protection - 3 cr.
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 419 Radiological Emergency Planning - 3 cr.
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 420 Reactor Health Physics - 3 cr.
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*

Richard R. Brey, Ph.D., C.H.P.

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Pocatello, ID 83209
D.O.B: 7/10/63

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

POSITIONS

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

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
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 ^{222}Rn 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

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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 Univ. 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

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, 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 Reseach Alliance Subsurface Science Symposium, Sept. 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 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 prceedings 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 Intrumentation 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 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. Duttagupta, 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).

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, *Development of Bremsstrahlung-based Positron Probe for Assay and Defect Analysis*, Published in Inland Northwest 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 Isomers*, 16th International Conference on the Application of Accelerators in Research and Industry CAARI 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).

Selim, F.A., 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, Development of Bremsstrahlung-based Positron Probe for Assay and Defect Analysis, 1st Inland Nothwest Research Alliance Conference on Sub-surface Science, (2001).

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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 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).

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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 (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 & Physiolog	x			
s	Bios 307 Radiobiology		x		
y	Chem 111, 112 Gen Chemistry	x		x	
s	Chem 102 Essentials of Chemistry II	x		x	
s	CS 181 or CIS 220 Computer Progra	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 Dosi		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.
Instructions: In listing the courses in the curriculum, refer to the current edition of *Criteria for Accrediting Applied Science Programs*.
Criterion 4. Professional Component (a), (b), (c) and
Criterion 4. Curriculum (a), (b), (c)

Table I-1B. Graduate Level Curriculum (MS)
Master of Science in Physics (Health Physics Emphasis)

Year; Semester or Quarter	Course (Department, Number, Title)	Category (Credit Hours)			
		Math & Basic Sciences	Professional Program Topics	General Education	Other
s	Phys 601 Quantitative Methods in Physics		x		
s	Phys 605 Rad. Environ. Monit. Surveillance		x		
s	Phys 610 Radiation Regulations		x		
s	Phys 650 Thesis		x		

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%	
Phys 411/511	Accelerator Health Physics	4	2	90%		10%	
Phys 413/513	Fundamentals of Industrial Hygiene	4	2	90%		10%	
Phys 416/516	Introduction to Nuclear Measurements	4	3	50%	50%		
Phys 431/531	Radiation Physics I	2	3	80%		20%	
Phys 432/532	Radiation Physics II	2	3	80%		20%	
Phys 433/533	External Dosimetry	4	2	80%		20%	
Phys 434/534	Internal Dosimetry	4	2	80%		20%	
Phys 455/555	Topics in Health Physics I	2	2	60%		40%	
Phys 456/556	Topics in Health Physics II	2	2	60%		40%	
Phys 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%			

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)			

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)			

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)			

Table I-4. Faculty Analysis

Department of Physics (Health Physics Program)

Name	Rank	Type of Academic Appointment TT, T, NTT	FT or PT	Highest Degree	Institution from which Highest Degree Earned & Year	Years of Experience			Professional Registration Certification	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	FT	Ph.D.	Purdue University Ph.D. 1994	4 years	8 years	8 years	C.H.P.	High	High	Medium
Thomas Gesell	P	T	FT	Ph.D.	University of Tennessee Ph.D. 1971	11 years	21 years	11 years		High	Medium	Medium
Douglas Well	P	T	FT	Ph.D.	University of Illinois Ph.D. 1990	6 years	6 years	6 years	C.H.P.	Medium	High	None

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.

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

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

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:
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